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2018 Cool-Season Grass Grazing Tolerance Report

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Introduction

Cool-season grasses such as tall fescue, orchardgrass, and Kentucky bluegrass are the primary pasture grasses in Kentucky. Other species such as perennial ryegrass, festulolium, and the brome grasses can be used in pasture systems. Little is known about the effect of variety on the grazing tolerance of these cool-season grass species.

The purpose of this report is to summarize current research on the grazing tolerance of varieties of tall fescue, orchardgrass, perennial ryegrass, and other species when they are subjected to continuous, heavy grazing pressure by cattle within the grazing season. This is not our recommendation on-farm, but indicates which varieties will survive a worst case scenario which often occurs over the life of a typical pasture. The main focus will be on plant stand survival. Tables 17, 18, and 19 show the summaries of all tall fescue, orchardgrass, and perennial ryegrass varieties tested in Kentucky during the past 15 years. The UK Forage Extension website, at forages.ca.uky.edu, 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 and 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), 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.

Description of the Tests

Grass variety tests for grazing tolerance were established in Lexington in the fall of 2014, 2015, 2016, and 2017. The soil at Lexington (Maury) is a well-drained silt loam and is well-suited to tall fescue, orchardgrass, and perennial ryegrass production. 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 sown into a prepared seedbed using a disk drill. Grazing began in April and was continuous until late September. Plots were grazed down to below 4 inches quickly by steers or heifers and kept at 2 to 4 inches for the remainder of the grazing season. The trials were rated for grazing preference 10 to 20 days after cattle were allowed to start grazing. (A rating of 1 indicates no forage removed and a rating of 9 indicates all forage was grazed.) Individual trials occasionally were clipped

Table 1. Temperature and rainfall at Lexington, Kentucky in 2015, 2016, 2017, and 2018.

	2015				2016				2017				2018[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	32	+1	2.17	-0.69	32	+1	0.80	-2.06	40	+9	6.81	+3.95	31	0	2.01	-0.85
FEB	26	-9	3.08	-0.13	38	+3	6.09	+2.88	47	+12	4.46	+1.25	45	+10	9.77	+6.56
MAR	45	+1	7.34	+2.94	52	+8	4.07	-0.33	48	+4	3.34	-1.06	42	-2.	5.16	+0.76
APR	57	+2	13.19	+9.31	57	+2	3.97	+0.09	62	+7	4.17	+0.29	50	-5	5.52	+1.64
MAY	69	+5	3.02	-1.45	64	0	9.17	+4.70	66	+2	7.74	+3.27	73	+9	8.39	+3.92
JUN	75	+3	8.20	+4.54	76	+4	5.09	+1.43	73	+1	7.68	+4.02	76	+4	6.42	+2.76
JUL	77	+1	10.22	+5.22	79	+3	7.43	+2.43	76	0	4.49	-0.51	77	+1	6.15	+1.15
AUG	74	-1	3.49	-0.44	79	+4	4.37	+0.44	74	-1	6.66	+2.73	77	+2	6.45	+2.52
SEP	72	+4	3.49	+0.29	74	+6	2.18	-1.02	69	+1	4.72	+1.52	74	+6	12.88	+9.68
OCT	59	+2	2.78	+0.21	64	+7	0.37	-2.20	60	+3	6.06	+3.49	59	+2	6.54	+3.97
NOV	51	+6	3.72	+0.33	51	+6	1.94	-1.45	47	+2	3.09	-0.30				
DEC	49	+13	8.42	+4.44	37	+1	9.4	+5.42	35	-1	2.66	-1.32				
Total			69.12	+24.57			54.88	+10.33			61.88	+17.33			69.29	+32.11

[1] DEP is departure from the long-term average.
[2] 2018 data is for the ten months through October.

Table 2. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown September 9, 2014, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2] Oct 9, 2014	Grazing Preference[3] 2015 May 1	2016 May 3	2017 Apr 26	2018 May 18	Percent Stand 2014 Oct 9	2015 Apr 6	2015 Oct 21	2016 Mar 24	2016 Oct 5	2017 Mar 22	2017 Oct 19	2018 Mar 15	2018 Oct 16
Commercial Varieties-Available for Farm Use															
SS-0705TFSL	free	4.8	2.3	1.0	1.5	1.0	100	100	100	100	100	100	100	100	100*
BarOptima PLUS E34	novel	4.1	3.0	3.3	3.5	1.0	98	98	100	100	100	100	100	100	100*
KY31+	toxic	4.8	2.7	1.3	2.3	1.0	100	100	100	100	100	100	100	100	100*
Jesup MaxQ	novel	4.8	2.0	1.0	1.3	1.0	100	100	100	100	100	100	99	99	99*
Select	free	4.6	1.2	1.0	1.5	1.0	99	99	100	100	100	100	99	99	99*
Lacefield MaxQII	novel	4.8	2.3	1.0	1.5	1.0	100	100	100	100	100	100	99	99	99*
Cajun II	free	4.8	1.5	1.0	1.2	1.0	100	100	100	100	100	99	98	98	97
Experimental Varieties															
KY31-	free	4.8	2.3	1.0	1.8	1.0	100	100	100	100	100	100	100	100	100*
NFTF 1044	free	4.3	2.0	1.0	1.8	1.0	99	100	100	100	100	100	100	100	100*
NFTF 1370	free	4.7	1.8	1.0	1.0	1.0	100	100	100	100	100	100	100	100	100*
KYFA1113/584	novel	4.7	2.2	1.3	1.7	1.0	99	100	100	100	100	100	100	100	99*
KYFA1115/584	novel	4.4	3.0	2.3	3.3	1.0	99	99	100	100	100	100	100	100	99*
KYFA1114/584	novel	4.8	2.8	1.2	1.7	1.0	99	100	100	100	100	100	100	100	99*
NFTF 1051	free	4.6	1.5	1.0	1.2	1.0	100	100	100	100	100	100	96	94	95
Mean		4.6	2.2	1.3	1.8	1.0	99	100	100	100	100	100	99	99	99
CV,%		10.3	39.3	32.8	34.3	0.0	1	1	0	0	0	1	2	2	3
LSD,0.05		0.6	1.0	0.5	0.7	0.0	1	1	0	0	0	1	3	3	3

[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; 2015-9 days, 2016-20 days, 2017-14 days, 2018-18 days.
*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 tall September 3, 2015, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2] Oct 19, 2015	Grazing Preference[3] 2016 Apr 26	2017 Apr 26	2018 May 18	Percent Stand 2015 Oct 19	2016 Mar 24	2016 Oct 4	2017 Mar 22	2017 Oct 12	2018 Mar 15	2018 Oct 16
Commercial Varieties-Available for Farm Use												
KY31+	toxic	4.8	2.3	1.3	1.0	99	100	100	100	100	100	100*
BarOptima PLUS E34	novel	3.8	2.4	3.5	1.0	98	99	100	100	100	100	100*
SS-0705TFSL	free	4.5	1.4	1.0	1.0	99	100	100	100	100	100	100*
Select	free	4.1	2.0	1.0	1.0	99	99	100	100	100	100	100*
Lacefield MaxQII	novel	4.6	2.3	1.8	1.0	99	100	100	100	100	100	100*
Jesup MaxQ	novel	4.7	1.5	1.0	1.0	99	100	100	100	100	100	99*
Cajun II	free	4.1	1.3	1.0	1.0	96	100	99	99	99	99	99*
Drover	free	4.4	1.0	1.0	1.0	98	99	99	99	99	99	99*
FSG 402TF	free	4.3	1.8	1.0	1.0	98	99	99	99	99	99	99
Baguala	free	4.4	1.8	1.0	1.0	98	100	98	98	98	98	98
Dominate	free	4.4	2.0	1.2	1.0	98	100	97	98	97	97	97
Experimental Varieties												
KYFA1114	free	4.6	2.2	1.3	1.0	98	100	100	100	100	100	100*
KYFA1311	free	4.6	2.5	1.7	1.0	100	100	100	100	100	100	100*
Drover+E34	novel	4.3	1.2	1.0	1.0	99	100	99	100	100	100	100*
KYFA1113	free	4.8	2.2	1.7	1.0	100	100	100	100	100	100	100*
KYFA9821/AR584	novel	4.8	1.8	1.3	1.0	99	100	100	100	100	100	100*
KY31-	free	4.8	2.3	1.3	1.0	99	100	100	100	100	100	99*
BARFAF131	free	3.7	3.5	1.3	1.0	98	100	99	100	99	99	99
Mean		4.4	2.0	1.4	1.0	98	100	99	99	99	99	99
CV,%		8.8	31.7	35.3	0.0	2	1	1	1	1	1	1
LSD,0.05		0.4	0.7	0.6	0.0	3	1	1	1	1	1	1

[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; 2016-20 days, 2017-14 days, 2018-18 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 tall fescue and meadow fescue (MF) varieties sown September 8, 2016, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2]	Grazing Preference[3]			Percent Stand				
			2017		2018	2016	2017		2018	
		Oct 5, 2016	Apr 26	Jun 2	May 18	Oct 5	Mar 15	Oct 11	Mar 15	Oct 16
Commercial Varieties-Available for Farm Use										
Bronson	free	3.8	1.5	1.8	1.0	100	100	100	100	100*
Bull	free	3.1	1.0	1.5	1.0	100	100	100	100	100*
Cajun II	free	3.5	1.2	1.7	1.0	98	99	99	100	100*
Goliath	free	3.7	1.5	2.7	1.0	100	100	100	100	100*
Jesup MaxQ	novel	4.5	1.8	3.0	1.0	100	100	100	100	100*
KY31+	toxic	3.6	2.7	4.0	1.0	100	100	100	100	100*
Lacefield MaxQII	novel	4.4	2.0	4.0	1.0	100	100	100	100	100*
SS0705TFSL	free	4.2	1.5	2.8	1.0	99	100	100	100	100*
BarOptima PLUS E34	novel	3.3	2.8	3.8	1.3	100	100	100	100	99*
Cosmonaut (MF)	free	3.6	5.2	7.8	5.0	99	99	99	100	84
Experimental Varieties										
KY31-	free	3.8	2.0	2.5	1.0	100	100	100	100	100*
KYFA1201	free	3.8	2.2	3.7	1.0	100	100	100	100	100*
KYFA1303	free	4.8	2.3	5.0	1.0	100	100	100	100	100*
KYFA9732/AR584	novel	4.1	2.5	3.8	1.0	100	100	100	100	100*
KYFA9304	free	4.5	2.7	4.5	1.0	100	100	100	100	99*
KYPP0901 (MF)	free	4.7	4.3	7.2	3.3	100	100	100	100	96*
Mean		4.0	2.3	3.7	1.4	100	100	100	100	99
CV,%		14.0	25.7	37.0	26.4	1	1	1	0	5
LSD,0.05		0.6	0.7	1.6	0.4	1	1	1	0	5

[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; 2017-14 days, 2018-18 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

to remove seedheads or weed growth not controlled by herbicides. Supplemental hay or soybean hulls were fed during periods of slowest growth. Animals were removed from plots after all fall growth had been removed and when little regrowth was expected. 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 30 pounds of actual N per acre in March, 30 pounds of actual N in May, and 40 pounds of actual N in November. 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 through 13. Statistical analyses were performed on all entries (including experimentals) to determine if the apparent 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.

Kentucky 31 tall fescue with the endophyte (KY31+) is considered to be the most grazing-tolerant variety and was the grazing-tolerant check entry in all tall fescue trials. The central questions in grazing tolerance among tall fescues are: Can endophyte-free varieties persist as well as KY31+ and will the new novel, or "friendly," endophyte materials persist as well as other tolerant varieties? After three and four seasons, several fescue varieties were comparable to KY31+ in regard to grazing tolerance (Tables 2, 3, and 17).

Tables 14 (fescue), 15 (orchardgrass), and 16 (perennial ryegrass and festulolium) summarize 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 that the variety was in the test but plant survival was significantly less than 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.

Tables 17, 18, and 19 are summaries of stand persistence data from 2000 to 2018 of commercial tall fescue, orchardgrass, and perennial ryegrass varieties that have been entered in the Kentucky trials. In Table 17 the data is listed as a percentage of KY31+. In other words, in the tall fescue trials KY31+ is 100 percent. Variet-

ies with percentages over 100 persisted better than KY31+, and varieties with percentages less than 100 persisted less than KY31+. In Tables 18 and 19 the data are 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 17, 18, and 19, 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 17, 18, and 19 to determine which yearly report should be referenced.

Table 5. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown September 9, 2017, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2] Oct 12, 2017	Grazing Preference[3] May 18, 2018	Percent Stand 2017 Oct 12	Percent Stand 2018 Mar 14	Percent Stand 2018 Oct 16
Commercial Varieties-Available for Farm Use						
KY31+	toxic	4.1	1.0	100	100	100*
SS0705TFSL	free	4.3	1.0	100	100	99*
Lacefield MaxQII	novel	4.2	1.0	100	100	99*
Jesup MaxQ	novel	3.8	1.0	99	99	99*
Bull	free	3.3	1.0	98	99	99*
BarOptima PLUS E34	novel	4.1	1.2	100	100	98*
Cajun II	free	3.5	1.0	99	99	98*
Experimental Varieties						
KY31-	free	4.1	1.0	99	99	99*
KYFA1305	free	3.9	1.2	99	100	99*
KYFA9304	free	4.6	1.0	100	100	99*
KYFA1304	free	3.7	1.0	98	99	99*
KYFA1306	free	4.1	1.0	99	99	99*
KYFA1404	free	3.2	1.0	98	98	98*
KYFA1405	free	3.0	1.0	97	97	98*
STF50	free	2.7	1.0	96	97	97*
BARFA6BTR179	free	3.6	2.2	100	100	88
Mean		3.8	1.1	99	99	98
CV,%		18.0	21.5	1	1	4
LSD,0.05		0.8	0.3	1	2	4

[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: 2018-18 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 6. Seedling vigor, grazing preference, and stand persistence of orchardgrass varieties sown in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 9, 2014	Grazing Preference[2] 2015 May 1	2016 Apr 26	2017 Apr 26	2017 Jun 2	2018 May 18	Percent Stand 2014 Oct 9	2015 Apr 6	2015 Oct 21	2016 Mar 24	2016 Oct 17	2017 Mar 22	2017 Oct 19	2018 Mar 15	2018 Oct 25
Commercial Varieties-Available for Farm Use															
Benchmark Plus	4.8	2.5	3.3	4.0	7.5	2.2	98	98	98	98	73	85	79	84	69*
SS-0708OGDT	4.7	2.5	3.2	4.7	8.0	2.5	99	99	98	99	75	83	64	68	57*
Persist	3.7	2.7	3.4	3.7	8.0	1.3	98	99	98	98	78	85	73	76	55*
Prodigy	4.8	2.7	3.3	4.5	7.3	3.2	100	100	97	98	75	80	73	73	53*
Prairie	4.3	2.8	2.8	5.3	7.8	2.5	98	98	97	98	65	73	58	69	40
Profit	4.8	3.5	3.2	4.7	8.0	3.0	99	98	97	98	65	73	48	50	40
Tekapo	4.3	8.8	4.4	4.8	7.0	3.2	99	81	81	83	52	53	52	46	28
Harvestar	4.2	6.5	4.0	5.3	8.5	4.5	98	95	93	93	42	45	34	41	15
Experimental Varieties															
2014.90.16	4.3	2.2	2.5	4.0	7.0	1.8	98	98	99	99	81	88	76	86	69*
B-SIG613	4.5	2.0	3.3	4.3	7.8	3.2	98	99	98	98	86	91	84	85	62*
Mean	4.4	3.6	3.3	4.5	7.7	2.7	98	96	96	96	69	75	64	68	49
CV,%	10.6	24.3	26.6	24.7	17.1	45.4	2	4	3	3	16	11	19	24	29
LSD,0.05	0.5	1.0	1.0	1.3	1.5	1.4	3	4	4	3	13	10	14	19	16

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2015-10 days, 2016-13 days, 2017-14 days, 2018-18 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Summary

These studies indicate that there are varieties of cool-season grasses that can tolerate overgrazing for multiple seasons and still maintain reasonable stands. Some varieties of endophyte-free as well as novel, or "friendly," endophyte tall fescue have been able to maintain equivalent stands to endophyte-infected KY31. There is no KY31+ equivalent in orchardgrass; that is, no variety has historically been proven to be tolerant of overgrazing. However, some varieties have exhibited good tolerance to grazing abuse even after three and four seasons.

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 recommended that tall fescue or orchardgrass be continuously overgrazed as was done in these trials. 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 becomes necessary in livestock operations.

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

Table 7. Seedling vigor, grazing preference, and stand persistence of orchardgrass varieties sown September 3, 2015, in a cattle grazing tolerance study at Lexington, Kentucky.

	Seedling Vigor[1]	Grazing Preference[2]				Percent Stand						
		2016	2017		2018	2015	2016		2017		2018	
Variety	Oct 9, 2014	Apr 26	Apr 26	Jun 2	May 18	Oct 19	Mar 24	Oct 4	Mar 22	Oct 20	Mar 15	Nov 15
Commercial Varieties-Available for Farm Use												
SS-0708OGDT	4.8	3.3	3.3	6.3	2.2	100	100	99	99	97	94	74*
Persist	4.6	3.3	3.3	6.8	1.3	100	100	99	99	98	96	63*
Prairie	4.2	3.5	3.7	7.2	1.8	99	100	99	99	97	97	58
Potomac	5.0	3.0	3.7	6.8	1.7	100	100	99	99	98	97	57
Profit	4.7	3.8	3.8	7.5	4.2	100	100	99	100	96	94	49
Tekapo	4.5	7.0	5.0	8.0	4.7	100	96	97	98	95	93	47
Experimental Varieties												
OG-0707	4.8	3.2	3.8	6.8	2.5	100	100	100	100	98	97	73*
KYDG1002	4.3	5.0	4.8	7.2	4.3	100	100	99	98	97	93	48
Dg82Ro1	3.5	4.5	4.5	7.5	4.8	99	100	97	98	93	93	45
KYDG1001	3.8	4.7	4.8	8.0	3.8	100	100	98	98	97	96	43
Mean	4.4	4.1	4.1	7.2	3.1	100	100	99	99	97	95	56
CV,%	11.2	24.8	21.6	14.3	29.7	1	1	1	1	2	3	24
LSD,0.05	0.6	1.2	1.0	1.2	1.1	1	1	2	1	2	3	16

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2016-13 days, 2017-14 days, 2018-18 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 8. Seedling vigor, grazing preference, and stand persistence of orchardgrass varieties sown September 8, 2016, in a cattle grazing tolerance study at Lexington, Kentucky.

	Seedling Vigor[1]	Grazing Preference[2]			Percent Stand				
		2017		2018	2016	2017		2018	
Variety	Oct 5, 2016	Apr 26	Jun 2	May 18	Oct 5	Mar 15	Oct 11	Mar 15	Oct 31
Commercial Varieties-Available for Farm Use									
Devour	3.4	4.8	8.3	6.3	100	100	100	100	92*
Persist	4.1	3.2	6.8	1.2	100	100	100	100	82*
Prairie	4.1	2.8	6.5	2.0	100	100	100	100	78
SS0708OGDT	4.8	3.0	7.3	2.3	100	100	100	100	76
Potomac	4.2	2.8	7.0	1.7	100	100	100	100	76
Prodigy	4.2	3.5	7.3	2.7	100	100	100	100	72
Harvestar	3.7	4.3	8.3	6.7	100	100	100	100	63
Elise	3.4	5.3	7.8	6.3	100	100	100	100	60
Experimental Varieties									
KYDG1001	4.3	4.2	7.2	3.3	100	100	100	100	77
KYDG1002	4.4	4.2	8.2	3.5	100	100	100	100	68
Mean	4.1	3.8	7.5	3.6	100	100	100	100	74
CV,%	12.4	22.1	14.3	26.5	0	0	0	0	16
LSD,0.05	0.6	1.0	1.2	1.1	0	0	0	0	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; 2017-14 days, 2018-18 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

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Table 9. Seedling vigor, grazing preference , and stand persistence of orchardgrass varieties sown September 9, 2017, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 12, 2017	Grazing Preference[2] May 18, 2018	Percent Stand 2017 Oct 12	Percent Stand 2018 Mar 14	Percent Stand 2018 Oct 16
Commercial Varieties-Available for Farm Use					
SS0708OGDT	4.4	2.2	99	99	96*
Potomac	3.7	2.7	98	99	96*
Prodigy	4.3	2.5	100	100	95*
Persist	3.7	2.0	98	98	94*
Prairie	3.4	3.2	97	99	93*
Experimental Varieties					
SOG-1614	2.6	7.3	92	93	91
Mean	3.7	3.3	97	98	94
CV,%	15.7	22.7	2	2	4
LSD,0.05	0.7	0.9	2	2	4

[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; 2018-18 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 10. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass varieties sown September 9, 2014, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 9, 2014	Grazing Preference[2] 2015 May 1	2016 May 5	2017 Apr 26	2017 Jun 2	2018 May 18	Winter Injury[3] Jan 29, 2015	Percent Stand 2014 Oct 9	2015 Apr 6	2015 Oct 21	2016 Mar 24	2016 Oct 5	2017 Mar 22	2017 Oct 19	2018 Mar 15	2018 Oct 25
Commercial Varieties-Available for Farm Use																
Remington PLUS NEA2[4]	4.8	5.0	3.5	4.5	7.7	4.8	2.5	100	100	100	100	100	99	97	96	94*
Remington	4.4	4.3	3.8	4.5	7.7	5.0	2.3	97	99	99	100	99	99	93	93	89*
BG34	4.9	3.2	3.7	4.7	6.3	4.3	2.8	100	100	99	99	95	90	85	85	73
Calibra	4.6	3.3	4.2	5.0	7.2	4.3	3.8	97	99	98	98	95	86	70	64	57
Granddaddy	3.9	3.5	2.0	2.7	3.0	1.2	2.7	96	98	97	97	96	84	78	65	55
PayDay	4.4	4.3	3.7	5.7	7.2	4.5	4.5	97	98	99	100	94	82	73	64	55
Linn (certified)	4.5	2.8	2.5	4.0	4.5	2.2	7.0	99	100	99	99	92	80	69	62	52
Power	4.2	4.5	3.8	4.7	7.2	4.3	4.7	95	98	97	98	92	81	74	63	51
Experimental Varieties																
AGRLP157-AR1[4]	4.8	3.5	3.7	3.8	7.0	4.2	3.3	100	100	100	100	98	96	93	93	83*
AGRLP156-AR1[4]	5.0	3.2	3.0	3.8	5.0	2.7	4.3	100	100	99	99	94	89	87	89	62
Mean	4.5	3.8	3.4	4.3	6.3	3.8	3.8	98	99	99	99	95	89	82	77	67
CV,%	9.7	21.8	20.4	16.7	22.0	22.4	26.4	3	1	1	1	4	10	11	16	17
LSD,0.05	0.5	1.0	0.8	0.8	1.6	1.0	1.2	3	2	2	1	4	10	11	14	13

[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; 2015-10 days, 2016-20 days, 2017-14 days, 2018-18 days.
[3] Winter injury based on a score of 1 to 9 with 9 being the greatest amount of injury.
[4] Remington PLUS NEA2 contains a non-toxic (novel) endophyte. AR1 is a non-toxic (novel) endophyte inserted into these experimental perennial ryegrass varieties.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 11. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass and festulolium (FL) varieties sown September 3, 2015, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 19, 2015	Grazing Preference[2] 2016 Apr 26	2017 Apr 26	2017 Jun 2	2018 May 18	Winter Injury[3] Jan 29, 2016	Percent Stand 2015 Oct 19	2016 Mar 24	2016 Oct 4	2017 Mar 22	2017 Oct 18	2018 Mar 15	2018 Oct 31
Commercial Varieties-Available for Farm Use													
Remington	4.4	1.7	3.2	7.2	5.7	0.9	100	100	100	100	99	99	97*
Remington PLUS NEA2[4]	4.3	1.8	3.5	7.2	5.3	1.0	100	100	100	99	98	98	93*
Grand Daddy	3.3	2.4	2.3	4.8	1.3	1.1	98	100	99	99	95	94	78
Albion	3.1	1.9	3.5	8.3	5.7	1.0	84	100	99	97	89	86	77
Power	4.3	2.0	4.2	6.5	5.2	1.5	100	100	99	97	90	81	70
Calibra	4.7	2.1	4.0	7.0	5.3	1.1	100	100	98	97	86	84	69
SpringGreen (FL)	4.3	2.3	4.2	6.8	4.8	1.3	99	100	96	95	90	88	68
BG-34	3.5	1.5	3.3	6.8	4.8	1.3	99	100	99	90	86	81	64
Duo (FL)	4.9	4.8	3.8	5.2	4.7	7.5	100	92	88	87	76	61	56
Linn (certified)	3.8	1.8	3.0	2.3	2.0	2.7	100	100	97	96	84	80	50
Barvitra	5.0	3.5	4.7	6.2	5.0	2.3	100	100	62	42	35	23	23
Experimental Varieties													
BARLP15261	3.4	1.8	3.3	7.7	6.0	0.8	100	100	100	100	98	98	95*
GPT-14021	3.7	2.2	3.7	7.7	5.7	0.8	100	100	100	100	98	96	91*
GDP-14018	4.3	1.7	3.8	7.0	5.5	1.9	100	100	98	98	97	97	81
GDP-14017	4.2	1.9	2.8	4.2	2.5	2.7	100	100	93	88	88	88	67
KYFL1013 (FL)	4.7	2.7	3.8	4.3	4.2	1.0	100	100	99	98	91	70	61
TAL-PR-02	4.0	4.2	2.8	4.2	3.5	5.8	100	84	92	93	85	61	60
TAL-PR-04	3.8	4.2	2.8	2.7	2.3	6.8	100	88	93	93	87	51	47
KYFA9819 (FL)	4.0	2.2	3.8	5.3	3.8	0.9	99	100	98	92	70	57	42
GPT-14023	4.2	6.2	3.5	5.3	3.3	7.8	100	34	62	69	64	35	39
GDP-14019	4.1	6.5	3.7	5.8	3.5	8.5	100	33	65	57	57	33	33
TAL-PR-03	2.6	3.3	3.2	4.5	2.5	5.0	98	95	84	55	41	23	28
Mean	4.0	2.8	3.5	5.8	4.2	2.9	99	92	92	88	82	72	63
CV,%	12.4	25.5	24.4	25.0	18.0	20.1	3	10	10	11	13	21	23
LSD,0.05	0.6	0.8	1.0	1.7	0.9	0.7	4	11	10	11	12	17	17

[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; 2016-13 days, 2017-14 days, 2018-18 days.
[3] Winter injury based on a score of 1 to 9 with 9 being the greatest amount of injury.
[4] Remington PLUS NEA2 contains a non-toxic (novel) endophyte.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 12. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass and festulolium (FL) varieties sown September 8, 2016, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 5, 2016	Grazing Preference[2] 2017 Apr 26	2017 Jun 2	2018 May 18	Percent Stand 2016 Oct 5	2017 Mar 15	2017 Oct 11	2018 Mar 15	2018 Oct 16
Commercial Varieties-Available for Farm Use									
Remington	4.2	2.8	4.3	5.5	100	100	100	100	100*
PayDay	3.9	4.0	4.8	5.7	100	100	100	100	98*
Melpetra	3.0	5.0	6.3	6.7	100	100	100	98	97*
Calibra	4.8	4.0	5.2	4.8	100	100	100	100	97*
SpringGreen (FL)	3.7	3.3	3.8	5.2	100	100	100	100	88
Duo (FL)	4.9	4.5	5.2	4.5	100	100	88	87	75
Linn (certified)	4.1	2.5	2.0	3.2	100	100	100	100	75
Experimental Varieties									
BARLP15261	4.0	3.5	5.0	6.2	100	100	100	100	100*
BARLP16237	3.6	3.3	5.0	6.2	100	100	100	100	100*
BARLP15COW	4.4	2.3	2.8	4.5	100	100	100	98	97*
KYFL1301 (FL)	4.3	4.0	4.7	4.8	100	100	99	100	96*
BARLP16238	4.0	2.8	3.7	4.5	100	100	99	98	95*
Mean	4.1	3.5	4.4	5.1	100	100	99	98	93
CV,%	11.1	24.6	30.4	13.7	0	0	2	2	9
LSD,0.05	0.5	1.0	1.5	0.8	0	0	2	2	10

[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; 2017-14 days, 2018-18 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 13. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass varieties sown September 9, 2017, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 12, 2017	Grazing Preference[2] May 18, 2018	Percent Stand 2017 Oct 12	2018 Mar 14	2018 Oct 16
Commercial Varieties-Available for Farm Use					
Remington	4.2	4.2	99	99	98*
PayDay	3.6	3.8	98	99	96*
Victorian	4.8	3.2	100	84	88*
Linn (certified)	4.6	2.3	100	100	85
TetraGain	3.4	3.3	97	98	70
Experimental Varieties					
BARLP17237	3.3	4.5	97	98	99*
BARLP17253	4.1	3.3	99	100	92*
BARLM16238	4.6	3.3	100	100	90*
Mean	4.1	3.5	99	97	90
CV,%	11.5	20.0	1	6	12
LSD,0.05	0.5	0.8	1	6	12

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2018-18 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 14. Summary of persistence of tall fescue varieties under heavy grazing pressure across years at Lexington, Kentucky.[1]

Variety	Endophyte Status[2]	Proprietor/ KY Distributor	2014[3]								2015						2016				2017	
			Apr	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Apr	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct
			2015[4]		2016		2017		2018		2016		2017		2018		2017		2018		2018	
Commercial Varieties-Available for Farm Use																						
Baguala	free	Allied Seed									*	x[5]	x	x	x	x						
BarOptima PLUS E34	novel	Barenbrug USA	x	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Bronson	free	Ampac Seed															*	*	*	*		
Bull	free	Caudill Seed															*	*	*	*	*	*
Cajun II	free	Smith Seed Services	*	*	*	*	*	*	*	x	*	x	*	*	*	*	*	*	*	*	*	*
Dominate	free	Allied Seed									*	x	x	x	x	x						
Drover	free	Barenbrug USA									*	*	*	*	*	*						
FSG 402TF	free	Farm Service Genetics									*	*	*	*	*	x						
Goliath	free	Ampac Seed															*	*	*	*		
Jesup MaxQ	novel	Pennington Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KY 31+	toxic	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lacefield MaxQ II	novel	Pennington Seed	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Select	free	Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
SS-0705TFSL	free	Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Experimental Varieties																						
BARFA6BTR179	free	Barenbrug USA																			*	x
BARFAF13131	free	Barenbrug USA									*	*	*	*	*	x						
Drover/E34	novel	Barenbrug USA									*	*	*	*	*	*						
KY 31-	free	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA1113	free	KY Agric. Exp. Station									*	*	*	*	*	*						
KYFA1113/AR584	novel	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
KYFA1114	free	KY Agric. Exp. Station									*	*	*	*	*	*						
KYFA1114/AR584	novel	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
KYFA1115/AR584	novel	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
KYFA1201	free	KY Agric. Exp. Station															*	*	*	*		
KYFA1311	free	KY Agric. Exp. Station									*	*	*	*	*	*						
KYFA1303	free	KY Agric. Exp. Station															*	*	*	*		
KYFA1304	free	KY Agric. Exp. Station																			*	*
KYFA1305	free	KY Agric. Exp. Station																			*	*
KYFA1306	free	KY Agric. Exp. Station																			*	*
KYFA1404	free	KY Agric. Exp. Station																			*	*
KYFA1405	free	KY Agric. Exp. Station																			x	*
KYFA9304	free	KY Agric. Exp. Station															*	*	*	*	*	*
KYFA9732/AR584	novel	KY Agric. Exp. Station															*	*	*	*		
KYFA9821/AR584	novel	KY Agric. Exp. Station									*	*	*	*	*	*						
NFTF 1044	free	Noble Foundation	*	*	*	*	*	*	*	*												
NFTF 1051	free	Noble Foundation	*	*	*	*	*	x	x	x												
NFTF 1370	free	Noble Foundation	*	*	*	*	*	*	*	*												
STF50	free	Smith Seed Services																			x	*

[1] For detailed stand ratings over years, see individual trial tables.
[2] 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.
[3] Establishment year.
[4] Date of rating of percent stand.
[5] "x" in the block indicates the variety was in the test but plant 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 15. Summary of persistence of orchardgrass varieties under heavy grazing pressure across years at Lexington, Kentucky.

Variety	Proprietor/ KY Distributor	2014[1]								2015						2016				2017	
		Apr	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Nov	Mar	Oct	Mar	Oct	Mar	Oct
		2015[2]		2016		2017		2018		2016		2017		2018		2017		2018		2018	
Commercial Varieties-Available for Farm Use																					
Benchmark Plus	Southern States	*	*	*	*	*	*	*	*												
Devour	Mountain View Seeds															*	*	*	*		
Elise	Pure Seed															*	*	*	x		
Harvestar	Columbia Seeds	*	x[3]	*	x	x	x	x	x							*	*	*	x		
Persist	Smith Seed Services	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Potomac	Public									*	*	*	*	*	*	*	*	*	x	*	*
Prairie	Turner Seed	*	*	*	x	x	x	*	x	*	*	*	*	*	x	*	*	*	x	*	*
Prodigy	Caudill Seed	*	*	*	*	*	*	*	*							*	*	*	x	*	*
Profit	Ampac Seed Co.	*	*	*	x	x	x	x	x	*	*	*	*	*	x						
SS-0708OGDT	Southern States	*	*	*	*	*	x	*	*	*	*	*	*	*	*	*	*	*	x	*	*
Tekapo	Ampac Seed Co.	x	x	x	x	x	x	x	x	x	x	x	x	x	x						
Experimental Varieties																					
2014.90.16	KY Agric. Exp. Station	*	*	*	*	*	*	*	*												
B-SIG 613	Blue Moon Farms	*	*	*	*	*	*	*	*												
Dg82Ro1	Barenbrug									*	x	x	x	x	x						
KYDG1001	KY Agric. Exp. Station									*	x	x	*	*	x	*	*	*	x		
KYDG1002	KY Agric. Exp. Station									*	*	x	*	x	x	*	*	*	x		
OG-0707	Allied									*	*	*	*	*	x						
SOG-1614	Smith Seed Services																			x	x

[1] Establishment year.
[2] Date of visual rating of percent stand.
[3] "x" in the block indicate the variety was in the test but stand survival was significantly less than the most persistent variety. Open blocks indicate the variety was not in the test.
*Not significantly different from the most persistent variety.

Table 16. Summary of persistence of perennial ryegrass and festulolium (FL) varieties under heavy grazing pressure across years at Lexington, Kentucky.

Variety	Proprietor/ KY Distributor	2014[1]								2015						2016				2017	
		Apr	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct	Mar	Oct
		2015[2]		2016		2017		2018		2016		2017		2018		2017		2018		2018	
Commercial Varieties-Available for Farm Use																					
Albion	Grassland Oregon									*	*	*	*	*	x						
Barvitra	Barenbrug USA									*	x[3]	x	x	x	x						
BG34	Barenbrug USA	*	*	*	x	*	x	*	x	*	*	*	x	x	x						
Calibra	DLF Pickseed	*	x	x	x	x	x	x	x	*	*	*	x	*	x	*	*	*	*		
Duo (FL)	Ampac Seed Co.									*	x	x	x	x	x	*	x	x	x		
Grand Daddy	Smith Seed	*	x	x	*	x	x	x	x	*	*	*	*	*	x						
Linn (certified)	Public	*	*	*	x	x	x	x	x	*	*	*	x	x	x	*	*	*	x	*	x
Melpetra	Hood River Seed															*	*	*	*		
PayDay	Mountain View Seeds	*	*	*	x	x	x	x	x							*	*	*	*	*	*
Power	Ampac Seed Co.	*	x	x	x	x	x	x	x	*	*	*	*	x	x						
Remington	Barenbrug USA	*	*	*	*	*	*	*	*	*	*	*	*	*	x	*	*	*	*	*	*
Remington PLUS NEA2[4]	Barenbrug USA	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
SpringGreen (FL)	Rose Agri-Seed									*	*	*	*	*	*	*	*	*	x		
TetraGain	Pure Seed																			*	x
Victorian	Caudill Seed																			x	*
Experimental Varieties																					
AGRLP156-AR1[4]	Ag. Research	*	*	*	x	*	*	*	x												
AGRLP157-AR1[4]	Ag. Research	*	*	*	*	*	*	*	*												
BARLP15261	Barenbrug USA									*	*	*	*	*	*	*	*	*	*		
BARLP15COW	Barenbrug USA															*	*	*	*		
BARLP16237	Barenbrug USA															*	*	*	*		
BARLP16238	Barenbrug USA															*	*	*	*	*	*
BARLP17237	Barenbrug USA																			*	*
BARLP17253	Barenbrug USA																			*	*
GPD-14017	Ag. Research									*	*	x	*	*	x						
GPD-14018	Ag. Research									*	*	*	*	*	x						
GPD-14019	Ag. Research									x	x	x	x	x	x						
GPT-14021	Ag. Research									*	*	*	*	*	*						
GPT-14023	Ag. Research									x	x	x	x	x	x						
KYFA1013 (FL)	KY Agric.Exp. Station									*	*	*	*	x	x						
KYFL1301 (FL)	KY Agric.Exp. Station															*	*	*	*		
KYFA9819 (FL)	KY Agric.Exp. Station									*	*	*	x	x	x						
TAL-PR-02	Ag. Research									x	*	*	x	x	x						
TAL-PR-03	Ag. Research									*	x	x	x	x	x						
TAL-PR-04	Ag. Research									x	*	*	*	x	x						

[1] Establishment year.
[2] Date of visual rating of percent stand.
[3] "x" in the block indicates the variety was in the test but plant survival was significantly less than the most persistent variety. An open block indicates the variety was not in the test.
[4] Remington PLUS NEA2 contains a non-toxic endophyte. AR1 is a non-toxic endophyte inserted into the experimental perennial ryegrass varieties.
*Not significantly different from the most persistent variety.

Table 17. Summary of 2000-2018 Kentucky tall fescue grazing tolerance trials (stand persistence shown as a percent of the stand rating of KY 31+).

Variety	Endophyte Status[1]	Proprietor	Lexington																Princeton	Mean[4] (#trials)
			2000[2,3]	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2002	
			4yr[5]	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	3yr	4yr	
Advance MaxQ	novel	Pennington Seed							94											–
Baguala	free	Allied Seed																98		–
Bariane	free	Barenbrug USA				89		75	47	29										60(4)
BarElite	free	Barenbrug USA								96										–
Barolex	free	Barenbrug USA						78	101	86										88(3)
BarOptima PLUS E34	novel	Barenbrug USA						100		97			98	100	98	100	100	100		99(8)
Bronson	free	Ampac Seed										98	98							98(2)
Bull	free	Caudill Seed														96				–
Cajun II	free	Smith Seed Services											98				97	99		98(3)
Cattle Club	free	Green Seed	93	91																92(2)
Carmine	free	DLF-Jenks		90																–
Cowgirl	free	Rose Agri-Seed					99								99					99(2)
Dominate	free	Allied Seed																97		–
Drover	free	Barenbrug USA																99		–
Festival	free	Pickseed West		100	101														89	97(3)
FSG 402TF	free	Farm Service Genetics																99		–
Flourish	free	Allied Seed													98					–
Goliath	free	Ampac Seed											98							–
Hoedown	free	DLF-Jenks	88																	–
HyMark	free	Fraser Seeds									95			100						98(2)
Jesup MaxQ	novel	Pennington Seed			103	97		68	102	97	97	99	98	100	99	99	99	99	105	97(14)
Johnstone	free	Proseeds		92																–
KY31+	toxic	KY Agri. Exp Sta.	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100(17)
KY31-	free	KY Agri. Exp Sta.		98	103	98	100	83	101	100	98	99	99	100	100	99	100	99	105	99(16)
Kokanee	free	Ampac Seed	43																	–
Lacefield MaxQ II	novel	Pennington Seed						82	102	99	98	98	97			100	99	100		97(9)
Maximize	free	Rose Agri-Seed		99																–
Nanryo	free	Japanese Grassland For.Seed								100										–
Orygun	free	–			99															–
Resolute	free	Ampac Seed		23																–
Select	free	Southern States	107	101	100	100		67	100	93	95	97	100	100	99	99	99	100	98	97(16)
SS0705TFSL	free	Southern States															100	100		–
Stargrazer	free	Southern States	86	89																79(4)
Stockman	free	Seed Res. of OR					102													–
Texoma MaxQ II	novel	Pennington Seed						88	100	98										95(3)
Tuscany II	free	Seed Res. of OR							101											–
Verdant	free	Am.Grass Seed							97											–

[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 in 2010 was grazed 4 years so the final report would be "2014 Cool-Season Grass Grazing Tolerance Report" archived in the KY 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.

Table 18. Summary of 2000-2018 Kentucky orchardgrass grazing tolerance trials (stand persistence shown as a percent of the mean of the commercial varieties in the trial).

		Lexington														Princeton	
		2000[1,2]	2001	2002	2003	2004	2005[3]	2007	2009	2010	2011	2012	2013[3]	2014	2015	2002	Mean[4]
Variety	Proprietor	4yr[5]	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	3yr	4yr	(#trials)
Abertop	Pennington Seed			38													–
Albert	Univ. of Wisconsin		115														–
Amba	DLF-Jenks		71														–
Ambrosia	Pennington Seed							94									–
Athos	DLF-Jenks		93				60										–
Benchmark	Southern States	118	123	114												133	122(4)
Benchmark Plus	Southern States			120			152	135	106	106	108	115	146	154		133	122(8)
Boone	Public	102															–
Command	Seed Research of OR					81											–
Crown Royale	Donley Seed		100														–
Crown Royale Plus	Donley Seed			124												83	104(2)
Elise	Pure Seed											97					–
Hallmark	James VanLeeuwen		115		113											83	104(3)
Harvestar	Columbia Seeds							75		89	94		51	34			73(4)
Haymate	Southern States	53	115	100	118											83	94(5)
Intensiv	Barenbrug USA				51												–
Mammoth	DLF-Jenks		115														–
Megabite	Turf Seed		77														–
Niva	DLF-Jenks			76												83	80(2)
Persist	Smith Seed						138	107	103	100	96	115	102	123	109		108(7)
Potomac (certified)	Public			116		119									98	117	113(4)
Prairie	Turner Seed	127	121								94		131	90	100	83	103(6)
Prodigy	Caudill Seed												109	119			–
Profile	Scott Seed			116													–
Profit	Ampac Seed								95	99	102	94	95	90	84		94(6)
Tekapo	Ampac Seed		55	74	118		50	103	95	105	106	80	66	63	81	100	89(11)
Takena	Smith Seed		99														–
Seco	Southern States							85									–
SS0708OGDT	Southern States													128	128		128(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 KY Forage website at <forages.ca.uky.edu>.

[3] Due to high variation during 2005 and 2013 trials 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.

Stand thinning may have been greater for preferred varieties due to closer grazing. See individual trial tables for preference ratings.

Table 19. Summary of 2000-2018 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).

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 3yr	Mean[3] (#trials)
AGRLP103	–	AgResearch USA	128		86									107(2)
Albion	tetraploid	Grassland Oregon											113	–
Aries	diploid	Ampac Seed		139										–
Barfest (FL)	MF x PR[6]	Barenbrug USA						116	112					114(2)
Barvitra	diploid	Barenbrug USA											34	–
Boost	tetraploid	Allied Seed					101	83	95	104				96(4)
Calibra	tetraploid	DLF International								120		88	101	103(3)
Citadel	tetraploid	Donley Seed	107											–
Duo (FL)	MF x PR[6]	Ampac Seed	116				95	72	90	115			82	95(6)
Grand Daddy	tetraploid	Smith Seed Services		121		82		100	81	103		85	115	98(7)
Lasso	diploid	DLF-Jenks		130										–
Linn (certified)	diploid	Public	112	129	63		95	108	95	103	96	80	73	95(10)
Maverick	tetraploid	Ampac Seed		36										–
Meadow Green (FL)	MF xIR[6]	Pure Seed								15				–
PayDay	tetraploid	Mountain View Seeds									101	85		93(2)
Polly II	tetraploid	FS Growmark	36	68										52(2)
Power	tetraploid	Ampac Seed				158		107	112	109	89	79	103	108(7)
Quartet	tetraploid	Ampac Seed		77		59								68(2)
Remington	tetraploid	Barenbrug USA			151							138	142	140(2)
Remington PLUS NEA2[5]	tetraploid	Barenbrug USA										145	137	141(2)
Spring Green (FL)	MF x PR[6]	Rose Agri-Seed	101				109	115	115	120			100	110(6)
TetraGain	tetraploid	Pure Seed								112				–
Victorian	diploid	Caudill Seed									114			–

[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 KY 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.

11-2018