



2016 Cool-Season Grass Horse Grazing Tolerance Report

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Introduction

Cool-season grasses such as Kentucky 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 website, 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 independent 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 horses and cattle.

Description of the Tests

Tests were established in Lexington in the fall of 2012, 2013, 2014, and 2015. 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 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 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 seed-heads 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

Table 1. Temperature and rainfall at Lexington, Kentucky, in 2013, 2014, 2015, and 2016.

	2013				2014				2015				2016 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	38	+7	4.50	+1.64	25	-6	2.28	-.58	32	+1	2.17	-0.69	32	+1	0.80	-2.06
FEB	36	+1	1.78	-1.43	30	-5	5.47	+2.26	26	14	3.08	-0.13	38	+3	6.09	+2.88
MAR	39	-5	5.47	+1.07	39	-5	3.08	-1.32	45	+1	7.34	+2.94	52	+8	4.07	-0.33
APR	55	0	4.46	+0.58	58	+3	5.27	-1.89	57	+2	13.19	+9.31	57	+2	3.97	+0.09
MAY	65	+1	5.23	+0.76	66	+2	5.72	+1.25	69	+5	3.02	-1.45	64	0	9.17	+4.70
JUN	72	0	7.32	+3.66	75	+3	2.93	-0.73	75	+3	8.20	+4.54	76	+4	5.09	+1.43
JUL	72	-4	9.33	+4.33	74	-2	3.18	-1.82	77	+1	10.22	+5.22	79	+3	7.43	+2.43
AUG	72	-3	3.68	-0.25	76	+1	6.53	+2.60	74	-1	3.49	-0.44	79	+4	4.37	+0.44
SEP	67	-1	2.21	-0.99	69	+1	3.63	+4.3	72	+4	3.49	+0.29	74	+6	2.18	-1.02
OCT	55	-2	7.02	+4.45	57	0	5.55	+2.98	59	+2	2.78	+0.21	64	+7	0.37	-2.20
NOV	41	-4	3.06	-0.33	41	-4	2.79	-0.60	51	+6	3.72	+0.33				
DEC	36	0	4.19	+0.21	40	+4	2.47	-1.51	49	+13	8.42	+4.44				
Total			58.25	+13.70			49.4	+4.85			69.12	+24.57			43.54	+6.36

¹ DEP is departure from the long-term average.

² 2016 data is for the ten months through October.

pasture. 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 for 2013, 2014, 2015, and 2016 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

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		2-yr 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 2-year total; when two varieties had the same 2-year total, ties were broken using the 2004 rank.

³ Stand survival after 4 years of continuous grazing.

⁴ "-" indicates variety is endophyte free.

Table 3. Seedling vigor, grazing preference, and stand persistence of forage grasses sown August 30, 2012, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Seedling Vigor ¹ Oct 10, 2012	Grazing Preference ²				Percent Stand									
			2013	2014	2015	2016	2012	2013		2014		2015		2016		
			May 8	May 6	May 1	May 3	Oct 10	Mar 27	Oct 15	Apr 8	Oct 20	Apr 6	Nov 10	Mar 29	Oct 14	
Commercial Varieties-Available for Farm Use																
Jesup EF	tall fescue	2.8	1.2	1.3	1.0	1.0	100	100	100	100	100	100	99	99	99*	
KY31+ ³	tall fescue	3.1	4.0	3.2	1.2	1.5	100	100	99	99	99	99	99	99	98*	
Cowgirl	tall fescue	2.3	3.7	2.2	1.0	1.5	100	100	100	100	100	100	99	99	98*	
Select	tall fescue	2.3	2.3	1.7	1.0	1.2	100	100	100	100	100	100	98	98	97*	
Jesup MaxQ ³	tall fescue	2.4	1.8	1.5	1.0	1.0	100	100	100	100	99	99	98	98	96*	
BarOptima Plus E34 ³	tall fescue	2.1	5.3	4.3	1.7	2.7	97	97	97	99	98	98	95	95	94*	
Benchmark Plus	orchardgrass	2.8	6.7	5.2	4.5	5.2	100	100	94	95	88	91	71	59	25	
Persist	orchardgrass	2.8	5.7	6.2	4.2	6.0	100	100	94	94	86	84	63	50	23	
Profit	orchardgrass	2.7	6.2	5.5	5.2	6.3	100	100	91	92	85	85	40	35	19	
Elise	orchardgrass	2.8	7.0	6.7	5.7	6.3	100	100	96	94	86	82	47	38	18	
Tekapo	orchardgrass	2.0	7.5	6.7	6.2	7.0	100	100	97	91	87	84	52	43	18	
Spring Green	festulolium	4.3	7.3	8.0	7.0	7.7	100	100	96	98	90	87	50	62	15	
TetraGain	perennial ryegrass	3.3	7.0	7.5	5.5	7.3	100	100	95	94	73	73	28	29	9	
Grand Daddy	perennial ryegrass	3.7	7.5	7.7	5.7	7.2	100	100	98	98	80	80	40	35	8	
BigBlue	KY bluegrass	0.7	8.2	8.0	7.7	6.8	76	74	12	28	23	20	17	14	6	
Giant	bentgrass species	1.0	8.2	8.0	5.4	5.3	100	100	71	81	32	48	17	13	5	
Ginger	KY bluegrass	1.0	8.0	8.0	-	-	90	98	9	10	9	6	6	6	5	
Meadow Green	festulolium	4.9	7.8	8.5	-	-	100	99	3	2	1	1	1	1	1	
Experimental Varieties																
KYFA0906	tall fescue	3.3	4.5	3.3	1.2	2.2	100	100	100	100	100	100	100	100	100*	
KY31- ³	tall fescue	2.8	3.5	2.5	1.0	1.2	100	100	100	100	100	100	100	100	99*	
KYFA0901	tall fescue	2.6	4.7	1.0	1.0	1.2	100	100	100	100	100	100	98	98	98*	
KYFA0905	tall fescue	2.3	6.0	4.2	1.2	1.7	100	100	100	99	99	99	97	88	94*	
OG 0707	orchardgrass	2.3	6.3	6.8	4.7	5.8	100	100	94	93	90	88	55	42	27	
OG 1002	orchardgrass	1.7	7.7	7.0	6.2	6.5	99	99	90	91	82	75	43	32	14	
Meran		2.6	5.8	5.1	3.5	4.2	98	99	85	86	79	79	63	60	49	
CV,%		19.1	20.1	23.9	33.8	30.3	3	3	7	7	15	14	20	22	17	
LSD,0.05		0.6	1.3	1.5	1.4	1.5	3	4	7	7	13	13	15	15	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; 2013-16 days, 2014-23 days, 2015-4 days, 2016-12 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 4. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 6, 2013, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Seedling Vigor ¹ Oct 15, 2013	Grazing Preference ²			Percent Stand						
			2014	2015	2016	2013	2014		2015		2016	
			May 6	May 1	May 3	Oct 15	Apr 7	Oct 20	Apr 6	Nov 10	Mar 29	Oct 14
Commercial Varieties-Available for Farm Use												
KY31+ ³	tall fescue	4.2	4.6	2.4	1.0	100	98	98	98	98	98	97*
Jesup MaxQ ³	tall fescue	4.3	2.0	1.7	1.0	99	99	99	99	99	98	97*
BarOptima Plus E34 ³	tall fescue	4.5	4.8	3.0	2.5	99	98	99	99	98	98	96*
Lacefield MaxQ II ³	tall fescue	4.3	2.8	2.5	1.2	99	99	99	99	98	97	96*
Select	tall fescue	4.2	1.8	1.7	1.2	99	97	97	97	95	96	94*
Cajun II	tall fescue	3.0	2.8	1.5	1.0	91	92	93	93	90	89	88*
Benchmark Plus	orchardgrass	4.2	5.7	5.3	6.0	96	94	96	94	61	63	40
Persist	orchardgrass	3.6	5.8	5.0	5.0	98	96	97	97	65	65	32
Clair	timothy	2.0	7.6	7.2	5.3	3	54	48	44	38	38	23
Tekapo	orchardgrass	4.3	7.6	6.8	6.8	99	69	75	71	47	30	22
Prodigy	orchardgrass	4.4	6.0	6.7	7.5	98	94	93	91	30	27	16
Comtral	timothy	3.0	8.0	8.2	7.3	62	80	68	60	23	31	15
Climax	timothy	2.7	8.8	8.3	8.2	67	77	62	50	22	18	9
Experimental Varieties												
KYFA9732/AR584 ³	tall fescue	4.8	4.2	2.8	1.3	99	99	99	99	99	99	98*
KYFA9821/AR584 ³	tall fescue	3.4	3.2	2.3	1.0	96	96	96	96	95	94	94*
KYFA0701	tall fescue	4.5	3.7	2.5	1.0	99	99	99	99	96	95	93*
KY31- ³	tall fescue	4.0	3.1	2.6	1.1	99	98	98	97	92	92	92*
HTWC4	tall fescue	3.8	2.8	2.8	1.0	99	98	98	97	92	91	88*
BARFAF 13131	tall fescue	3.2	4.7	2.2	1.0	88	84	91	92	88	88	84
Mean		3.9	4.7	3.9	3.2	89	91	90	89	75	74	67
CV,%		22.4	23.8	25.6	26.3	13	13	12	14	16	15	15
LSD,0.05		1.1	1.3	1.2	1.0	13	13	13	14	13	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 indicating all forage was grazed. Grazing time before rating; 2014-9 days, 2015-4 days, 2016-12 days

³ KY 31- is the variety KY31 from which the toxic endophyte has been removed. Jesup MaxQ and Lacefield MaxQ II contain a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. AR584 is a non-toxic endophyte inserted into the experimental tall fescue varieties. KY31+ contains the 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.

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 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 Kentucky bluegrass and perennial 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 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 for-

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

Table 5. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 9, 2014, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Seedling Vigor ¹ Oct 9, 2014	Grazing Preference ²		Percent Stand				
			2015	2016	2014	2015		2016	
			May 1	Apr 26	Oct 9	Apr 6	Oct 21	Mar 29	Oct 14
Commercial Varieties-Available for Farm Use									
BarOptima Plus E34 ³	tall fescue	3.3	2.5	1.0	99	99	100	100	99*
Jesup MaxQ ³	tall fescue	3.8	1.8	1.0	99	100	100	100	99*
KY31+ ³	tall fescue	5.0	2.0	1.0	100	100	100	100	99*
SS-0705TFSL	tall fescue	4.2	2.0	1.0	99	100	99	99	99*
Select	tall fescue	3.6	1.2	1.0	97	99	98	99	98*
Persist	orchardgrass	3.3	2.7	3.2	99	99	98	96	60
SS0708OGDT	orchardgrass	4.4	3.3	3.8	100	100	99	98	56
Benchmark Plus	orchardgrass	3.7	3.0	3.8	99	99	98	97	48
Profit	orchardgrass	4.5	2.8	3.3	100	100	80	96	45
Power	perennial ryegrass	4.8	5.7	5.8	100	96	95	96	40
Grand Daddy	perennial ryegrass	4.4	3.5	3.0	98	98	95	94	38
Experimental Varieties									
NFTF 1370	tall fescue	4.5	1.3	1.0	100	100	100	100	100*
KY31- ³	tall fescue	4.3	2.2	1.0	98	99	99	99	100*
NFTF 1044	tall fescue	3.8	1.8	1.0	100	100	100	100	100*
NFTF 1051	tall fescue	3.8	1.2	1.0	100	100	100	100	98*
2014.90.19	orchardgrass	4.3	2.7	3.2	100	100	99	99	70
OG 0901G	orchardgrass	3.8	3.3	5.5	98	99	98	97	56
B-14.0516	orchardgrass	2.3	4.2	5.3	95	95	94	94	51
OG 1102G	orchardgrass	3.8	3.2	3.6	100	100	98	98	50
OG 1101G	orchardgrass	3.6	3.4	4.2	100	100	95	94	36
Mean		4.0	2.7	3.7	99.0	99	97	98	72
CV,%		16.1	28.1	30.9	2.0	2	8	3	17
LSD,0.05		0.7	0.9	1.0	2.0	3	9	3	14

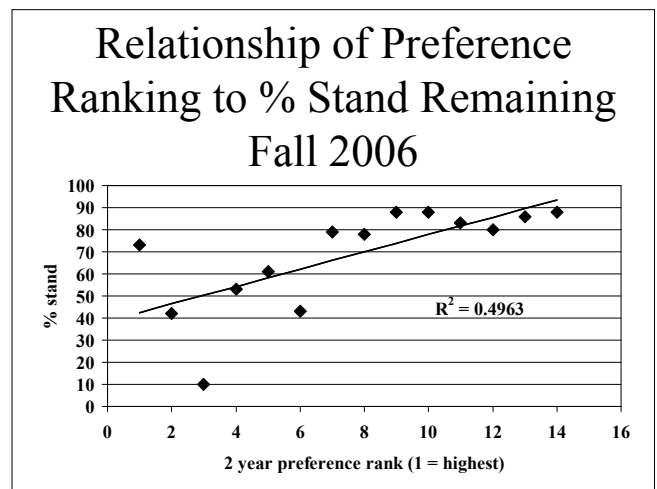
¹ Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

² Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2015-4 days, 2016-5 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.

Figure 1. Relationship of preference ranking to percent stand remaining in fall 2006.



Note-species on above 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

Tables 8 and 9 are summaries of stand persistence data from 1999 to 2016 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

Table 6. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 3, 2015, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Seedling Vigor ¹ Oct 19, 2015	Grazing Preference ² Apr 26, 2016	Percent Stand		
				2015		2016
				Oct 19	Mar 29	Oct 14
Commercial Varieties-Available for Farm Use						
Jesup MaxQ ³	tall fescue	3.5	1.4	100	100	100*
KY31+ ³	tall fescue	3.6	1.8	100	100	100*
Lacefield MaxQ II ³	tall fescue	3.7	1.8	100	100	100*
Select	tall fescue	3.3	1.5	100	100	100*
SS-0705TFSL	tall fescue	3.3	1.5	100	100	100*
BarOptima Plus E34 ³	tall fescue	3.0	1.9	100	100	99*
Tekapo	orchardgrass	3.3	4.2	100	100	97*
Persist	orchardgrass	3.3	2.7	100	100	97*
Grand Daddy	perennial ryegrass	4.3	3.5	100	100	96*
SS-0708OGDT	orchardgrass	3.7	2.5	100	100	94*
Prairie	orchardgrass	3.3	2.7	100	100	94*
Power	perennial ryegrass	4.7	4.5	100	100	93*
Spring Green	festulolium	4.8	3.7	100	100	88
Duo	festulolium	5.0	6.3	100	98	72
Experimental Varieties						
KY31- ³	tall fescue	3.3	1.6	100	100	100*
KYFA1113	tall fescue	3.4	1.7	100	100	100*
KYFA1114	tall fescue	3.6	1.8	100	100	100*
KYFA9821/AR584 ³	tall fescue	3.8	1.5	100	100	100*
KYFA1311	tall fescue	3.2	1.5	100	100	98*
KYDG1002	orchardgrass	3.2	3.2	100	100	96*
KYFL1013	festulolium	4.9	3.5	100	100	86
Mean		3.7	2.6	100	100	96
CV,%		9.2	27.0	0	1	7
LSD,0.05		0.4	0.9	0	1	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; 2016-5 days.

³ KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ and Lacefield MaxQII contain a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. AR584 is a non-toxic endophyte inserted into the experimental tall fescue variety. 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.

in this trial. Although several varieties expressed tolerance to the level of grazing pressure used in these trials, overgrazing 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

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Table 7. Summary of persistence of forage grasses under heavy grazing pressure by horses across years at Lexington, Kentucky.

Variety	Species	Proprietor/ KY Distributor	2012 ¹								2013						2014				2015	
			Mar ²	Oct	Apr	Oct	Apr	Nov	Mar	Oct	Apr	Oct	Apr	Nov	Mar	Oct	Apr	Oct	Mar	Oct	Mar	Oct
			2013	2014	2015	2016	2014	2015	2016	2015	2016	2015	2016	2016	2016	2016	2016	2016	2016	2016	2016	2016
Commercial Varieties-Available for Farm Use																						
BarOptima PLUS E34 ³	tall fescue	Barenbrug USA	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Benchmark Plus	orchardgrass	Southern States	*	*	*	*	*	x ⁴	x	x	*	*	*	x	x	x	*	*	*	*	x	
BigBlue	KY bluegrass	Pure Seed	x	x	x	x	x	x	x	x												
Cajun II	tall fescue	Smith Seed Services									*	*	*	*	*	*						
Clair	timothy	Turner Seed									x	x	x	x	x	x						
Climax	timothy	Canada Agr. Res. Station									x	x	x	x	x	x						
Comtral	timothy	Caudill Seed									x	x	x	x	x	x						
Cowgirl	tall fescue	Pure Seed	*	*	*	*	*	*	*	*												
Duo	festulolium	Ampac Seed Company																			x	x
Elise	orchardgrass	Pure Seed	*	*	*	x	x	x	x	x												
Giant	bentgrass species	Rose-Agri Seed	*	x	x	x	x	x	x	x												
Ginger	KY bluegrass	ProSeeds Marketing	*	x	x	x	x	x	x	x												
Grand Daddy	perennial ryegrass	Smith Seed Services	*	*	*	x	x	x	x	x							*	x	x	x	*	*
Jesup EF	tall fescue	Pennington Seed	*	*	*	*	*	*	*	*												
Jesup Max Q ³	tall fescue	Pennington Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KY 31+ ³	tall fescue	Public	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lacefield MaxQ II ³	tall fescue	Pennington Seed									*	*	*	*	*	*					*	*
Meadow Green	festulolium	Pure Seed	*	x	x	x	x	x	x	x												
Persist	orchardgrass	Smith Seed Services	*	*	*	x	x	x	x	x	*	*	*	x	x	x	*	*	x	x	*	*
Power	perennial ryegrass	Ampac Seed Company															x	x	x	x	*	*
Prairie	orchardgrass	Turner Seed																			*	*
Prodigy	orchardgrass	Caudill Seed									*	*	*	x	x	x						
Profit	orchardgrass	Ampac Seed Company	*	x	x	x	x	x	x	x							*	x	x	x		
Select	tall fescue	Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Spring Green	festulolium	Rose-Agri Seed	*	*	*	*	*	x	x	x											*	x
SS-0705TFSL	tall fescue	Southern States															*	*	*	*	*	*
SS-0708OGDT	orchardgrass	Southern States															*	*	*	x	*	*
Tekapo	orchardgrass	Ampac Seed Company	*	*	x	*	x	x	x	x	x	x	x	x	x	x					*	*
TetraGain	perennial ryegrass	Pure Seed	*	*	*	x	x	x	x	x											*	*
Experimental Varieties																						
B-14.0516	orchardgrass	Blue Moom Farms															x	x	x	x		
BARFAF 13131	tall fescue	Barenbrug USA									x	*	*	*	*	*	x					
HTWC4	tall fescue	KY Agric. Exp. Station									*	*	*	*	*	*						
KY 31- ³	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYDG1002	orchardgrass	KY Agric. Exp. Station																			*	*
KYFA0701	tall fescue	KY Agric. Exp. Station									*	*	*	*	*	*						
KYFA0901	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
KYFA0905	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
KYFA0906	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
KYFA1113	tall fescue	KY Agric. Exp. Station																			*	*
KYFA1114	tall fescue	KY Agric. Exp. Station																			*	*
KYFA1311	tall fescue	KY Agric. Exp. Station																			*	*
KYFA9732/AR584 ³	tall fescue	KY Agric. Exp. Station									*	*	*	*	*	*						
KYFA9821/AR584 ³	tall fescue	KY Agric. Exp. Station									*	*	*	*	*	*					*	*
KYFL1013	festulolium	KY Agric. Exp. Station																			*	x
NFTF 1044	tall fescue	Noble Foundation															*	*	*	*		
NFTF 1051	tall fescue	Noble Foundation															*	*	*	*		
NFTF 1370	tall fescue	Noble Foundation															*	*	*	*		
OG 0707	orchardgrass	FFR/Southern States	*	*	*	*	*	x	x	x												
OG 0901G	orchardgrass	FFR/Southern States															*	*	*	x		
OG 1002	orchardgrass	FFR/Southern States	*	x	x	x	x	x	x	x												
OG 1101G	orchardgrass	FFR/Southern States															*	x	x	x		
OG 1102G	orchardgrass	FFR/Southern States															*	*	*	x		
2014.90.19	orchardgrass	KY Agric. Exp. Station															*	*	*	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 and Lacefield MaxQ II contain a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. AR584 is a non-toxic endophyte inserted into the experimental tall fescue varieties. 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 1999-2016 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	2010	2011	2012	2013	Mean ³ (#trials)
		3-yr ⁴	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	3-yr	
BarOptima PLUS E34 ⁵	Barenbrug								107			101	101	95	104	102(5)
Bronson	Ampac Seed	80														–
Cajun II	Smith Seed														96	–
Cattle Club	Green Seed	95														–
Cowgirl	Rose Agri-Seed									105				99		102(2)
Festorina	Advanta Seed	102														–
Jesup MaxQ ⁵	Pennington Seed			98			78			104	97	100	101	97	105	98(8)
Johnstone	ProSeeds		88													–
KY31+ ⁵	KY Agri. Exp.Sta.		105				102	109	120	107	101	101	101	99	105	105(10)
KY31- ⁵	KY Agri. Exp.Sta.	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100(14)
Lacefield MaxQ II ⁵	Pennington Seed							105	110		98				104	104(4)
Nanryo	Japanese Grassland For. Seed								72							–
Seine	Seed Research of OR					135										–
Select	Southern States	82		109	94	99	73	104	76	108	98	100	101	98	102	96(13)
Stargrazer	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 2010 was grazed 4 years so the final report would be "2014 Cool-Season Grass Horse 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 Lacefield MaxQII 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 9. Summary of 1999-2016 Kentucky orchardgrass horse grazing tolerance trials in Lexington (stand persistence shown as a percentage of the mean of the commercial varieties in the trial).

Variety	Proprietor/KY Distributor	1999 ^{1,2}	2000	2001	2002	2005 ³	2006	2009	2010	2011	2012	2013	Mean ⁴ (#trials)
		3-yr ⁵	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	3-yr	
Albert	Univ. of Wisconsin			95									–
Ambrosia	Amer.Grass Seed Prod.						61						–
Benchmark	Southern States	104			85								95(2)
Benchmark Plus	Southern States				111	157	139	111	114	121	121	145	123(7)
Crown Royale	Grassland Oregon			95									–
Crown Royale Plus	Grassland Oregon				97								–
Elise	Pure Seed										87		–
Haymate	Southern States	96	85		97								93(3)
Persist	Smith Seed					114		103	101	92	112	116	105(5)
Potomac	Public				117								–
Prairie	Turner Seed			100									–
Prodigy	Caudill Seed											58	–
Profit	Ampac Seed							93	86		92		90(3)
SS-0708OGDT	Southern States									104			–
Tekapo	Ampac Seed	101	115		93	30		92	100	83	87	80	94(8)

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 2010 was grazed 4 years so the final report would be "2014 Cool-Season Grass Horse Grazing Tolerance Report" archived in the KY Forage website at <www.uky.edu/Ag/Forage>.

³ Due to high variation during 2005 these values are not included in the overall mean.

⁴ Mean only presented when respective variety was included in two or more trials.

⁵ Number of years of data.

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