

# 2004 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. While variety evaluations for yield have been carried out for many years, 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 and orchardgrass and other species when subjected to continuous and heavy grazing pressure by horses within the grazing season. The main focus will be on plant stand survival.

## Description of the Tests

Tests were established in Lexington in the fall of 2000, 2001, 2002 and 2003. 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 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 kept at that height or below for the remainder of the grazing season. Supplemental hay was fed during periods of slowest growth. Visual ratings of percent stand were made in the fall several weeks after the cattle were removed to check stand survival after the grazing season and in the spring prior to grazing to check on winter survival and spring growth. Since trials were seeded in rows, persistence ratings were based on density within a row and not total ground cover. Grass plots were fertilized with 60 pounds of actual N per acre in the spring, and other fertilizer (lime, P, and K) was applied as needed.

## Results and Discussion

Weather data for Lexington for 2001, 2002, 2003 and 2004 are presented in Table 1.

Data on percent stand are presented in Tables 2, 3, 4 and 5.

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 2, 3, and 4), but the varieties of timothy and prairie brome (prairiegrass) (*Bromus willdenoii*) in these trials did not. The sensitivity of timothy and prairie brome to heavy grazing was not surprising, as these are both erect species and sensitive to heavy defoliation.

Perennial ryegrasses vary in tolerance to grazing. Several ryegrasses and a ryegrass/fescue hybrid (Duo) showed good survival (Tables 2, 3). Mara and Duo were among the most persistent after three seasons of grazing (Table 2).

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 are alongside tall fescue. These data should be taken as an indication of tolerance to short durations of overgrazing. For best pasture stands, forage grasses should not be abused as in this study.

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.

Table 6 summarizes information about distributors and persistence across locations and years for all varieties in these tests. Varieties are listed in alphabetical order with experimental varieties listed at the bottom. An open block indicates that the variety was not in that particular test (labeled at the top of the column), while an "x" in the block indicates the variety was in the test but 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. It is best to choose a variety that has performed well over several years.

## Summary

These studies indicate that there are varieties of cool-season grasses that can tolerate overgrazing by horses for one to three 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 or 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 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 occurs.

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

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**Table 1. Temperature and rainfall at Lexington during the 2001, 2002, 2003 and 2004 growing seasons.**

	2001				2002				2003				2004			
	Temperature		Rainfall		Temperature		Rainfall		Temperature		Rainfall		Temperature		Rainfall	
	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	31		0.92	-1.94	38	+7	2.12	-0.7	26	-5	0.96	-1.90	30	-1	3.14	+0.28
FEB	40	+5	3.20	-0.01	38	+3	1.28	-1.9	32	-3	3.59	+0.38	36	+1	1.32	-1.89
MAR	40	-4	2.73	-1.67	45	+1	7.93	+3.5	47	+3	2.09	-2.31	47	+3	3.43	-0.97
APR	59	+4	1.66	-2.22	58	+3	4.19	+0.3	57	+2	3.14	-0.74	55	0	3.06	-0.82
MAY	66	+2	4.85	+0.38	61	-3	4.36	-0.1	63	-1	6.68	+2.21	68	+4	9.79	+5.32
JUN	71	-1	2.04	-1.12	74	+2	2.45	-1.2	69	-3	4.85	+1.19	72	0	3.13	-0.53
JUL	75	-1	5.58	+0.58	78	+2	1.10	-3.9	74	-2	2.68	-2.32	73	-3	7.65	+2.65
AUG	76	+1	4.75	+0.82	77	+2	0.95	-3.0	75	0	5.26	+1.33	71	-4	2.91	-1.02
SEP	65	-3	2.99	-0.21	72	+4	4.90	+1.7	65	-3	4.22	+1.02	68	0	2.61	-0.59
OCT	56	-1	3.62	+1.05	55	-2	5.61	+3.0	56	-1	1.61	-0.96	58	+1	5.65	+3.08
NOV	51	+6	2.83	-0.56	43	-2	3.76	+0.4	50	+5	4.63	+1.24	49	+4	6.29	+2.90
Total			35.17	-5.40			38.65	-1.92			39.71	-0.86			48.98	+8.41

DEP is departure from the long-term average for that location.

**Table 2. Percent stand of forage grasses planted September 19, 2000 at Lexington, Kentucky in a horse grazing tolerance trial.**

Variety	Species <sup>1</sup>	Percent Stand							
		Apr 9, 2001	Oct 15, 2001	Apr 2, 2002	Oct 11, 2002	Mar 25, 2003	Oct 30, 2003	Mar 26, 2004	Aug 11, 2004
<b>Commercial Varieties—Available for Farm Use</b>									
Barcarella	tall fescue	88	56	70	65	83	48	84	85*
Cattleclub	tall fescue	90	69	78	68	83	53	84	80*
Mara	diploid perennial ryegrass	90	77	89	73	84	68	85	78*
Duo	festulolium	90	66	82	76	84	68	88	72*
Stargrazer	tall fescue	89	62	75	63	83	38	78	72*
Tekapo	orchardgrass	89	77	83	64	74	57	71	68
Ginger	KY bluegrass	90	9	43	8	55	34	60	58
Kokanee	tall fescue	90	58	73	36	69	41	68	55
Haymate	orchardgrass	90	68	75	53	63	43	62	50
Tuukka	timothy	90	18	50	6	20	15	21	6
<b>Experimental Varieties</b>									
OG9705g	orchardgrass	90	61	68	55	60	46	68	55
K5568k	orchardgrass	90	73	79	53	66	38	52	35
K5632m	prairie brome	84	7	28	3	11	4	22	10
K5633d	prairie brome	81	8	33	4	16	1	20	9
Mean		88.6	50.5	66.1	44.8	60.7	39.5	61.6	51.9
CV, %		2.5	22.1	19.0	27.2	19.4	30.0	19.7	25.8
LSD,0.05		2.5	12.8	14.5	14.1	13.6	13.6	14.0	15.8

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

<sup>1</sup> All tall fescues in this trial are endophyte free.

**Table 3. Seedling vigor rating and percent stand of forage grasses sown September 12, 2001 at Lexington, Kentucky in a horse grazing tolerance study.**

Variety	Species	Seedling Vigor <sup>1</sup> Nov 2, 2001	Percent Stand					
			Apr 4, 2002	Oct 15, 2002	Mar 28, 2003	Oct 27, 2003	Mar 31, 2004	Nov 8, 2004
<b>Commercial Varieties—Available for Farm Use</b>								
Aries	diploid perennial ryegrass	5	90	79	90	77	67	63*
Crown Royale	orchardgrass	4	90	66	79	65	38	60*
Grand Daddy	tetraploid perennial ryegrass	5	90	78	89	72	70	53*
KY31+ <sup>2</sup>	tall fescue	4	90	60	81	54	48	53*
Prairie	orchardgrass	4	90	58	73	51	39	52
Albert	orchardgrass	3	90	62	78	62	52	50
Quartet	tetraploid perennial ryegrass	5	78	62	83	57	36	48
Fure	meadow fescue	3	90	21	56	18	10	33
Johnstone	tall fescue	4	89	48	73	41	26	27
Platini	KY bluegrass	2	90	70	86	60	6	18
Clair	timothy	2	89	21	64	16	19	15
Colt	timothy	3	90	15	59	13	18	13
Maverick Gold	diploid perennial ryegrass	5	28	21	57	23	25	13
Slezanka	KY bluegrass	3	88	74	87	72	35	13
Kenblue	KY bluegrass	2	88	78	88	70	28	10
<b>Experimental Varieties</b>								
KYFA 9301	tall fescue	4	90	71	85	60	60	68*
KYFA 9304	tall fescue	4	90	61	81	59	51	57*
KY 31- <sup>2</sup>	tall fescue	4	90	58	82	56	49	47
OG 9705G	orchardgrass	2	90	57	70	57	37	43
PP 10	tall fescue variety mixture	3	88	48	75	29	19	38
PP 11	per. ryegrass variety mixture	5	48	23	68	26	25	17
Mean		3.5	84.2	53.8	76.3	49.4	36.2	37.8
CV, %		12.5	5.1	26.0	12.3	31.0	47.1	36.4
LSD, 0.05		0.5	5.2	16.7	11.2	18.3	20.4	16.5

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

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

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

**Table 4. Seedling vigor rating and percent stand of forage grasses sown September 19, 2002 at Lexington, Kentucky in a horse grazing tolerance study.**

Variety	Species	Seedling Vigor <sup>1</sup> Oct 31, 02	Percent Stand			
			Mar 25, 03	Oct 30, 03	Mar 26, 04	Nov 8, 04
<b>Commercial Varieties—Available for Farm Use</b>						
Select	tall fescue	4	90	78	94	85*
Duo	festulolium	5	90	79	91	80*
Jesup MaxQ	tall fescue	4	90	71	93	80*
KY 31-	tall fescue	4	90	79	94	78*
Benchmark Plus	orchardgrass	4	89	74	88	73
Certified Potomac	orchardgrass	4	89	67	87	73
Crown Royale Plus	orchardgrass	4	89	73	88	73
Uncertified Potomac	orchardgrass	4	88	65	85	67
Haymate	orchardgrass	3	85	68	79	65
Tekapo	orchardgrass	3	82	55	78	63
Benchmark	orchardgrass	4	86	60	78	60
Certified Kenblue	KY bluegrass	2	88	36	53	22
<b>Experimental Varieties</b>						
KYFA 9304	tall fescue	5	90	79	95	88*
S-22	KY bluegrass	2	88	45	46	30
HB 120	KY bluegrass	1	89	26	19	16
KYPP 9901	KY bluegrass	1	84	8	17	13
VB 5649	KY bluegrass	2	88	34	13	13
HB 121	KY bluegrass	2	90	19	16	9
Mean		3.1	88.1	56.4	67.4	55.0
CV, %		15.9	2.9	16.8	10.2	17.8
LSD, 0.05		0.6	3.0	10.9	7.9	11.3

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

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

**Table 5. Seedling vigor and percent stand of forage grasses sown September 17, 2003 at Lexington, Kentucky in a horse grazing tolerance study.**

Variety	Species	Seedling Vigor <sup>1</sup> Oct 31, 03	Percent Stand	
			Mar 26, 04	Nov 8, 04
<b>Commercial Varieties—Available for Farm Use</b>				
Select	tall fescue	4	99	88*
KY 31-	tall fescue	5	99	88*
ArkPlus	tall fescue	5	100	85*
Haymate	orchardgrass	4	98	83*
Common	KY bluegrass	3	99	75
Barfleo	timothy	3	96	72
Peak	smooth brome	3	91	37
Ginger	KY bluegrass	3	81	10
<b>Experimental Varieties</b>				
KYFA 0006	tall fescue	5	99	90*
KYFA 9304	tall fescue	5	98	90*
KYTF 2	tall fescue	5	99	90*
KYFA 9611	tall fescue	4	96	88*
KYFA 9819	festulolium	5	99	87*
KYFA 9602	tall fescue	4	96	83*
TM 9901	timothy	4	96	78
Mean		4.0	96.4	76.3
CV, %		8.7	9.6	10.9
LSD, 0.05		0.4	10.7	9.5
*Not significantly different from the highest value in the column, based on the 0.05 LSD.				
<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.				

**Table 6. Summary of persistence of forage grasses under heavy grazing pressure by horses across years at Lexington, Kentucky.**

Variety	Species	Proprietor/ KY Distributor	2000 <sup>1</sup>					2001				2002			2003		
			Oct 01	Oct 02	Oct 03	Mar 04	Aug 04	Oct 02	Oct 03	Mar 04	Nov 04	Oct 03	Mar 04	Nov 04	Mar 04	Nov 04	
<b>Commercial Varieties—Available for Farm Use</b>																	
Albert	orchardgrass	University of Wisconsin							x	*	*	x					
Aries	diploid perennial ryegrass	Ampac Seed Company							*	*	*	*					
ArkPlus	tall fescue	FFR/Southern States														*	*
Barcarella	tall fescue	Barenbrug USA	*	*	x	*	*										
Barfleo	timothy	Barenbrug USA													*	x	
Benchmark	orchardgrass	FFR/Southern States										x	x	x			
Benchmark Plus	orchardgrass	FFR/Southern States										*	*	x			
Cattle Club	tall fescue		*	*	*	*	*										
Clair	timothy	Public						x	x	x	x						
Crown Royale	orchardgrass	Grassland Oregon						*	*	x	*						
Crown Royale Plus	orchardgrass	Grassland Oregon										*	*	x			
Colt	timothy	FFR/Southern States						x	x	x	x						
Duo	festulolium	Ampac Seed Company	*	*	*	*	*					*	*	*			
Fure	meadow fescue	DLF-Jenks						x	x	x	x						
Ginger	KY bluegrass	Dye Seed Ranch, Inc	x	x	x	x	x								x	x	
		ProSeeds Marketing															
Grand Daddy	tetraploid perennial ryegrass	Smith Seed Services						*	*	*	*						
Haymate	orchardgrass	FFR/Southern States	*	x	x	x	x					*	x	x	*	*	
Jesup Max Q	tall fescue	Pennington Seed										*	*	*			
Johnstone	tall fescue	ProSeeds Marketing						x	x	x	x						
Kenblue	KY bluegrass	Public						*	*	x	x	x	x	x			
Kokanee	tall fescue	Ampac Seed Company	x	x	x	x	x										
Common	KY bluegrass	Public													*	x	
KY 31+	tall fescue	Public						*	*	x	*						
Mara	diploid perennial ryegrass	Barenbrug USA	*	*	*	*	*										
Maverick Gold	diploid perennial ryegrass	Ampac Seed Company						x	x	x	x						
Peak	smooth brome	Allied Seed, L.L.C.													*	x	
Platini	KY bluegrass	Turner Seed Inc. of KY						*	*	x	x						
Potomac certified	orchardgrass	Public										x	*	x			
Potomac uncertified	orchardgrass	Public										x	x	x			
Prairie	orchardgrass	Turner Seed Inc. of KY						x	x	x	x						
Quartet	tetraploid perennial ryegrass	Ampac Seed Company						x	x	x	x						
Select	tall fescue	FFR/Southern States										*	*	*	*	*	
Slezanka	KY bluegrass	DLF-Jenks						*	*	x	x						
Stargrazer	tall fescue	FFR/Southern States	x	*	x	*	*										
Tekapo	orchardgrass	Ampac Seed Company	*	*	*	x	x										
Tuukka	timothy	Ampac Seed Company	x	x	x	x	x										
<b>Experimental Varieties</b>																	
HB 120	KY bluegrass	DLF-Jenks										x	x	x			
HB 121	KY bluegrass	DLF-Jenks										x	x	x			
K 5568K	orchardgrass	Ampac Seed Company	*	x	x	x	x										
K 5632M	prairie brome	Ampac Seed Company	x	x	x	x	x										
K 5633D	prairie brome	Ampac Seed Company	x	x	x	x	x										
KY 31-	tall fescue	KY Agric. Exp. Station						x	*	x	x	*	*	*	*	*	
KYFA 0006	tall fescue	KY Agric. Exp. Station													*	*	
KYFA 9301	tall fescue	KY Agric. Exp. Station						*	*	*	*						
KYFA 9304	tall fescue	KY Agric. Exp. Station						x	x	*	*	*	*	*	*	*	
KYFA 9602	tall fescue	KY Agric. Exp. Station													*	*	
KYFA 9611	tall fescue	KY Agric. Exp. Station													*	*	
KYFA 9819	festulolium	KY Agric. Exp. Station													*	*	
KYTF 2	tall fescue	KY Agric. Exp. Station													*	*	
KYPP 9901	KY bluegrass	KY Agric. Exp. Station										x	x	x			

**Table 6. Summary of persistence of forage grasses under heavy grazing pressure by horses across years at Lexington, Kentucky.**

Variety	Species	Proprietor/ KY Distributor	2000 <sup>1</sup>					2001				2002			2003	
			Oct <sup>2</sup> 01	Oct 02	Oct 03	Mar 04	Aug 04	Oct 02	Oct 03	Mar 04	Nov 04	Oct 03	Mar 04	Nov 04	Mar 04	Nov 04
<b>Experimental Varieties</b> (continued)																
OG 9705G	orchardgrass	FFR/Southern States	x	x	x	x	x	x	x	x	x	x				
PP 10	tall fescue mixture	Ampac Seed Company							x	x	x	x				
PP 11	per. ryegrass mixture	Ampac Seed Company							x	x	x	x				
TM 9901	timothy	FFR/Southern States													*	x
S-22	KY bluegrass	Barenbrug USA											x	x	x	
VB 5649	KY bluegrass	Barenbrug USA											x	x	x	

<sup>1</sup> Establishment year

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

\* Not significantly different from the most persistent variety in the test. An open block indicates the variety was not in the test, while an "x" in the block indicates the variety was in the test but the stand survival was significantly less than the most persistent variety.



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