



2021 Cool-Season Grass Horse Grazing Tolerance Report

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Introduction

Cool-season forages, 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 evaluate varieties of these grasses for 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 growing season. The main focus will be on stand survival but data on seedling vigor and grazing preference are also included.

Consult the UK Forage Extension website (<https://forages.ca.uky.edu>) to access all forage variety testing reports from Kentucky and surrounding states as well as several other forage publications.

Important Selection Considerations

Local adaptation and seasonal yield. Select a variety that is adapted to Kentucky as indicated by good performance across years and locations in replicated trials, such as those presented in this publication. Grazing persistence data should be used in combination with yield data to select the best variety for pasture use. Refer to the appropriate yield trial reports for 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. Take note of other information on the label including the test date (which must be within the previous nine months), 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 pasture for horses of any kind, insist on an endophyte-free variety. The endophyte level should be stated on a green tag on every bag of seed. Most forage types of perennial ryegrass are endophyte free, but most new turf types are infected. The ryegrass endophyte is similar to that of tall fescue and produces alkaloids that are toxic to horses and cattle. Similarly, when seeding tall fescue insist on endophyte-free or novel endophyte varieties (the endophyte level will be stated on a green tag on every bag of seed). Seed of novel endophyte varieties should be handled carefully to preserve the infection (keep the endophyte fungus alive), which means keeping seed cool and planting as soon as possible. Novel endophyte tall fescue varieties are good options for horses because of their improved persistence and absence of the toxic alkaloid ergovaline. The exception is

the novel endophyte variety BarOptima PLUS E34. It contains low levels of the alkaloid ergovaline and therefore should never be seeded in pastures where pregnant mares are grazing, since they are very sensitive to ergovaline during their last trimester.

Description of the Tests

Tests were established in Lexington in the fall of 2017, 2018, 2019, and 2020. 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.

In spring, 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 and in the spring prior to resum-

Table 1. Temperature and rainfall at Lexington, Kentucky, in 2018, 2019, 2020, and 2021.

	2018				2019				2020				2021 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	31	0	2.01	-0.85	33	+2	4.11	+1.25	40	+9	3.72	+0.86	34	+3	4.51	+1.65
FEB	45	+10	9.77	+6.56	42	+7	7.64	+4.43	38	+3	5.14	+1.93	31	-4	4.6	+1.39
MAR	42	-2.	5.16	+0.76	43	-1	3.49	-0.91	51	+7	3.79	-0.61	50	+6	5.12	+0.72
APR	50	-5	5.52	+1.64	54	+4	4.76	+0.88	52	-3	4.92	+1.04	54	-1	2.72	-1.16
MAY	73	+9	8.39	+3.92	69	+5	4.49	+0.02	62	-2	5.69	+1.22	62	-2	4.34	-0.13
JUN	76	+4	6.42	+2.76	73	+1	6.13	+2.47	72	0	2.56	-1.10	73	+1	6.26	+2.60
JUL	77	+1	6.15	+1.15	79	+3	3.30	-1.70	79	+3	3.23	-1.77	75	-1	5.9	+0.90
AUG	77	+2	6.45	+2.52	77	+2	2.42	-1.51	75	0	3.41	-0.52	76	+1	6.16	+2.23
SEP	74	+6	12.88	+9.68	77	+9	0.18	-3.02	68	0	4.43	+0.83	69	+1	3.03	-0.17
OCT	59	+2	6.54	+3.97	61	+4	7.55	+5.58	57	0	4.98	+2.41	62	+5	3.68	-1.11
NOV	42	-3	5.64	+2.25	41	-4	5.39	+2.00	49	+4	2.18	-1.21				
DEC	40	+4	7.35	+3.37	43	+7	5.74	+1.76	36	0	2.27	-1.71				
Total			82.28	+37.73			55.20	+10.65			45.92	+1.37			46.32	+9.14

¹ DEP is departure from the long-term average.

² 2021 data is for ten months through October.

ing grazing to assess 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 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, 3, 4, and 5. Statistical analyses were performed on all entries (including experimentals) to determine if numerical differences are truly due to variety. 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) is a measure of the variability of the data and 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 in these trials did not. The sensitivity of timothy to heavy grazing was not surprising, as it is an erect species and sensitive to frequent, close defoliation. Perennial ryegrasses, Kentucky bluegrasses, and festuloliums vary in tolerance to grazing by horses.

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. (Note: KY31+ is not recommended for late term mares because of toxicity issues associated with ergovaline production.) However, there are no proven grazing-tolerant varieties for the other species. Still, certain varieties were clearly more tolerant than others.

Table 2. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 9, 2017, in a horse-grazing tolerance study at Lexington, Kentucky.

Variety	Species	Endophyte Status ¹	Seedling Vigor ² Oct 12, 2017	Grazing Preference ³						Percent Stand									
				2018		2019		2020		2021		2018		2019		2020		2021	
				May 18	May 21	May 18	May 21	May 20	May 4	Oct 12	Oct 13	Oct 12	Oct 13	Oct 12	Oct 13	Oct 12	Oct 13	Oct 12	Oct 13
Commercial Varieties-Available for Farm Use																			
Jesup MaxQ	tall fescue	novel	3.3	1.5	1.3	1.5	1.0	1.0	1.0	1.0	100	100	100	100	100	100	100	100*	
SS0705FSL	tall fescue	free	3.3	1.3	1.3	1.3	1.0	1.0	1.0	100	100	100	100	100	100	100	100	100*	
BarOptima PLUS E34	tall fescue	novel	3.3	2.8	3.0	1.7	1.2	1.2	1.0	100	100	99	99	99	99	99	99	99*	
KY31+	tall fescue	toxic	3.3	2.2	1.5	1.3	1.2	1.2	1.2	99	98	99	99	99	99	99	99	99*	
Lacefield MaxQII	tall fescue	novel	3.6	1.5	1.0	1.2	1.2	1.2	1.2	99	99	100	100	99	99	99	99	99*	
Persist	orchardgrass		3.4	5.5	5.3	4.5	3.0	3.0	100	99	91	89	62	52	33	36	25	25	
Prairie	orchardgrass		3.3	5.3	6.5	5.0	3.2	3.2	99	99	87	88	55	52	31	29	24	24	
SS0708OGDT	orchardgrass		4.3	5.8	7.0	4.5	3.8	3.8	100	100	90	91	52	55	28	27	23	23	
Potomac	orchardgrass		4.2	4.2	5.8	5.5	3.3	3.3	100	100	94	94	45	45	23	19	14	14	
Climax	timothy		2.5	6.3	8.3	7.2	5.8	5.8	85	93	89	83	17	10	3	3	1	1	
Clair	timothy		1.9	7.5	8.7	7.2	5.3	5.3	75	86	78	80	13	8	3	2	1	1	
KY Early	timothy		1.3	6.2	7.3	6.5	4.8	4.8	58	85	85	85	13	14	4	3	1	1	
Experimental Varieties																			
KYFA1306	tall fescue	free	3.5	1.7	1.3	1.2	1.2	1.2	100	100	100	100	100	100	100	100	100	100*	
KYFA9304	tall fescue	free	3.4	2.0	1.2	1.8	1.3	1.3	100	100	100	100	100	100	100	100	100	100*	
KYFA1305	tall fescue	free	3.8	1.5	1.8	1.0	1.5	1.5	98	98	99	99	99	99	99	99	99	99*	
KY31-	tall fescue	free	3.3	2.3	1.5	1.2	1.2	1.2	98	98	99	99	99	99	99	99	99	99*	
KYFA1304	tall fescue	free	3.1	1.2	1.3	1.2	1.2	1.2	99	99	99	99	99	99	99	99	99	99*	
KYFA1404	tall fescue	free	3.0	1.8	1.8	1.3	1.5	1.5	99	99	99	99	99	99	99	99	99	99*	
KYFA1405	tall fescue	free	2.3	1.8	1.3	1.3	1.7	1.7	97	97	97	98	97	97	96	96	96	96*	
NC-JimGraze	timothy		2.4	5.2	7.5	7.2	4.3	4.3	94	98	94	94	20	19	5	3	1	1	
Mean			3.1	3.4	3.8	3.2	2.2	2.2	95	97	95	95	73	72	66	65	64	64	
CV,%			20.7	32.5	28.9	27.2	21.1	21.1	8	4	5	5	16	14	10	13	9	9	
LSD,0.05			0.7	1.3	1.2	1.0	0.9	0.9	9	4	5	5	13	11	8	10	7	7	

¹ Free varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel varieties that contain an endophyte that aids persistence but is not toxic to cattle.

² Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

³ Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2018-25 days, 2019-30 days, 2020-30 days, 2021-15 days.

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

Differences in tolerance among varieties could be due to true grazing tolerance but also to preference, especially when highly palatable species such as Kentucky bluegrass and perennial ryegrass were in

the same test as tall fescue. Horses tend to graze the preferred species and varieties more intensely than others. Because of potential preference between species, comparison between varieties is most ac-

Table 3. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 5, 2018, in a horse-grazing tolerance study at Lexington, Kentucky.

Variety	Species	Fescue Endophyte Status ¹	Seedling Vigor ² Sep 28, 2018	Grazing Preference ³			Percent Stand						
				2019	2020	2021	2018	2019		2020		2021	
				May 21	May 20	May 4	Sep 28	Apr 4	Oct 24	Mar 19	Oct 13	Mar 29	Oct 22
Commercial Varieties-Available for Farm Use													
KY31+	tall fescue	toxic	4.6	1.5	1.5	1.0	100	100	100	100	100	99	99*
SS0705TFSL	tall fescue	free	4.1	1.0	1.2	1.2	97	99	99	99	100	99	99*
Jesup MaxQ	tall fescue	novel	4.4	1.8	1.5	1.0	99	100	100	99	99	99	99*
Lacefield MaxQII	tall fescue	novel	3.8	1.3	1.5	1.2	98	99	99	98	98	98	98*
Persist	orchardgrass		4.8	5.5	4.2	3.7	100	100	100	100	93	86	69
SS0708OGDT	orchardgrass		5.0	6.2	4.2	4.3	100	100	99	99	93	82	60
Prairie	orchardgrass		4.8	6.7	4.7	4.5	100	100	98	98	71	64	40
Prodigy	orchardgrass		4.8	6.5	4.8	4.3	100	100	99	99	61	58	37
Experimental Varieties													
KY31-	tall fescue	free	4.3	2.3	1.8	1.5	99	99	99	99	100	100	100*
KYFA9304	tall fescue	free	4.5	2.5	1.7	1.3	99	100	100	100	100	100	100*
KYFA9521/AR584	tall fescue	novel	4.2	1.0	1.5	1.2	99	100	100	99	99	99	99*
KYFA9611	tall fescue	free	3.8	3.8	2.7	1.0	99	99	99	99	99	98	98*
KYFA1704	tall fescue	free	3.9	1.7	1.2	1.2	99	99	99	99	99	99	99*
7016	tall fescue	free	4.1	1.3	1.0	1.3	98	98	98	98	98	98	98*
Mean			4.4	3.1	2.4	2.0	99	99	99	99	93	91	85
CV,%			8.2	24.5	42.4	33.7	1	1	1	1	10	10	11
LSD,0.05			0.4	0.9	1.2	0.8	2	1	1	1	11	10	11

¹ Free varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel varieties that contain an endophyte that aids persistence but is not toxic to cattle.

² Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

³ Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2019-30 days, 2020-30 days, 2021-15 days.

*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 5, 2019, in a horse-grazing tolerance study at Lexington, Kentucky.

Variety	Species	Fescue Endophyte Status ¹	Seedling Vigor ² Oct 25, 2019	Grazing Preference ³		Percent Stand					
				2020	2021	2019	2020		2021		
				May 20	May 4	Oct 25	Mar 19	Oct 13	Mar 29	Oct 22	
Commercial Varieties-Available for Farm Use											
KY31+	tall fescue	toxic	3.6	2.3	1.0	100	100	100	100	100	100*
Texoma MaxQII	tall fescue	novel	3.0	2.7	1.0	100	100	100	100	100	100*
Jesup MaxQII	tall fescue	novel	3.2	2.0	1.0	100	100	99	99	99	99*
Lacefield MaxQII	tall fescue	novel	3.3	2.5	1.0	100	100	99	99	99	99*
SS0705TFSL	tall fescue	free	3.5	2.3	1.2	100	100	99	99	99	99*
Remington	perennial ryegrass		4.8	6.7	6.7	100	100	100	100	100	88*
Remington PLUS NEA2 ⁴	perennial ryegrass		4.7	7.2	5.8	100	100	100	100	100	88*
Linn (certified)	perennial ryegrass		5.0	3.2	4.0	100	100	100	100	100	87*
PayDay	perennial ryegrass		4.8	5.2	5.0	100	100	100	100	100	85
Persist	orchardgrass		3.3	6.5	3.8	100	100	80	93	84	84
Prairie	orchardgrass		3.2	6.3	4.2	100	100	90	91	73	73
Prodigy	orchardgrass		3.3	6.5	4.2	100	100	96	94	65	65
Climax	timothy		3.2	7.3	7.3	98	100	80	86	43	43
Clair	timothy		2.8	7.8	6.7	97	98	80	83	37	37
KYEarly	timothy		1.0	6.5	5.2	-- ⁵	76	35	42	22	22
MacBeth	bromegrass		2.3	5.2	4.8	96	93	24	23	14	14
Experimental Varieties											
KY31-	tall fescue	free	3.7	2.5	1.0	100	100	100	100	99*	99*
KYFA9611	tall fescue	free	3.4	3.5	3.2	100	100	100	100	98*	98*
11PHL4806	timothy		3.0	6.5	4.8	98	100	78	86	30	30
MB1302	bromegrass		3.0	5.2	4.3	94	94	38	36	15	15
Mean			3.4	4.9	3.8	99	98	85	86	71	71
CV,%			12.0	23.0	24.3	3	4	15	9	16	16
LSD,0.05			0.5	1.3	1.1	3	5	15	9	13	13

¹ Free varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel varieties that contain an endophyte that aids persistence but is not toxic to cattle.

² Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

³ Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2020-30 days, 2021-15 days.

⁴ Remington PLUS NEA2 contains a nontoxic (novel) endophyte.

⁵ Germination and seedling growth was very slow and could not get a good stand rating in the fall.

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

curate 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.

Tables 2, 3, 4, and 5 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 6 shows information about proprietors/distributors for all varieties in these tests. Varieties are listed in alphabetical order, with experimental varieties at the bottom.

How to Interpret the Summary Tables

Tables 7 and 8 are summaries of stand persistence data from 1999 to 2021 of commercial tall fescue and orchardgrass varieties that have been entered in the Kentucky trials. In Table 7 the data for each is listed as a percentage of endophyte-free KY31 (KY31-). In other words, the stand persistence values for all varieties in the tall fescue trials are set as a percentage of KY31- whose value is set as 100 percent. Varieties with percentages over 100 persisted better than KY31-, and varieties with percentages less than 100 persisted less well than KY31-. In Table 8 the data is listed as a percentage of the mean of the commercial orchardgrass varieties entered in each specific trial. In other words, values for persistence of the varieties in the trial is expressed as a percentage of the mean value for that trial. Varieties with percentages over 100 persisted better than average, and varieties with percentages less than 100 persisted less well than average. Statistical differences between varieties cannot be determined using the data in tables 7 and 8, but comparisons can help identify varieties for further consideration. Varieties that have performed better than average over many years have very stable performance; others may have performed well in wet years or on particular soil types. These details

Table 5. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 8, 2020, in a horse-grazing tolerance study at Lexington, Kentucky.

Variety	Species	Fescue Endophyte Status ¹	Seedling Vigor ² Oct 2, 2020	Grazing Preference ³ May 4, 2021	Percent Stand		
					2020	2021	
					Oct 2	Mar 29	Oct 22
Commercial Varieties-Available for Farm Use							
Cajun II	tall fescue	free	3.8	1.7	100	100	100*
Jesup MaxQII	tall fescue	novel	3.8	1.5	100	100	100*
KY31+	tall fescue	toxic	3.8	1.8	100	100	100*
Lacefield MaxQII	tall fescue	novel	3.7	2.0	100	100	100*
SS0505TFSL	tall fescue	free	3.7	2.0	100	100	100*
Estancia Arkshield	tall fescue	novel	3.5	1.7	100	100	99*
Remington	perennial ryegrass		4.5	5.0	100	100	98*
Persist	orchardgrass		3.8	4.3	100	100	96*
Power	perennial ryegrass		4.7	4.8	100	100	94*
Profit	orchardgrass		3.4	4.0	100	100	93*
Prairie	orchardgrass		3.7	3.8	100	100	92*
Linn (certified)	perennial ryegrass		4.5	4.2	100	100	92*
Ginger	Kentucky bluegrass		2.8	5.3	100	100	62
Experimental Varieties							
KY31-	tall fescue	free	4.0	2.2	100	100	100*
KYFA9611	tall fescue	free	3.6	2.3	100	100	100*
SEPP16-6	Kentucky bluegrass		2.8	4.6	100	100	82
Mean			3.8	3.2	100	100	94
CV,%			17.8	24.7	0	0	8
LSD,0.05			0.8	0.9	0	0	9

¹ Free varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel varieties that contain an endophyte that aids persistence but is not toxic to cattle.

² Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

³ Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2021-15 days.

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

can influence variety choice, and more information can be found in the yearly reports. See the footnotes in tables 7 and 8 to determine which yearly report should be referenced. Table 9 is a summary of perennial ryegrass and festulolium varieties in the cattle tolerance grazing trials. This table is included to show grazing tolerance of grass species not shown in Horse Tolerance Summary tables.

Summary

These studies indicate there are varieties of cool-season grasses that can tolerate overgrazing by horses for three to four seasons and 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. See yield variety trials on the UK Forage website (<https://forages.ca.uky.edu>) or the summary publication 2021 *Long-Term Summary of Kentucky Forage Variety Trials* (PR-810) that shows variety comparisons over all species. Tall fescue, orchardgrass, or other cool-season grasses should not be continually overgrazed as was done in this trial. Although

several varieties expressed tolerance to the level of grazing pressure in these trials, overgrazing greatly reduces forage production and stand persistence. This information should be used as an indication of those varieties which will better withstand overgrazing when it occurs.

Good management for maximum production and stand life from any grass would be to allow complete establishment before grazing and to avoid overgrazing during times of extreme stress, such as drought. For further information about grazing management, refer to the following College of Agriculture publications, available at the local county Extension office or in the publication section of the UK Forage website at www.forages.ca.uky.edu.

- Rotational Grazing (ID-43)
- Tall Fescue (AGR-59)
- Fescue Toxicosis (ID-221)
- Broadleaf Weeds of Kentucky Pastures (AGR-207)
- Weed Management in Grass Pastures, Hayfields and Other Farmstead Sites (AGR 172)

Table 6. Proprietors of forage grasses in current horse-grazing trials in Kentucky.

Variety	Species	Endophyte Status ¹	Proprietor/ KY Distributor
Commercial Varieties-Available for Farm Use			
BarOptima PLUS E34 ²	tall fescue	novel	Barenbrug USA
Cajun II	tall fescue	free	Smith Seed Services
Clair	timothy		Turner Seed
Climax	timothy		Canada Agr. Res. Station
Estancia Arkshield	tall fescue	novel	Mountain View Seeds
Ginger	Kentucky bluegrass		Proseeds Marketing
Jesup Max Q	tall fescue	novel	Pennington Seed
Jesup MaxQII	tall fescue	novel	Pennington Seed
KY Early	timothy		Smith Seed Services
KY 31+	tall fescue	toxic	Public
Lacefield MaxQ II	tall fescue	novel	Pennington Seed
Linn (certified)	perennial ryegrass		Public
Macbeth	bromegrass		Cisco Seeds
PayDay	perennial ryegrass		Mountain View Seeds
Persist	orchardgrass		Smith Seed Services
Potomac	orchardgrass		Public
Power	perennial ryegrass		Ampac Seed
Prairie	orchardgrass		Turner Seed
Prodigy	orchardgrass		Caudill Seed
Profit	orchardgrass		Ampac Seed
Remington	perennial ryegrass		Barenbrug USA
Remington PLUS NEA2	perennial ryegrass	novel	Barenbrug USA
SS-0705TFSL	tall fescue	free	Southern States
SS-0708OGDT	orchardgrass		Southern States
Texoma MaxQII	tall fescue	novel	Pennington Seed
Experimental Varieties³			
KY 31-	tall fescue	free	KY Agric. Exp. Station
KYFA1304	tall fescue	free	KY Agric. Exp. Station
KYFA1305	tall fescue	free	KY Agric. Exp. Station
KYFA1306	tall fescue	free	KY Agric. Exp. Station
KYFA1404	tall fescue	free	KY Agric. Exp. Station
KYFA1405	tall fescue	free	KY Agric. Exp. Station
KYFA1704	tall fescue	free	KY Agric. Exp. Station
KYFA9304	tall fescue	free	KY Agric. Exp. Station
KYFA9611	tall fescue	free	KY Agric. Exp. Station
KYFA9821/AR584	tall fescue	novel	KY Agric. Exp. Station
MB1302	bromegrass		Allied Seed
NC-JimGraze	timothy		Green Consulting Serv.
SEPP16-6	Kentucky bluegrass		Smith Seed Services
11PHL4806	timothy		Barenbrug USA
7016	tall fescue	free	KY Agric. Exp. Station

¹ Free varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel varieties that contain an endophyte that aids persistence but is not toxic to cattle. Orchardgrass, bentgrass, timothy and festulolium do not contain an endophyte and forage type perennial ryegrass varieties do not contain a toxic endophyte.

² BarOptima PLUS E34 is not recommended for pregnant mares because it produces low levels of the alkaloid ergovaline.

³ Experimental varieties are not available commercially, but provide an indication of the progress being made by forage breeding companies.

About the Authors

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Table 7. Summary of 2002-2021 Kentucky tall fescue horse-grazing tolerance trials with three or more years of data in Lexington (stand persistence shown as a percent of the stand rating of the endophyte free variety KY 31-).

Variety	Endophyte Status ¹	Proprietor/KY Distributor	2002 ^{2,3}		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		Mean ⁴ (#trials)
			4-yr ⁵	4-yr ⁵	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr		
BarOptima PLUS E346	novel	Barenbrug USA										107							101	101	101	95	104	99	101	99	101	100							101(9)		
Cajun II	free	Smith Seed Services																				99													99(2)		
Cowgirl	free	Rose Agri-Seed												105								99												102(2)			
Jesup MaxQ	novel	Pennington Seed	98						78					104	107	105	98	100	100	100	101	97	105	98	100	99	100	99	101	101	99	98	99	98(13)			
KY31+	toxic	KY Agri. Exp.Sta.	100	100	100	100	100	102	109	120	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	103(14)		
KY31-	free	KY Agri. Exp.Sta.	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100(17)	
Lacefield MaxQ II	novel	Pennington Seed							105	110								98					104												102(8)		
Namryo	free	Japanese Grassland Forage Seed								72																									-		
Seine	free	Seed Research of Oregon						135																											-		
Select	free	Southern States	109	94	99	73	104	76	108	108	98	100	101	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	97(14)	
SS0705TFSL	free	Southern States																																	100(5)		
Stockman	free	Seed Research of Oregon						125																											-		

¹ Free varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel varieties that contain an endophyte that aids persistence but is not toxic to cattle.

² Year trial was established.

³ 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 2016 was grazed four years so the final report would be "2020 Cool-Season Grass Horse Grazing Tolerance Report" archived in the UK Forage website (<https://forages.ca.uky.edu>).

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

⁵ Number of years of data.

⁶ BarOptima PLUS E34 is not recommended for pregnant mares because it produces low levels of the alkaloid ergovaline.

Table 8. Summary of 1999-2021 Kentucky orchardgrass horse grazing tolerance trials with three or more years of data 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		2003 ³		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		Mean ⁴ (#trials)
		3-yr ⁵	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-yr	4-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	137	105																							120(8)			
Crown Royale	Grassland Oregon			95																																		-				
Crown Royale Plus	Grassland Oregon					97																																-				
Elise	Pure Seed																																					-				
Haymate	Southern States	96	85																																			93(3)				
Persist	Smith Seed Services							114				103	101	92	112	146	95	123	109	116	134																		113(11)			
Potomac	Public							117																														91(2)				
Prairie	Turner Seed			100																																		78				
Prodigy	Caudill Seed																																					72				
Profit	Ampac Seed																																						95(4)			
SS-0708OGDT	Southern States																																					99(6)				
Tekapo	Ampac Seed	101	115					93	30	30	92	100	83	87	63																							94(9)				

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 four years so the final report would be "2014 Cool-Season Grass Horse Grazing Tolerance Report" archived in the UK Forage website (<https://forages.ca.uky.edu>).

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.

Table 9. Summary of 2000-2021 Kentucky perennial ryegrass and festulolium (FL) grazing tolerance trials in Lexington (stand persistence shown as a percent of the mean of the commercial varieties in the trial, included to represent grazing tolerance of grass species not shown in horse tolerance summary tables).

Variety	Type	Proprietor	2000 ^{1,2}	2001	2003	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	Mean ³ (#trials)
			4yr ⁴	3yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	3yr		
AGRPL103	-	AgResearch USA	128		86												107(2)
Albion	tetraploid	Grassland Oregon											120				-
Aries	diploid	Ampac Seed		139													-
Barfest (FL)	MF x PR ⁶	Barenbrug USA					116	112									114(2)
Barvitra	diploid	Barenbrug USA											35				-
BG-34	diploid	Barenbrug USA											83				-
Boost	tetraploid	Allied Seed					101	83	95	104							96(4)
Calibra	tetraploid	DLF International								120		88	97	98		102	101(5)
Citadel	tetraploid	Donley Seed	107														-
Duo (FL)	MF x PR ⁶	Ampac Seed	116				95	72	90	115			70	65			89(7)
Lasso	diploid	DLF-Jenks		130													-
Linn (certified)	diploid	Public	112	129	63		95	108	95	103	96	80	74	88	79	96	94(13)
Maverick	tetraploid	Ampac Seed		36													-
Meadow Green (FL)	MF x IR ⁶	Pure Seed								15				90			-
Melpetra	tetraploid	Hood River Seed															-
PayDay	tetraploid	Mountain View Seeds									101	85		99	97		96(4)
Polly II	tetraploid	FS Growmark	36	68													52(2)
Power	tetraploid	Ampac Seed				158		107	112	109	89	79	83				105(7)
Quartet	tetraploid	Ampac Seed		77		59											68(2)
Remington	tetraploid	Barenbrug USA			151							138	180	169	124	107	145(6)
Remington PLUS NEA2 ⁵	tetraploid	Barenbrug USA										145	171		107		141(3)
Spring Green (FL)	MF x PR ⁶	Rose Agri-Seed	101				109	115	115	120			87	88			105(7)
TetraGain	tetraploid	Pure Seed								112				90			101(2)
TetraMag	tetraploid	Mountain View Seeds															93
TetraSweet	tetraploid	Mountain View Seeds															98
Victorian	diploid	Caudill Seed									114			109			112(2)

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 2016 was grazed four years so the final report would be "2020 Cool-Season Grass Grazing Tolerance Report" archived in the UK Forage website (<https://forages.ca.uky.edu>).

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

⁴ Number of years of data.

⁵ Remington PLUS NEA2 contains a non-toxic (novel) endophyte.

⁶ MF=meadow fescue, PR=perennial ryegrass, IR=Italian ryegrass.



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