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2020 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 at www.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 2016, 2017, 2018, and 2019. 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

Table 1. Temperature and rainfall at Lexington, Kentucky, in 2017, 2018, 2019, and 2020.

	2017				2018				2019				2020[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	40	+9	6.81	+3.95	31	0	2.01	-0.85	33	+2	4.11	+1.25	40	+9	3.72	+0.86
FEB	47	+12	4.46	+1.25	45	+10	9.77	+6.56	42	+7	7.64	+4.43	38	+3	5.14	+1.93
MAR	48	+4	3.34	-1.06	42	-2.	5.16	+0.76	43	-1	3.49	-0.91	51	+7	3.79	-0.61
APR	62	+7	4.17	+0.29	50	-5	5.52	+1.64	54	+4	4.76	+0.88	52	-3	4.92	+1.04
MAY	66	+2	7.74	+3.27	73	+9	8.39	+3.92	69	+5	4.49	+0.02	62	-2	5.69	+1.22
JUN	73	+1	7.68	+4.02	76	+4	6.42	+2.76	73	+1	6.13	+2.47	72	0	2.56	-1.1
JUL	76	0	4.49	-0.51	77	+1	6.15	+1.15	79	+3	3.30	-1.70	79	+3	3.23	-1.77
AUG	74	-1	6.66	+2.73	77	+2	6.45	+2.52	77	+2	2.42	-1.51	75	0	3.41	-0.52
SEP	69	+1	4.72	+1.52	74	+6	12.88	+9.68	77	+9	0.18	-3.02	68	0	4.43	-0.83
OCT	60	+3	6.06	+3.49	59	+2	6.54	+3.97	61	+4	7.55	+5.58	57	0	4.98	+2.41
NOV	47	+2	3.09	-0.30	42	-3	5.64	+2.25	41	-4	5.39	+2.00				
DEC	35	-1	2.66	-1.32	40	+4	7.35	+3.37	43	+7	5.74	+1.76				
Total			61.88	+17.33			82.28	+37.73			55.20	+10.65			41.47	+4.29

[1] DEP is departure from the long-term average.
[2] 2020 data is for ten months through October.

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 resuming 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

Table 2. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 8, 2016, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Fescue Endophyte Status[1]	Seedling Vigor[2]	Grazing Preference[3]				Percent Stand									
				2017	2018	2019	2020	2016	2017		2018		2019		2020		
			Oct 6, 2016	May 26	May 18	May 21	May 20	Oct 6	Mar 15	Oct 9	Mar 16	Nov 2	Apr 4	Oct 24	Mar 19	Oct 13	
Commercial Varieties-Available for Farm Use																	
KY31+	tall fescue	toxic	2.5	1.2	1.7	2.0	1.5	100	100	100	100	100	85	100	100	100*	
BarOptimaPlusE34	tall fescue	novel	2.3	1.5	2.0	2.3	2.3	100	100	100	100	100	100	100	100	100*	
CajunII	tall fescue	free	2.8	1.3	1.3	1.3	1.0	100	100	99	100	100	100	100	100	100*	
LacefieldMaxQII	tall fescue	novel	3.7	1.3	1.3	1.5	1.0	100	100	99	99	99	99	99	99	99*	
SS0705TFSL	tall fescue	free	3.0	2.5	1.3	1.5	1.3	100	100	99	99	99	99	99	99	99*	
JesupMaxQ	tall fescue	novel	3.6	1.5	1.3	1.2	1.5	100	100	98	98	98	98	98	98	98*	
Vision	colonial bentgrass		1.0	9.0	8.2	7.3	7.3	75	78	86	88	92	93	90	91	92	
Remington	perennial ryegrass		4.3	8.3	9.0	9.0	6.8	100	100	98	98	58	61	43	4	26	
Persist	orchardgrass		2.8	3.2	7.8	7.5	5.8	100	100	98	98	32	33	14	18	8	
Prairie	orchardgrass		3.3	5.2	7.7	6.2	5.2	100	100	97	97	21	23	10	10	7	
SS0708DGDT	orchardgrass		3.8	4.7	7.0	8.0	5.3	100	100	96	97	23	27	9	11	7	
Giant	redtop bentgrass		1.0	8.7	8.2	8.5	5.3	73	68	57	80	25	23	7	7	3	
PayDay	perennial ryegrass		3.9	8.3	8.8	9.0	--[4]	100	100	98	93	23	29	14	0	2	
Linn	perennial ryegrass		4.7	6.2	7.8	8.8	--	100	100	95	95	23	16	4	0	1	
SpringGreen	festulolium		3.8	6.7	8.5	9.0	--	100	100	98	98	28	30	7	1	1	
Duo	festulolium		4.8	6.7	9.0	9.0	--	100	98	68	56	18	10	2	0	0	
Experimental Varieties																	
KYFA1303	tall fescue	free	4.0	2.0	1.5	1.7	2.0	100	100	100	100	100	100	100	100	100*	
KY31-	tall fescue	free	2.8	1.3	1.5	1.5	1.5	100	100	99	99	99	99	99	99	99*	
KYFA1201	tall fescue	free	3.2	1.5	1.5	1.3	1.2	100	100	100	100	100	99	99	99	99*	
KYFA9304	tall fescue	free	3.5	1.7	1.8	2.0	2.2	100	100	99	99	99	99	99	99	99*	
KYFA9732/AR584	tall fescue	novel	3.8	1.8	1.7	2.3	1.7	100	100	100	100	100	100	100	100	99*	
KYDG1001	orchardgrass		3.5	5.7	8.2	7.8	4.3	100	100	99	99	19	18	8	9	6	
KYDG1002	orchardgrass		4.2	5.0	8.0	8.7	5.3	100	100	97	97	15	15	7	6	6	
KYFL1301	festulolium		4.2	6.5	8.8	9.0	--	100	100	94	93	15	16	5	0	0	
Mean			3.3	4.2	5.2	5.3	3.2	98	98	95	95	62	61	55	52	52	
CV,%			15.7	26.1	13.5	18.9	36.8	4	4	8	7	16	20	13	7	13	
LSD,0.05			0.6	1.3	0.8	1.1	1.4	4	4	8	7	11	14	8	4	8	

[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; 2017-35 days, 2018-25 days, 2019-30 days, 2020-30 days.
[4] Not enough grass in plots to get a preference rating.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 3. Seedling vigor, grazing preference, and stand persistence of forage grasses sown September 9, 2017, in a horse grazing tolerance study at Lexington, Kentucky.

Variety	Species	Fescue Endophyte Status[1]	Seedling Vigor[2] Oct 12, 2017	Grazing Preference[3] 2018 May 18	Grazing Preference[3] 2019 May 21	Grazing Preference[3] 2020 May 20	Percent Stand 2017 Oct 12	Percent Stand 2018 Mar 15	Percent Stand 2018 Nov 2	Percent Stand 2019 Apr 4	Percent Stand 2019 Oct 24	Percent Stand 2020 Mar 19	Percent Stand 2020 Oct 13
Commercial Varieties-Available for Farm Use													
Jesup MaxQ	tall fescue	novel	3.3	1.5	1.3	1.0	100	100	100	100	100	100	100*
SS0705TFSL	tall fescue	free	3.3	1.3	1.3	1.3	100	100	100	100	100	100	100*
BarOptima PLUS E34	tall fescue	novel	3.3	2.8	3.0	1.7	100	100	99	99	99	99	99*
KY31+	tall fescue	toxic	3.3	2.2	1.5	1.3	99	98	99	99	99	99	99*
Lacefield MaxQII	tall fescue	novel	3.6	1.5	1.0	1.2	99	99	100	100	99	99	99*
Persist	orchardgrass		3.4	5.5	5.3	4.5	100	99	91	89	62	52	33
Prairie	orchardgrass		3.3	5.3	6.5	5.0	99	99	87	88	55	52	31
SS0708OGDT	orchardgrass		4.3	5.8	7.0	4.5	100	100	90	91	52	55	28
Potomac	orchardgrass		4.2	4.2	5.8	5.5	100	100	94	94	45	45	23
KYEarly	timothy		1.3	6.2	7.3	6.5	58	85	85	85	13	14	4
Climax	timothy		2.5	6.3	8.3	7.2	85	93	89	83	17	10	3
Clair	timothy		1.9	7.5	8.7	7.2	75	86	78	80	13	8	3
Experimental Varieties													
KYFA1306	tall fescue	free	3.5	1.7	1.3	1.2	100	100	100	100	100	100	100*
KYFA9304	tall fescue	free	3.4	2.0	1.2	1.8	100	100	100	100	100	100	100*
KYFA1305	tall fescue	free	3.8	1.5	1.8	1.0	98	98	99	99	99	99	99*
KY31-	tall fescue	free	3.3	2.3	1.5	1.2	98	98	99	99	99	99	99*
KYFA1304	tall fescue	free	3.1	1.2	1.3	1.2	99	99	99	99	99	99	99*
KYFA1404	tall fescue	free	3.0	1.8	1.8	1.3	99	99	99	99	99	99	99*
KYFA1405	tall fescue	free	2.3	1.8	1.3	1.3	97	97	97	98	97	97	96*
NC-JimGraze	timothy		2.4	5.2	7.5	7.2	94	98	94	94	20	19	5
Mean			3.1	3.4	3.8	3.2	95	97	95	95	73	72	66
CV,%			20.7	32.5	28.9	27.2	8	4	5	5	16	14	10
LSD,0.05			0.7	1.3	1.2	1.0	9	4	5	5	13	11	8

[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; 2017-35 days, 2018-25 days, 2019-30 days, 2020-30 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, 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] 2019 May 21	Grazing Preference[3] 2020 May 20	Percent Stand 2018 Sep 28	Percent Stand 2019 Apr 4	Percent Stand 2019 Oct 24	Percent Stand 2020 Mar 19	Percent Stand 2020 Oct 13
Commercial Varieties-Available for Farm Use										
KY31+	tall fescue	toxic	4.6	1.5	1.5	100	100	100	100	100*
SS0705TFSL	tall fescue	free	4.1	1.0	1.2	97	99	99	99	100*
Jesup MaxQ	tall fescue	novel	4.4	1.8	1.5	99	100	100	99	99*
Lacefield MaxQII	tall fescue	novel	3.8	1.3	1.5	98	99	99	98	98*
Persist	orchardgrass		4.8	5.5	4.2	100	100	100	100	93*
SS0708OGDT	orchardgrass		5.0	6.2	4.2	100	100	99	99	93*
Prairie	orchardgrass		4.8	6.7	4.7	100	100	98	98	71
Prodigy	orchardgrass		4.8	6.5	4.8	100	100	99	99	61
Experimental Varieties										
KY31-	tall fescue	free	4.3	2.3	1.8	99	99	99	99	100*
KYFA9304	tall fescue	free	4.5	2.5	1.7	99	100	100	100	100*
KYFA9821/AR584	tall fescue	novel	4.2	1.0	1.5	99	100	100	99	99*
KYFA9611	tall fescue	free	3.8	3.8	2.7	99	99	99	99	99*
KYFA1704	tall fescue	free	3.9	1.7	1.2	99	99	99	99	99*
7016	tall fescue	free	4.1	1.3	1.0	98	98	98	98	98*
Mean			4.4	3.1	2.4	99	99	99	99	93
CV,%			8.2	24.5	42.4	1	1	1	1	10
LSD,0.05			0.4	0.9	1.2	2	1	1	1	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.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

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.

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 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.

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 5. 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] May 20, 2020	Percent Stand 2019 Oct 25	Percent Stand 2020 Mar 19	Percent Stand 2020 Oct 13
Commercial Varieties-Available for Farm Use							
KY31+	tall fescue	toxic	3.6	2.3	100	100	100*
Remington	perennial ryegrass		4.8	6.7	100	100	100*
PayDay	perennial ryegrass		4.8	5.2	100	100	100*
Remington PLUS NEA2[4]	perennial ryegrass		4.7	7.2	100	100	100*
Texoma MaxQII	tall fescue	novel	3.0	2.7	100	100	100*
Linn (certified)	perennial ryegrass		5.0	3.2	100	100	100*
Lacefield MaxQII	tall fescue	novel	3.3	2.5	100	100	99*
SS0705TFSL	tall fescue	free	3.5	2.3	100	100	99*
Jesup MaxQII	tall fescue	novel	3.2	2.0	100	100	99*
Prodigy	orchardgrass		3.3	6.5	100	100	96*
Prairie	orchardgrass		3.2	6.3	100	100	90*
Climax	timothy		3.2	7.3	98	100	80
Persist	orchardgrass		3.3	6.5	100	100	80
Clair	timothy		2.8	7.8	97	98	80
KYEarly	timothy		1.0	6.5	- -[5]	76	35
MacBeth	bromegrass		2.3	5.2	96	93	24
Experimental Varieties							
KY31-	tall fescue	free	3.7	2.5	100	100	100*
KYFA9611	tall fescue	free	3.4	3.5	100	100	100*
11PHL4806	timothy		3.0	6.5	98	100	78
MB1302	bromegrass		3.0	5.2	94	94	38
Mean			3.4	4.9	99	98	85
CV,%			12.0	23.0	3	4	15
LSD,0.05			0.5	1.3	3	5	15

[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.
[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.

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.

Tables 7 and 8 are summaries of stand persistence data from 1999 to 2019 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 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 at www.forages.ca.uky.edu or the summary publication *2020 Long-Term Summary of Kentucky Forage Variety Trials* (PR-792) 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)

About the Authors

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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
Duo	festulolium		Ampac Seed Company
Giant	redtop bentgrass		Pure Seed Testing
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
Prairie	orchardgrass		Turner Seed
Prodigy	orchardgrass		Caudill Seed
Remington	perennial ryegrass		Barenbrug USA
Remington PLUS NEA2[3]	perennial ryegrass	novel	Barenbrug USA
Spring Green	festulolium		Rose-Agri Seed
SS-0705TFSL	tall fescue	free	Southern States
SS-0708OGDT	orchardgrass		Southern States
Texoma MaxQII	tall fescue	novel	Pennington Seed
Vision	colonial bentgrass		Blue Moon Farms
Experimental Varieties[4]			
KY 31-	tall fescue	free	KY Agric. Exp. Station
KYDG1001	orchardgrass		KY Agric. Exp. Station
KYDG1002	orchardgrass		KY Agric. Exp. Station
KYFA1201	tall fescue	free	KY Agric. Exp. Station
KYFA1303	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
KYFA9732/AR584	tall fescue	novel	KY Agric. Exp. Station
KYFA9821/AR584	tall fescue	novel	KY Agric. Exp. Station
KYFL1301	festulolium		KY Agric. Exp. Station
MB1302	bromegrass		Allied Seed
NC-JimGraze	timothy		Green Consulting Serv.
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] Remington PLUS NEA2 contains a nontoxic (novel) endophyte.

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

Table 7. Summary of 2001-2020 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	2001[2,3] 4-yr[5]	2002 4-yr	2003 4-yr	2004 4-yr	2005 4-yr	2006 4-yr	2007 4-yr	2008 4-yr	2009 4-yr	2010 4-yr	2011 4-yr	2012 4-yr	2013 4-yr	2014 4-yr	2015 4-yr	2016 4-yr	2017 3-yr	Mean[4] (#trials)
BarOptima PLUS E34[6]	novel	Barenbrug USA							107			101	101	95	104	99	99	101	100	101(9)
Cajun II	free	Smith Seed Services													96			101		99(2)
Cowgirl	free	Rose Agri-Seed								105				99						102(2)
Jesup MaxQ	novel	Pennington Seed		98			78			104	97	100	101	97	105	98	100	99	101	98(12)
Johnstone	free	ProSeeds Marketing	88																	–
KY31+	toxic	KY Agri. Exp.Sta.	105				102	109	120	107	101	101	101	99	105	99	100	101	100	104(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(17)
Lacefield MaxQ II	novel	Pennington Seed						105	110		98				104		100	100	100	102(7)
Nanryo	free	Japanese Grassland Forage Seed							72											–
Seine	free	Seed Research of Oregon				135														–
Select	free	Southern States		109	94	99	73	104	76	108	98	100	101	98	98	97	100			96(15)
SS0705TFSL	free	Southern States														98	100	100	101	100(4)
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 2010 was grazed 4 years so the final report would be "2014 Cool-Season Grass Horse Grazing Tolerance Report" archived in the UK Forage website at <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 1999-2020 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] 3-yr[5]	2000 4-yr	2001 4-yr	2002 4-yr	2005[3] 4-yr	2006 4-yr	2009 4-yr	2010 4-yr	2011 4-yr	2012 4-yr	2013 4-yr	2014 4-yr	2015 4-yr	2016[3] 4-yr	2017 3-yr	Mean[4] (#trials)
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										87						–
Haymate	Southern States	96	85		97												93(3)
Persist	Smith Seed Services					114		103	101	92	112	146	95	123	109	115	111(9)
Potomac	Public				117											80	–
Prairie	Turner Seed			100										92	95	108	99(4)
Prodigy	Caudill Seed											54					–
Profit	Ampac Seed							93	86		92		108				95(4)
SS-0708OGDT	Southern States									104			92	77	95	97	93(5)
Tekapo	Ampac Seed	101	115		93	30		92	100	83	87	63		108			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 4 years so the final report would be "2014 Cool-Season Grass Horse Grazing Tolerance Report" archived in the UK Forage website at <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 2000-2020 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] 4yr[4]	2001 3yr	2003 4yr	2007 4yr	2008 4yr	2010 4yr	2011 4yr	2012 4yr	2013 4yr	2014 4yr	2015 4yr	2016 4yr	2017 3yr	Mean[3] (#trials)
AGRLP103	–	AgResearch USA	128		86											107(2)
Albion	tetraploid	Grassland Oregon											120			–
Aries	diploid	Ampac Seed		139												–
Barfest (FL)	MF[6] 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		101(4)
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	75	93(12)
Maverick	tetraploid	Ampac Seed		36												–
Meadow Green (FL)	MF x IR[6]	Pure Seed								15						–
Melpetra	tetraploid	Hood River Seed												90		–
PayDay	tetraploid	Mountain View Seeds									101	85			101	96(3)
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	133	154(5)
Remington PLUS NEA2[5]	tetraploid	Barenbrug USA										145	171			158(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					72	–
Victorian	diploid	Caudill Seed									114				119	117(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 2010 was grazed 4 years so the final report would be "2014 Cool-Season Grass Grazing Tolerance Report" archived in the UK Forage website at <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.

12-2020