



# 2020 Cool-Season Grass Grazing Tolerance Report

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## Introduction

Cool-season forages such as tall fescue, orchardgrass, and Kentucky bluegrass are the primary pasture grasses in Kentucky. Other species such as perennial ryegrass and festulolium can also 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 growing season. Overgrazing is not a recommended practice, but is done in these studies to determine how different varieties perform under conditions that are worse than occur during the life of a typical pasture. Varieties are primarily rated for percent survival but data on seedling vigor and grazing preference are also presented. Consult the UK Forage Extension website at [www.forages.ca.uky.edu](http://www.forages.ca.uky.edu) to access all forage variety testing reports from Kentucky and surrounding states as well as from a large number of other forage publications.

## Important Selection Considerations

**Local adaptation and seasonal yield.** Select a variety that is adapted to Kentucky as indicated by superior performance across years and locations in replicated trials, such as those reported in this publication. Grazing persistence data should be used in combination with yield data to select the best variety for pas-

ture 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 ensure 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 2016, 2017, 2018, and 2019. 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 to remove seedheads or weed growth not controlled by herbicides. Supplemental hay was 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 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 November. Other fertilizers (lime, P, and K) were applied as needed according to the University of Kentucky soil test recommendations.

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

	2017				2018				2019				2020 <sup>2</sup>			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP <sup>1</sup>	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

<sup>1</sup> DEP is departure from the long-term average.

<sup>2</sup> 2020 data is for ten months through October.

**Table 2. 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 <sup>1</sup>	Seedling Vigor <sup>2</sup> Oct 5, 2016	Grazing Preference <sup>3</sup>				Percent Stand									
			2017		2018	2020	2016	2017			2018		2019		2020	
			Apr 26	Jun 2	May 18	May 14	Oct 5	Mar 15	Oct 11	Mar 16	Oct 16	Mar 28	Oct 18	Mar 19	Oct 13	
<b>Commercial Varieties-Available for Farm Use</b>																
BarOptima PLUS E34	novel	3.3	2.8	3.8	1.3	4.8	100	100	100	100	99	98	99	99	100*	
Bronson	free	3.8	1.5	1.8	1.0	1.8	100	100	100	100	100	100	100	100	100*	
Bull	free	3.1	1.0	1.5	1.0	1.7	100	100	100	100	100	100	100	100	100*	
Cajun II	free	3.5	1.2	1.7	1.0	2.5	98	99	99	100	100	100	100	100	100*	
Goliath	free	3.7	1.5	2.7	1.0	3.5	100	100	100	100	100	100	100	100	100*	
Jesup MaxQ	novel	4.5	1.8	3.0	1.0	2.7	100	100	100	100	100	100	100	100	100*	
KY31+	toxic	3.6	2.7	4.0	1.0	4.2	100	100	100	100	100	100	100	100	100*	
Lacefield MaxQII	novel	4.4	2.0	4.0	1.0	3.5	100	100	100	100	100	100	100	100	100*	
SS0705TFSL	free	4.2	1.5	2.8	1.0	3.0	99	100	100	100	100	100	100	100	100*	
Cosmonaut (MF)	free	3.6	5.2	7.8	5.0		99	99	99	100	84	75	8	3	2	
<b>Experimental Varieties</b>																
KY31-	free	3.8	2.0	2.5	1.0	3.7	100	100	100	100	100	100	100	100	100*	
KYFA1201	free	3.8	2.2	3.7	1.0	3.5	100	100	100	100	100	100	100	100	100*	
KYFA1303	free	4.8	2.3	5.0	1.0	4.0	100	100	100	100	100	100	100	100	100*	
KYFA9304	free	4.5	2.7	4.5	1.0	4.0	100	100	100	100	99	99	100	100	100*	
KYFA9732/AR584	novel	4.1	2.5	3.8	1.0	4.2	100	100	100	100	100	100	100	100	100*	
KYPP0901 (MF)	free	4.7	4.3	7.2	3.3		100	100	100	100	96	93	13	3	3	
Mean		4.0	2.3	3.7	1.4	3.4	100	100	100	100	99	98	89	88	88	
CV,%		14.0	25.7	37.0	26.4	30.4	1	1	1	0	5	6	3	1	1	
LSD,0.05		0.6	0.7	1.6	0.4	1.2	1	1	1	0	5	7	3	1	1	

<sup>1</sup> 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.

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

<sup>3</sup> 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, 2020-30 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 fescue varieties sown September 9, 2017, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Endophyte Status <sup>1</sup>	Seedling Vigor <sup>2</sup> Oct 12, 2017	Grazing Preference <sup>3</sup>		Percent Stand							
			2018	2020	2017	2018		2019		2020		
			May 18	May 14	Oct 12	Mar 14	Oct 16	Mar 28	Oct 18	Mar 19	Oct 13	
<b>Commercial Varieties-Available for Farm Use</b>												
Jesup MaxQ	novel	3.8	1.0	2.0	99	99	99	99	99	99	99	99*
KY31+	toxic	4.1	1.0	3.3	100	100	100	99	99	99	99	99*
Lacefield MaxQII	novel	4.2	1.0	2.8	100	100	99	98	98	98	98	98*
Cajun II	free	3.5	1.0	2.0	99	99	98	98	98	98	98	98*
SS0705TFSL	free	4.3	1.0	2.7	100	100	99	99	99	98	98	98*
Ranchero	free	2.7	1.0	2.5	96	97	97	97	97	97	97	97*
Bull	free	3.3	1.0	1.0	98	99	99	98	97	97	97	97*
BarOptima PLUS E34	novel	4.1	1.2	3.3	100	100	98	97	96	95	95	
<b>Experimental Varieties</b>												
KYFA1305	free	3.9	1.2	3.3	99	100	99	99	99	99	99	99*
KY31-	free	4.1	1.0	2.7	99	99	99	99	98	98	98	98*
KYFA1404	free	3.2	1.0	2.5	98	98	98	98	98	98	98	98*
KYFA1405	free	3.0	1.0	3.0	97	97	98	98	98	98	98	98*
KYFA1304	free	3.7	1.0	2.5	98	99	99	98	98	98	98	98*
KYFA1306	free	4.1	1.0	2.5	99	99	99	98	98	98	98	98*
KYFA9304	free	4.6	1.0	3.2	100	100	99	98	98	98	98	98*
BARFA6BTR179	free	3.6	2.2	3.3	100	100	93	93	93	91	91	
Mean		3.8	1.1	2.7	99	99	98	98	98	97	97	
CV,%		18.0	21.5	25.5	1	1	2	2	2	2	2	
LSD,0.05		0.8	0.3	0.8	1	2	2	2	2	2	2	

<sup>1</sup> 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.

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

<sup>3</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2018-18 days, 2020-30 days.

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

## Results and Discussion

Weather data for Lexington are presented in Table 1. Data on percent stand are presented in Tables 2 through 13. Varieties are listed in alphabetical order, with experimental varieties at the bottom. Statistical analyses were performed on all entries (including experimentals) to determine if the apparent 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), 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 regarding 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 grazing tolerant varieties? Several fescue varieties were comparable to KY31+ in regard to grazing tolerance even after three or four seasons (Tables 2, 3, and 17).

Tables 14 (tall fescue), 15 (orchardgrass), and 16 (perennial ryegrass and festulolium) show information about proprietors/distributors for all varieties in these tests. Tables 17, 18, and 19 are summaries of stand persistence data from 2000 to 2020 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, the stand survival ratings of all varieties is expressed as a percent of KY31+, with KY31+ set to 100. Varieties with percentages over 100 persisted better than KY31+, and those with percentages less than 100 persisted less well than KY31+. In Tables 18 and 19 the data are listed

**Table 4. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown September 5, 2018, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Endophyte Status <sup>1</sup>	Seedling Vigor <sup>2</sup> Sep 28, 2018	Grazing Preference <sup>3</sup> May 14, 2020	Percent Stand				
				2018	2019		2020	
				Sep 28	Mar 28	Oct 18	Mar 19	Oct 13
<b>Commercial Varieties-Available for Farm Use</b>								
KY31+	toxic	2.8	3.5	90	93	93	93	93*
Lacefield MaxQII	novel	3.8	2.3	88	91	91	91	91*
SS0705TFSL	free	3.8	3.0	89	90	90	90	90*
Jesup MaxQ	novel	2.8	2.2	81	87	89	90	90*
Cajun II	free	3.4	2.5	83	87	86	89	88*
Bull	free	3.3	2.2	81	85	86	87	87*
BarOptima PLUS E34	novel	3.3	3.0	83	84	84	84	84*
<b>Experimental Varieties</b>								
KYFA9304	free	3.3	2.8	90	89	90	91	91*
RADMRF20	free	3.4	3.3	90	89	91	91	91*
KY31-	free	3.5	2.7	88	87	88	89	89*
7FAC82	free	3.6	2.8	88	89	88	88	88*
7016	free	3.7	3.3	87	87	88	88	88*
KYFA9611	free	2.9	3.3	84	85	86	87	87*
BARFAF137	free	3.1	4.0	82	85	88	86	86*
KYFA9821/AR584	novel	3.0	2.5	82	83	83	83	83
BARFAF131	free	2.0	2.7	70	79	79	79	79
BARFAF135	free	2.8	3.8	82	82	83	83	79
BARFABTR7 NEA23	novel	2.2	3.0	78	80	80	81	75
KYFA1704	free	3.0	3.3	78	77	77	75	73
BARFA6BR-179	free	2.5	3.3	81	82	79	77	73
Mean		3.1	3.0	84	85	86	86	85
CV,%		23.3	31.3	10	8	8	8	9
LSD,0.05		0.9	1.1	10	8	8	8	9

<sup>1</sup> 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.

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

<sup>3</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2020-30 days.

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

as a percentage of the mean of the commercial varieties entered in each specific trial. In other words, the mean value for each trial is set at 100 percent. Varieties with percentages over 100 persisted better than average, and varieties with percentages less than 100 persisted less well than average. Direct, statistical comparisons of varieties cannot be made using the summary Tables 17, 18, and 19, but these 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 very well in wet years or on particular soil types. These details may influence variety choice, and more information can be found in the yearly reports. See the footnotes in Tables 17, 18, and 19 to determine which yearly report should be referenced.

## 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. Overgrazing tall fescue or orchardgrass is not recommended.

Although several varieties expressed tolerance to the level of grazing pressure used in these trials, overgrazing greatly reduces yield, persistence and therefore profitability of these varieties. This information should be an indication of those varieties that will better withstand 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.

For further information about grazing management, refer to the College of Agriculture publications, available at the local Extension office or in the publications section of the UK Forage Extension website at [www.forages.ca.uky.edu](http://www.forages.ca.uky.edu).

- Rotational Grazing (ID-143)
- Tall Fescue (AGR-59)
- Fescue Toxicosis (ID-221)
- Producers Guide to Pasture-Based Finishing (ID-224)
- Broadleaf Weeds of Kentucky Pastures (AGR-207)

## About the Authors

G.L. Olson is a research specialist, S.R. Smith and J.C. Henning are Extension professors and forage specialists, C.D. Teutsch is an Extension associate professor and forage specialist, and T.D. Phillips is an associate professor of tall fescue and grass breeding.

**Table 5. Seedling vigor, grazing preference, and stand persistence of tall fescue and meadow fescue (MF) varieties sown September 5, 2019, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Endophyte Status <sup>1</sup>	Seedling Vigor <sup>2</sup> Oct 25, 2019	Grazing Preference <sup>3</sup> Apr 22, 2020	Percent Stand		
				2019 Oct 25	2020 Mar 19	2020 Oct 13
<b>Commercial Varieties-Available for Farm Use</b>						
BARFASTF43	free	3.7	5.7	100	100	100*
BARFPHDR (MF)	free	3.9	5.8	100	100	100*
BarOptima PLUS E34	novel	3.7	4.5	100	100	100*
Cajun II	free	3.6	3.8	100	100	100*
Estancia Arkshield	novel	3.6	4.8	100	100	100*
Jesup MaxQII	novel	2.8	4.5	100	100	100*
KY31+	toxic	3.8	4.3	100	100	100*
Lacefield MaxQII	novel	3.6	4.5	100	100	100*
Ranchero	free	3.8	4.0	100	100	100*
SS0705TFSL	free	3.4	4.5	100	100	100*
Texoma MaxQII	novel	3.5	4.8	100	100	100*
Armory	free	3.2	5.2	99	100	99*
Pradel (MF)	free	4.5	5.2	100	100	99*
<b>Experimental Varieties</b>						
BARFA9125	free	2.8	5.3	100	100	100*
KY31-	free	4.0	4.7	100	100	100*
KYFA9611	free	3.6	5.7	100	100	100*
KYFP1301 (MF)	free	4.3	5.2	100	100	100*
SETFN97	free	2.8	4.5	100	100	100*
GA95101T	free	3.7	4.5	99	100	99*
GA29	free	1.3	5.2	67	94	93
Mean		3.5	4.8	98	100	100
CV,%		17.6	15.8	4	1	1
LSD,0.05		0.7	0.9	5	1	1

<sup>1</sup> 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.

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

<sup>3</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2020-8 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 September 8, 2016, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 5, 2016	Grazing Preference <sup>2</sup>				Percent Stand								
		2017 Apr 26	2018 Jun 2	2020 May 18	2020 May 14	2016 Oct 5	2017 Mar 15	2017 Oct 11	2018 Mar 16	2018 Oct 31	2019 Mar 28	2019 Nov 5	2020 Mar 19	2020 Oct 13
<b>Commercial Varieties-Available for Farm Use</b>														
Devour	3.4	4.8	8.3	6.3	4.5	100	100	100	100	92	92	85	71	65*
Persist	4.1	3.2	6.8	1.2	2.7	100	100	100	100	82	83	74	57	59*
SS0707OGDT	4.8	3.0	7.3	2.3	3.8	100	100	100	100	76	77	69	55	53*
Prairie	4.1	2.8	6.5	2.0	4.3	100	100	100	100	78	78	72	55	48
Prodigy	4.2	3.5	7.3	2.7	4.0	100	100	100	100	72	74	67	57	42
Potomac	4.2	2.8	7.0	1.7	4.8	100	100	100	100	76	78	70	58	37
Elise	3.4	5.3	7.8	6.3	5.3	100	100	100	100	60	59	50	43	28
Harvestar	3.7	4.3	8.3	6.7	6.2	100	100	100	100	63	64	55	40	27
<b>Experimental Varieties</b>														
KYDG1001	4.3	4.2	7.2	3.3	4.7	100	100	100	100	77	77	62	38	30
KYDG1002	4.4	4.2	8.2	3.5	4.5	100	100	100	100	68	67	50	28	22
Mean	4.1	3.8	7.5	3.6	4.5	100	100	100	100	74	75	65	50	41
CV,%	12.4	22.1	14.3	26.5	34.8	0	0	0	0	16	15	18	23	29
LSD,0.05	0.6	1.0	1.2	1.1	1.8	0	0	0	0	14	13	18	13	14

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

<sup>2</sup> 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, 2020-30 days.

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

**Table 7. 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 <sup>1</sup> Oct 12, 2017	Grazing Preference <sup>2</sup>		Percent Stand						
		2018	2020	2017	2018		2019		2020	
		May 18	May 14	Oct 12	Mar 14	Oct 16	Mar 28	Nov 5	Mar 19	Oct 27
<b>Commercial Varieties-Available for Farm Use</b>										
Prodigy	4.3	2.5	2.8	100	100	95	91	67	49	41*
Persist	3.7	2.0	2.2	98	98	94	88	70	54	40*
Potomac	3.7	2.7	2.5	98	99	96	95	73	63	37*
SS0708OGDT	4.4	2.2	2.3	99	99	96	93	70	50	35*
Prairie	3.4	3.2	2.8	97	99	93	87	64	45	28*
<b>Experimental Varieties</b>										
SOG-1614	2.6	7.3	2.8	92	93	91	85	58	32	25
Mean	3.7	3.3	2.6	97	98	94	90	67	49	34
CV,%	15.8	22.7	22.7	2	2	4	6	19	27	33
LSD,0.05	0.7	0.9	0.7	2	2	4	6	15	16	13

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

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2018-18 days, 2020-30 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 5, 2018, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Sep 28, 2018	Grazing Preference <sup>2</sup> May 14, 2020	Percent Stand				
			2018	2019		2020	
			Sep 28	Mar 28	Nov 5	Mar 19	Oct 27
<b>Commercial Varieties-Available for Farm Use</b>							
Prairie	4.7	2.3	95	96	95	95	89*
Persist	4.3	2.2	96	96	96	96	89*
SS0708OGDT	4.7	2.3	97	97	96	96	82*
Prodigy	4.4	2.5	94	94	92	84	64
Swante	1.8	2.8	73	79	68	43	33
<b>Experimental Varieties</b>							
DgLF48	3.7	2.5	92	92	91	91	83*
18-DgLF92	3.3	3.2	93	92	90	87	61
18-DgLF93	2.8	2.5	88	85	86	83	58
Mean	3.8	2.5	92	92	90	86	71
CV,%	16.5	21.8	8	7	6	11	23
LSD,0.05	0.8	0.6	9	8	6	12	20

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

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed.

Grazing time before rating; 2020-30 days.

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

**Table 9. Seedling vigor, grazing preference, and stand persistence of orchardgrass varieties sown September 5, 2019, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 25, 2019	Grazing Preference <sup>2</sup> Apr 22, 2020	Percent Stand		
			2019	2020	
			Oct 25	Mar 19	Oct 13
<b>Commercial Varieties-Available for Farm Use</b>					
Persist	4.2	3.0	100	100	99*
Prairie	3.9	3.5	99	99	99*
SS0708OGDT	4.3	3.0	100	100	99*
Prodigy	4.2	3.3	99	100	98*
BAR DGL HLR	3.6	4.7	98	99	93
<b>Experimental Varieties</b>					
SEOGP2	3.8	3.8	99	100	98*
Mean	4.0	3.6	99	100	98
CV,%	16.1	22.1	1	1	2
LSD,0.05	0.8	0.9	2	1	3

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

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2020-8 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 and festulolium (FL) varieties sown September 8, 2016, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 5, 2016	Grazing Preference <sup>2</sup>					Percent Stand								
		2017		2018	2019	2020	2016	2017		2018		2019		2020	
		Apr 26	Jun 2	May 18	May 20	May 14	Oct 5	Mar 15	Oct 11	Mar 16	Oct 16	Mar 28	Oct 25	Mar 19	Oct 13
<b>Commercial Varieties-Available for Farm Use</b>															
Remington	4.2	2.8	4.3	5.5	5.3	7.0	100	100	100	100	100	100	93	83	83*
PayDay	3.9	4.0	4.8	5.7	3.8	6.7	100	100	100	100	98	96	76	67	50
Calibra	4.8	4.0	5.2	4.8	3.3	6.5	100	100	100	100	97	96	74	66	48
Melpetra	3.0	5.0	6.3	6.7	5.3	6.8	100	100	100	98	97	96	73	57	44
Linn (certified)	4.1	2.5	2.0	3.2	1.0	4.3	100	100	100	100	75	79	66	60	43
SpringGreen (FL)	3.7	3.3	3.8	5.2	3.2	6.2	100	100	100	100	88	88	61	56	43
Duo (FL)	4.9	4.5	5.2	4.5	3.0	6.2	100	100	88	87	75	75	46	43	32
<b>Experimental Varieties</b>															
BARLP16238	4.0	2.8	3.7	4.5	1.8	5.5	100	100	99	98	95	95	87	85	86*
BARLP15COW	4.4	2.3	2.8	4.5	2.5	6.2	100	100	100	98	97	96	87	82	83*
BARLP16237	3.6	3.3	5.0	6.2	5.5	7.2	100	100	100	100	100	100	93	90	81*
BARLP15261	4.0	3.5	5.0	6.2	5.3	7.5	100	100	100	100	100	99	89	77	74*
KYFL1301 (FL)	4.3	4.0	4.7	4.8	3.7	6.0	100	100	99	100	96	96	73	68	45
Mean	4.1	3.5	4.4	5.1	3.7	6.3	100	100	99	98	93	93	76	69	59
CV,%	11.1	24.6	30.4	13.7	15.7	10.6	0	0	2	2	9	8	15	19	21
LSD,0.05	0.5	1.0	1.5	0.8	0.7	0.8	0	0	2	2	10	9	13	15	15

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

<sup>2</sup> 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, 2019-30days, 2020-30 days.

\*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 varieties sown September 9, 2017, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 12, 2017	Grazing Preference <sup>2</sup>			Percent Stand							
		2018	2019	2020	2017	2018		2019		2020		
		May 18	May 20	May 14	Oct 12	Mar 14	Oct 16	Mar 28	Oct 18	Mar 19	Oct 13	
<b>Commercial Varieties-Available for Farm Use</b>												
Remington	4.2	4.2	2.0	4.0	99	99	98	97	95	95	88*	
Victorian	4.8	3.2	2.0	2.0	100	84	88	91	85	88	79*	
PayDay	3.6	3.8	3.3	3.2	98	99	96	94	76	78	67	
Linn (certified)	4.6	2.3	2.8	2.8	100	100	85	76	56	56	50	
TetraGain	3.4	3.3	2.8	3.2	97	98	70	69	50	53	48	
<b>Experimental Varieties</b>												
BARLP17237	3.3	4.5	2.2	3.5	97	98	99	98	96	94	88*	
BARLM16238	4.6	3.3	2.2	3.0	100	100	90	88	68	70	76*	
BARLP17253	4.1	3.3	3.2	3.3	99	100	92	94	58	64	69	
Mean	4.1	3.5	2.6	3.1	99	97	90	88	73	75	71	
CV,%	10.4	20.7	55.0	16.4	1	6	12	11	20	19	16	
LSD,0.05	0.5	0.9	1.8	0.6	1	6	12	12	17	16	13	

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

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2018-18 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 12. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass varieties sown September 5, 2018, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Sep 28, 2018	Grazing Preference <sup>2</sup>		Percent Stand				
		2019	2020	2018	2019		2020	
		May 20	May 14	Sep 28	Mar 28	Oct 18	Mar 19	Oct 13
<b>Commercial Varieties-Available for Farm Use</b>								
Remington	4.8	3.7	3.3	100	100	100	100	99*
Remington PLUS NEA2 <sup>3</sup>	4.4	3.7	3.5	98	98	99	97	98*
PayDay	4.3	3.2	2.8	100	99	98	98	95*
TetraSweet	4.8	3.0	3.0	100	99	97	97	95*
Calibra	4.4	3.0	3.2	100	100	97	97	94
Linn (certified)	4.4	1.0	2.3	100	95	93	93	88
TetraMag	4.8	3.3	3.0	100	100	91	92	86
<b>Experimental Varieties</b>								
BARLPF253	4.0	2.5	3.2	100	99	97	96	96*
Mean	4.5	2.9	3.0	100	98	96	96	94
CV,%	10.3	18.9	18.8	1	2	3	3	4
LSD,0.05	0.5	0.6	0.7	1	2	3	3	4

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

<sup>2</sup> 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.

<sup>3</sup> 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 13. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass varieties sown September 5, 2019, in a cattle grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 25, 2019	Grazing Preference <sup>2</sup> Apr 22, 2020	Percent Stand		
			2019	2020	
			Oct 25	Mar 19	Oct 13
<b>Commercial Varieties-Available for Farm Use</b>					
PayDay	4.6	3.8	100	100	100*
Remington	4.5	4.8	100	100	100*
Remington PLUS NEA2 <sup>3</sup>	4.0	5.0	100	100	100*
TetraSweet	4.3	4.0	100	100	100*
Linn (certified)	4.6	2.2	100	100	100*
TetraMag	4.8	3.5	100	100	99
Mean	4.4	3.9	100	100	100
CV,%	8.3	16.6	0	0	1
LSD,0.05	0.4	0.8	0	0	1

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

<sup>2</sup> Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2020-8 days.

<sup>3</sup> 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 14. Proprietors of tall fescue varieties in current grazing trials in Lexington, Kentucky.**

Variety	Endophyte Status <sup>1</sup>	Proprietor/ KY distributor
<b>Commercial Varieties-Available for Farm Use</b>		
Armory	free	Barenbrug USA
BARFASTF43	free	Barenbrug USA
BarOptima PLUS E34	novel	Barenbrug USA
Bronson	free	Ampac Seed
Bull	free	Caudill Seed
Cajun II	free	Smith Seed Services
Estancia Arkshield	novel	Mountain View Seeds
Goliath	free	Ampac Seed
Jesup MaxQ	novel	Pennington Seed
Jesup MaxQII	novel	Pennington Seed
KY 31+	toxic	KY Agric. Exp. Station
Lacefield MaxQ II	novel	Pennington Seed
Ranchero	free	Smith Seed Services
SS-0705TFSL	free	Southern States
Texoma MaxQII	novel	Pennington Seed
<b>Experimental Varieties<sup>2</sup></b>		
BARFA6BTR179	free	Barenbrug USA
BAREA9125	free	Barenbrug USA
BARFABTR7NEA23	novel	Barenbrug USA
BARFAF131	free	Barenbrug USA
BARFAF135	free	Barenbrug USA
BARFAF137	free	Barenbrug USA
GA29	free	Univ. of GA
GA95101T	free	Univ. of GA
KY 31-	free	KY Agric. Exp. Station
KYFA1201	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
KYFA1704	free	KY Agric. Exp. Station
KYFA9304	free	KY Agric. Exp. Station
KYFA9611	free	KY Agric. Exp. Station
KYFA9732/AR584	novel	KY Agric. Exp. Station
KYFA9821/AR584	novel	KY Agric. Exp. Station
RADMRF20	free	Radix Research
SETFN97	free	Smith Seed Services
7FAC82	free	Barenbrug USA
7016	free	KY Agric. Exp. Station

<sup>1</sup> 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.

<sup>2</sup> Experimental varieties are not available commercially, but provide an indication of the progress being made by forage breeding companies.

**Table 15. Proprietors of orchardgrass varieties in current grazing trials in Lexington, Kentucky.**

Variety	Proprietor/ KY Distributor
<b>Commercial Varieties-Available for Farm Use</b>	
BAR DGL HLR	Barenbrug USA
Devour	Mountain View Seeds
Elise	Pure Seed
Harvestar	Columbia Seeds
Persist	Smith Seed Services
Potomac	Public
Prairie	Turner Seed
Prodigy	Caudill Seed
SS-0708OGDT	Southern States
Swante	Smith Seed Services
<b>Experimental Varieties<sup>1</sup></b>	
DgLF48	Barenbrug USA
KYDG1001	KY Agric. Exp. Station
KYDG1002	KY Agric. Exp. Station
SEOGP2	Smith Seed Services
SOG-1614	Smith Seed Services
18-DgLF92	Barenbrug USA
18-DgLF93	Barenbrug USA

<sup>1</sup> Experimental varieties are not available commercially, but provide an indication of the progress being made by forage breeding companies.

**Table 16. Proprietors of perennial ryegrass and festulolium (FL) varieties in current grazing trials in Lexington, Kentucky.**

Variety	Proprietor/ KY Distributor
<b>Commercial Varieties-Available for Farm Use</b>	
Calibra	DLF Pickseed
Duo (FL)	Ampac Seed Co.
Linn (certified)	Public
Melpetra	Hood River Seed
PayDay	Mountain View Seeds
Remington	Barenbrug USA
Remington PLUS NEA2 <sup>1</sup>	Barenbrug USA
SpringGreen (FL)	Rose Agri-Seed
TetraGain	Pure Seed
TetraMag	Mountain View Seeds
TetraSweet	Mountain View Seeds
Victorian	Caudill Seed
<b>Experimental Varieties<sup>2</sup></b>	
BARLP15261	Barenbrug USA
BARLP15COW	Barenbrug USA
BARLP16237	Barenbrug USA
BARLP16238	Barenbrug USA
BARLP17237	Barenbrug USA
BARLP17253	Barenbrug USA
BARLPF253	Barenbrug USA
KYFL1301 (FL)	KY Agric.Exp. Station

<sup>1</sup> Remington PLUS NEA2 contains a non-toxic (novel) endophyte.

<sup>2</sup> Experimental varieties are not available commercially, but provide an indication of the progress being made by forage breeding companies.





**Table 18. Summary of 2000-2020 Kentucky orchardgrass grazing tolerance trials in Lexington (stand persistence shown as a percent of the mean of the commercial varieties in the trial).**

Variety	Proprietor	2000 <sup>1,2</sup>		2001	2002	2003	2004	2005 <sup>3</sup>	2007	2009	2010	2011	2012	2013	2014	2015	2016	2017	Mean <sup>4</sup>
		4yr <sup>5</sup>	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	4yr	3yr	(#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															118(3)
Benchmark Plus	Southern States		120	120			152	135	106	106	108	115	146	154					121(7)
Boone	Public	102																	
Command	Seed Research of OR						81												
Crown Royale	Donley Seed		100																
Crown Royale Plus	Donley Seed			124															
Devour	Mountain View Seeds																		
Elise	Pure Seed											97					145		80(2)
Hallmark	James VanLeeuwen		115		113												62		114(2)
Harvestar	Columbia Seeds								75		89	94		34		60			70(5)
Haymate	Southern States	53	115	100	118														97(4)
Intensiv	Barenbrug USA			51															
Mammoth	DLF-Jenks		115																
Megabite	Turf Seed		77																
Niva	DLF-Jenks			76															
Persist	Smith Seed																		
Potomac (certified)	Public			116			119		138	107	100	96	115	102	123	104	131	110	109(9)
Prairie	Turner Seed	127	121									94		131	90	97	107	77	102(7)
Prodigy	Caudill Seed													109	119	94			109(3)
Profile	Scott Seed		116																
Profit	Ampac Seed									95	99	102	94	95	90	82			94(6)
Tekapo	Ampac Seed	55	74	118			50	103	95	105	106	80	66	63	77				87(10)
Takena	Smith Seed	99																	
Seco	Southern States							85											
SS0708OGDT	Southern States													128	131	118	97		119(4)

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 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 2000-2020 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).**

Variety	Type	Proprietor	2000 <sup>1,2</sup> 4yr <sup>4</sup>	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 <sup>3</sup> (#trials)
AGRLP103	–	AgResearch USA	128		86											107(2)
Albion	tetraploid	Grassland Oregon											120			–
Aries	diploid	Ampac Seed		139												–
Barfest (FL)	MF <sup>6</sup> x PR <sup>6</sup>	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 <sup>6</sup>	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 <sup>6</sup>	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 <sup>5</sup>	tetraploid	Barenbrug USA										145	171			158(3)
Spring Green (FL)	MF x PR <sup>6</sup>	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)

<sup>1</sup> Year trial was established.

<sup>2</sup> 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>.

<sup>3</sup> Mean only presented when respective variety was included in two or more trials.

<sup>4</sup> Number of years of data

<sup>5</sup> Remington PLUS NEA2 contains a non-toxic (novel) endophyte.

<sup>6</sup> MF = meadow fescue, PR = perennial ryegrass, IR = Italian ryegrass.



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