



# 2021 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 (<https://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 pasture 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 2017, 2018, 2019, and 2020. 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 2018, 2019, 2020, and 2021.

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

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

<sup>2</sup> 2021 data is for ten months through October.

**Table 2. 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	2021	2017	2018		2019		2020		2021	
			May 18	May 14	Apr 26	Oct 12	Mar 14	Oct 16	Mar 28	Oct 18	Mar 19	Oct 13	Mar 29	Oct 7
<b>Commercial Varieties-Available for Farm Use</b>														
Jesup MaxQ	novel	3.8	1.0	2.0	1.0	99	99	99	99	99	99	99	99	99*
KY31+	toxic	4.1	1.0	3.3	1.0	100	100	100	99	99	99	99	99	99*
SS0705TFSL	free	4.3	1.0	2.7	1.0	100	100	99	99	99	98	98	98	98*
Cajun II	free	3.5	1.0	2.0	1.0	99	99	98	98	98	98	98	98	98*
Lacefield MaxQII	novel	4.2	1.0	2.8	1.0	100	100	99	98	98	98	98	98	98*
Bull	free	3.3	1.0	1.0	1.0	98	99	99	97	97	97	97	97	97*
Ranchero	free	2.7	1.0	2.5	1.0	96	97	97	97	97	97	97	97	97*
BarOptima PLUS E34	novel	4.1	1.2	3.3	1.0	100	100	98	97	96	95	95	95	95
<b>Experimental Varieties</b>														
KY31-	free	4.1	1.0	2.7	1.0	99	99	99	99	98	98	98	98	98*
KYFA1305	free	3.9	1.2	3.3	1.0	99	100	99	99	99	99	99	99	98*
KYFA1306	free	4.1	1.0	2.5	1.0	99	99	99	98	98	98	98	98	98*
KYFA1404	free	3.2	1.0	2.5	1.0	98	98	98	98	98	98	98	98	98*
KYFA1405	free	3.0	1.0	3.0	1.0	97	97	98	98	98	98	98	98	98*
KYFA1304	free	3.7	1.0	2.5	1.0	98	99	99	98	98	98	98	96	96*
KYFA9304	free	4.6	1.0	3.2	1.0	100	100	99	98	98	98	98	95	95
BARFA6BTR179	novel	3.6	2.2	3.3	1.0	100	100	93	93	93	91	91	91	91
Mean		3.8	1.1	2.7	1.0	99	99	98	98	98	97	97	97	97
CV,%		18.0	21.5	25.5	0.0	1	1	2	2	2	2	2	3	3
LSD,0.05		0.8	0.3	0.8	0.0	1	2	2	2	2	2	2	3	3

<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, 2021-14 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 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>		Percent Stand						
			2020	2021	2018	2019		2020		2021	
			May 14	Apr 26	Sep 28	Mar 28	Oct 18	Mar 19	Oct 13	Mar 29	Oct 7
<b>Commercial Varieties-Available for Farm Use</b>											
Lacefield MaxQII	novel	3.8	2.3	1.0	88	91	91	91	91	92	92*
KY31+	toxic	2.8	3.5	1.0	90	93	93	93	93	92	92*
Jesup MaxQ	novel	2.8	2.2	1.0	81	87	89	90	90	90	91*
SS0705TFSL	free	3.8	3.0	1.0	89	90	90	90	90	88	89*
Cajun II	free	3.4	2.5	1.0	83	87	86	89	88	88	88*
Bull	free	3.3	2.2	1.0	81	85	86	87	87	87	87*
BarOptima PLUS E34	novel	3.3	3.0	1.0	83	84	84	84	84	83	84*
<b>Experimental Varieties</b>											
KYFA9304	free	3.3	2.8	1.0	90	89	90	91	91	91	91*
RADMR20	free	3.4	3.3	1.0	90	89	91	91	91	91	90*
KY31-	free	3.5	2.7	1.0	88	87	88	89	89	89	88*
7016	free	3.7	3.3	1.0	87	87	88	88	88	88	87*
BARFAF137	free	3.1	4.0	1.0	82	85	88	86	86	86	86*
KYFA9611	free	2.9	3.3	1.0	84	85	86	87	87	86	86*
KYFA9821/AR584	novel	3.0	2.5	1.0	82	83	83	83	83	85	85*
BARFAF131	free	2.0	2.7	1.0	70	79	79	79	79	80	78
7FAC82	free	3.6	2.8	1.0	88	89	88	88	88	76	76
BARFABTR7NEA23	novel	2.2	3.0	1.0	78	80	80	81	75	77	75
KYFA1704	free	3.0	3.3	1.0	78	77	77	75	73	73	75
BARFA6BR-179	novel	2.5	3.3	1.0	81	82	79	77	73	74	74
BARFAF135	free	2.8	3.8	1.0	82	82	83	83	79	69	71
Mean		3.1	3.0	1.0	84	85	86	86	85	84	84
CV,%		23.3	31.3	0.0	10	8	8	8	9	11	11
LSD,0.05		0.9	1.1	0.0	10	8	8	8	9	11	11

<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, 2021-14 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 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>		Percent Stand				
			2020	2021	2019	2020		2021	
			Apr 22	Apr 26	Oct 25	Mar 19	Oct 13	Mar 29	Oct 7
<b>Commercial Varieties-Available for Farm Use</b>									
BarOptima PLUS E34	novel	3.7	4.5	1.5	100	100	100	100	100*
Estancia Arkshield	novel	3.6	4.8	1.7	100	100	100	100	100*
Jesup MaxQII	novel	2.8	4.5	1.0	100	100	100	100	100*
KY31+	toxic	3.8	4.3	1.3	100	100	100	100	100*
Lacefield MaxQII	novel	3.6	4.5	1.2	100	100	100	100	100*
SS0705TFSL	free	3.4	4.5	1.5	100	100	100	100	100*
STF43	free	3.7	5.7	2.5	100	100	100	100	100*
Cajun II	free	3.6	3.8	1.0	100	100	100	100	100*
Armory	free	3.2	5.2	1.2	99	100	99	99	99*
Ranchero	free	3.8	4.0	1.2	100	100	100	100	98*
Texoma MaxQII	novel	3.5	4.8	1.2	100	100	100	100	95*
Pradel (MF)	free	4.5	5.2	6.3	100	100	99	98	68
BARFPHDR (MF)	free	3.9	5.8	6.5	100	100	100	100	60
<b>Experimental Varieties</b>									
KY31-	free	4.0	4.7	1.3	100	100	100	100	100*
SETFN97	free	2.8	4.5	1.0	100	100	100	100	100*
KYFA9611	free	3.6	5.7	3.5	100	100	100	100	98*
GA95101T	free	3.7	4.5	1.5	99	100	99	99	98*
GA29	free	1.3	5.2	1.0	67	94	93	93	94*
BARFA9125	free	2.8	5.3	2.3	100	100	100	100	87
KYFP1301 (MF)	free	4.3	5.2	6.5	100	100	100	100	63
Mean		3.5	4.8	2.3	98	100	100	100	93
CV,%		17.6	15.8	36.2	4	1	1	1	8
LSD,0.05		0.7	0.9	0.9	5	1	1	2	8

<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, 2021-14 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. 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.

### How to Interpret the Summary Tables

Tables 17, 18, and 19 are summaries of stand persistence data from 2000 to 2021 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 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 publica-

**Table 5. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown September 8, 2020, in a cattle-grazing tolerance study at Lexington, Kentucky.**

Variety	Endophyte Status <sup>1</sup>	Seedling Vigor <sup>2</sup> Oct 2, 2020	Grazing Preference <sup>3</sup> Apr 26, 2021	Percent Stand		
				2020	2021	
				Oct 2	Mar 29	Oct 7
<b>Commercial Varieties-Available for Farm Use</b>						
Armory	free	4.3	2.7	100	100	100*
BarOptima PLUS E34	novel	4.6	2.7	100	100	100*
Cajun II	free	4.6	2.2	100	100	100*
Estancia Arkshield	novel	4.1	2.7	100	100	100*
Evergraze	free	4.5	3.0	100	100	100*
Goliath	free	4.6	2.5	100	100	100*
Jesup MaxQ	novel	4.7	2.2	100	100	100*
KY31+	toxic	4.5	3.0	100	100	100*
Lacefield MaxQII	novel	4.3	2.7	100	100	100*
Ranchero	free	4.5	2.2	100	100	100*
SS0705TFSL	free	4.8	3.0	100	100	100*
STF43	free	4.3	3.0	100	100	100*
<b>Experimental Varieties</b>						
BAR 9301BTR1	novel	4.5	3.0	100	100	100*
BAR BTR7 NEA21	novel	3.5	2.3	100	100	100*
BAR BTR7 NEA23	novel	4.2	2.8	100	100	100*
BAR FA6 BTR 179	novel	4.2	2.5	100	100	100*
BAR FAF135	free	4.6	3.2	100	100	100*
BAR FAF137	free	4.8	3.0	100	100	100*
KY31-	free	4.8	3.0	100	100	100*
KYFA9611	free	4.2	3.3	100	100	100*
RAD-ERFH82	free	3.9	3.2	100	100	100*
SETFN97	free	4.3	2.7	100	100	100*
Mean		4.4	2.8	100	100	100
CV,%		8.0	14.6	0	0	0
LSD,0.05		0.4	0.5	0	0	0

<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; 2021-14 days.

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

tions 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)
- Weed Management in Grass Pastures, Hayfields and Other Farmstead Sites (AGR-172)

**Table 6. 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	2021	2017	2018		2019		2020		2021	
		May 18	May 14	Apr 26	Oct 12	Mar 14	Oct 16	Mar 28	Nov 5	Mar 19	Oct 27	Mar 29	Oct 22
<b>Commercial Varieties-Available for Farm Use</b>													
Persist	3.7	2.0	2.2	3.0	98	98	94	88	70	54	40	38	35*
Potomac	3.7	2.7	2.5	4.0	98	99	96	95	73	63	37	38	33*
Prodigy	4.3	2.5	2.8	3.8	100	100	95	91	67	49	41	33	33*
SS0708OGDT	4.4	2.2	2.3	3.8	99	99	96	93	70	50	35	37	32*
Prairie	3.4	3.2	2.8	3.7	97	99	93	87	64	45	28	25	18
<b>Experimental Varieties</b>													
SOG-1614	2.6	7.3	2.8	3.8	92	93	91	85	58	32	25	20	23
Mean	3.7	3.3	2.6	3.7	97	98	94	90	67	49	34	32	29
CV,%	15.8	22.7	22.7	27.3	2	2	4	6	19	27	33	31	31
LSD,0.05	0.7	0.9	0.7	1.2	2	2	4	6	15	16	13	12	11

<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, 2021-14days.

\*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, 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						
		2020	2021	2018	2019		2020		2021	
		May 14	Apr 26	Sep 28	Mar 28	Nov 5	Mar 19	Oct 27	Mar 29	Oct 22
<b>Commercial Varieties-Available for Farm Use</b>										
Persist	4.3	2.2	4.2	96	96	96	96	89	84	78*
Prairie	4.7	2.3	4.0	95	96	95	95	89	84	65*
SS0708OGDT	4.7	2.3	3.8	97	97	96	96	82	69	61
Prodigy	4.4	2.5	4.0	94	94	92	84	64	58	52
Swante	1.8	2.8	5.2	73	79	68	43	33	28	28
<b>Experimental Varieties</b>										
DgLF48	3.7	2.5	3.8	92	92	91	91	83	78	68*
18-DgLF93	2.8	2.5	4.3	88	85	86	83	58	48	44
18-DgLF92	3.3	3.2	4.3	93	92	90	87	61	52	38
Mean	3.8	2.5	4.2	92	97	90	86	71	64	55
CV,%	16.5	21.8	27.6	8	7	6	11	23	28	24
LSD,0.05	0.8	0.6	1.4	9	8	6	12	20	22	16

<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, 2021-14days.

\*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, 2019, in a cattle-grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 25, 2019	Grazing Preference <sup>2</sup>		Percent Stand				
		2020	2021	2019	2020		2021	
		Apr 22	Apr 26	Oct 25	Mar 19	Oct 13	Mar 29	Oct 22
<b>Commercial Varieties-Available for Farm Use</b>								
SS0708OGDT	4.3	3.0	3.7	100	100	99	99	83*
Persist	4.2	3.0	3.3	100	100	99	99	82*
BARDGLHLR	3.6	4.7	4.8	98	99	93	91	80*
Prodigy	4.2	3.3	3.2	99	100	98	98	78*
Prairie	3.9	3.5	3.8	99	99	99	98	76
<b>Experimental Varieties</b>								
SEOGP2	3.8	3.8	3.7	99	100	98	97	82*
Mean	4.0	3.6	3.8	99	100	98	97	80
CV,%	16.1	22.1	26.3	1	1	2	3	7
LSD,0.05	0.8	0.9	1.2	2	1	3	4	6

<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, 2021-14 days.

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

## About the Authors

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**Table 9. Seedling vigor, grazing preference, and stand persistence of orchardgrass varieties sown September 8, 2020, in a cattle-grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 2, 2020	Grazing Preference <sup>2</sup> Apr 26, 2021	Percent Stand		
			2020		2021
			Oct 2	Mar 29	Oct 7
<b>Commercial Varieties-Available for Farm Use</b>					
Devour	4.2	5.0	100	100	100*
HLR	4.2	4.5	100	100	100*
Intensiv	4.4	4.3	100	100	100*
Prairie	4.3	4.5	100	100	100*
Profit	3.8	4.7	100	100	100*
Persist	4.1	4.5	100	100	100*
Swante	4.3	5.2	100	100	100*
<b>Experimental Varieties</b>					
BARDGLF94	4.0	5.2	100	100	100*
SEOGP2	4.3	4.7	100	100	100*
BARDGLF95	3.3	5.0	100	100	99
Mean	4.1	4.8	100	100	100
CV,%	9.1	9.3	0	0	1
LSD,0.05	0.4	0.5	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; 2021-14 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, 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	2021	2017	2018		2019		2020		2021	
		May 18	May 20	May 14	Apr 26	Oct 12	Mar 14	Oct 16	Mar 28	Oct 18	Mar 19	Oct 13	Mar 29	Oct 22
<b>Commercial Varieties-Available for Farm Use</b>														
Remington	4.4	4.0	2.0	4.0	4.0	99	99	98	97	95	95	88	93	91*
Victorian	4.8	3.2	2.0	2.0	3.3	100	84	88	91	85	88	79	82	80*
PayDay	3.6	3.8	3.3	3.2	5.3	98	99	96	94	76	78	67	84	73
TetraGain	3.4	3.6	2.8	3.3	4.4	97	98	74	73	56	59	54	70	66
Linn (certified)	4.6	2.3	2.8	2.8	4.0	100	100	85	76	56	56	50	60	58
<b>Experimental Varieties</b>														
BARLP17237	3.3	4.5	2.2	3.5	5.3	97	98	99	98	96	94	88	91	86*
BARLM16238	4.6	3.3	2.2	3.0	3.8	100	100	90	88	68	70	76	70	82*
BARLP17253	4.1	3.3	3.2	3.3	4.0	99	100	92	94	58	64	69	68	74
Mean	4.1	3.5	2.6	3.1	4.3	99	97	90	88	73	75	71	77	76
CV,%	10.4	20.7	55.0	16.4	27.0	1	6	12	11	21	20	18	18	18
LSD,0.05	0.5	0.9	1.8	0.6	1.4	1	6	13	12	18	17	15	16	16

<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, 2021-14 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 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	2021	2018	2019		2020		2021	
		May 20	May 14	Apr 26	Sep 28	Mar 28	Oct 18	Mar 19	Oct 13	Mar 29	Oct 22
<b>Commercial Varieties-Available for Farm Use</b>											
Remington PLUS NEA2 <sup>3</sup>	4.4	3.7	3.5	4.0	98	98	99	97	98	98	96*
Remington	4.8	3.7	3.3	4.5	100	100	100	100	99	99	96*
Calibra	4.4	3.0	3.2	4.5	100	100	97	97	94	95	91
TetraSweet	4.8	3.0	3.0	3.8	100	99	97	97	95	96	88
PayDay	4.3	3.2	2.8	5.0	100	99	98	98	95	97	87
Linn (certified)	4.4	1.0	2.3	3.0	100	95	93	93	88	89	86
TetraMag	4.8	3.3	3.0	5.5	100	100	91	92	86	88	83
<b>Experimental Varieties</b>											
BARLPF253	4.0	2.5	3.2	4.5	100	99	97	96	96	95	90
Mean	4.5	2.9	3.0	4.4	100	99	96	96	94	95	89
CV,%	10.3	18.9	18.8	16.5	1	2	3	3	4	4	5
LSD,0.05	0.5	0.6	0.7	0.8	1	2	3	3	4	4	5

<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 2021-14 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 12. 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>		Percent Stand				
		2020	2021	2019	2020		2021	
		Apr 22	Apr 26	Oct 25	Mar 19	Oct 13	Mar 29	Oct 22
<b>Commercial Varieties-Available for Farm Use</b>								
Remington	4.5	4.8	2.7	100	100	100	100	97*
Remington PLUS NEA2 <sup>3</sup>	4.0	5.0	2.7	100	100	100	100	97*
Linn	4.6	2.2	1.5	100	100	100	100	96*
TetraSweet	4.3	4.0	3.2	100	100	100	100	94*
PayDay	4.6	3.8	3.8	100	100	100	100	93*
TetraMag	4.8	3.5	4.5	100	100	99	99	89
Mean	4.4	3.9	3.1	100	100	100	100	94
CV,%	8.3	16.6	28.4	0	0	1	1	3
LSD,0.05	0.4	0.8	1.0	0	0	1	1	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; 2020-8 days 2021-14 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 8, 2020, in a cattle-grazing tolerance study at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 2, 2020	Grazing Preference <sup>2</sup> Apr 26, 2021	Percent Stand		
			2020	2021	
			Oct 2	Mar 29	Oct 7
<b>Commercial Varieties-Available for Farm Use</b>					
PayDay	4.1	4.7	100	100	100*
Remington	3.9	5.0	100	100	100*
Remington PLUS NEA2 <sup>3</sup>	4.1	5.3	100	100	100*
Power	4.3	4.7	100	100	100*
Linn	4.9	3.2	100	100	97
<b>Experimental Varieties</b>					
BARLPF237	3.9	5.2	100	100	100*
Mean	4.2	4.7	100	100	99
CV,%	9.3	10.2	0	0	1
LSD,0.05	0.5	0.6	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; 2021-14 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
BarOptima PLUS E34	novel	Barenbrug USA
Bull	free	Caudill Seed
Cajun II	free	Smith Seed Services
Estancia Arkshield	novel	Mountain View Seeds
Evergraze	free	Bailey Seed and Grain
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
STF43	free	Barenbrug USA
Texoma MaxQII	novel	Pennington Seed
<b>Experimental Varieties<sup>2</sup></b>		
BARFA6BTR179	novel	Barenbrug USA
BAREA9125	free	Barenbrug USA
BAR BTR7 NEA1	novel	Barenbrug USA
BARFABTR7NEA23	novel	Barenbrug USA
BARFAF131	free	Barenbrug USA
BARFAF135	free	Barenbrug USA
BARFAF137	free	Barenbrug USA
BAR 9301BTR1	novel	Barenbrug USA
GA29	free	Univ. of GA
GA95101T	free	Univ. of GA
KY 31-	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
KYFA9821/AR584	novel	KY Agric. Exp. Station
RAD-ERFH82	free	Radix Research
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
HLR	Barenbrug USA
Intensiv	Barenbrug USA
Persist	Smith Seed Services
Potomac	Public
Prairie	Turner Seed
Prodigy	Caudill Seed
Profit	Ampac Seed
SS-0708OGDT	Southern States
Swante	Smith Seed Services
<b>Experimental Varieties<sup>1</sup></b>	
BARDGLF94	Barenbrug USA
BARDGLF95	Barenbrug USA
DgLF48	Barenbrug USA
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 varieties in current grazing trials in Lexington, Kentucky.**

Variety	Proprietor/ KY Distributor
<b>Commercial Varieties-Available for Farm Use</b>	
Calibra	DLF Pickseed
Linn (certified)	Public
PayDay	Mountain View Seeds
Power	Ampac Seed Co.
Remington	Barenbrug USA
Remington PLUS NEA2 <sup>1</sup>	Barenbrug USA
TetraGain	Pure Seed
TetraMag	Mountain View Seeds
TetraSweet	Mountain View Seeds
Victorian	Caudill Seed
<b>Experimental Varieties<sup>2</sup></b>	
BARLP16238	Barenbrug USA
BARLP17237	Barenbrug USA
BARLP17253	Barenbrug USA
BARLPF237	Barenbrug USA
BARLPF253	Barenbrug USA

<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 17. Summary of 2001-2021 Kentucky tall fescue grazing tolerance trials in Lexington (stand persistence shown as a percent of the stand rating of KY 31+).

Variety	Endophyte Status <sup>1</sup>	Proprietor	2001 <sup>2,3</sup> 4yr <sup>5</sup>	2002 4yr	2003 4yr	2004 4yr	2005 4yr	2006 4yr	2007 4yr	2008 4yr	2009 4yr	2010 4yr	2011 4yr	2012 4yr	2013 4yr	2014 4yr	2015 4yr	2016 4yr	2017 4yr	2018 3yr	Mean <sup>4</sup> (#trials)
Advance MaxQ	novel	Pennington Seed						94													
Baguala	free	Allied Seed						47	29							99					
Bariane	free	Barenbrug USA		89			75														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(11)
Bronson	free	Ampac Seed								98	98							100			99(3)
Bull	free	Caudill Seed																			97(4)
Cajun II	free	Smith Seed Services													97	100	100	100	99	96	98(6)
Cattle Club	free	Green Seed	91																		
Carmine	free	DLF-Jenks	90											99							
Cowgirl	free	Rose Agri-Seed				99															99(2)
Dominate	free	Allied Seed														99					
Drover	free	Barenbrug USA														99					
Festival	free	Pickseed West	100	101																	
FSG 402TF	free	Farm Service Genetics															99				101(2)
Flourish	free	Allied Seed												98							
Goliath	free	Ampac Seed																100			99(2)
HyMark	free	Fraser Seeds								95											98(2)
Jesup MaxQ	novel	Pennington Seed		103	97		68	102	97	97	99	98	100	99	99	100	100	100	100	98	97(16)
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	100(18)
KY31-	free	KY Agri. Exp Sta.	98	103	98	100	83	101	100	98	99	99	100	100	100	100	100	100	99	91	98(18)
Lacefield MaxQ II	novel	Pennington Seed					82	102	99	98	98	97									
Maximize	free	Rose Agri-Seed	99																		
Nanryo	free	Japanese Grassland For.Seed							100												
Orygun	free	-		99																	
Ranchero	free	Smith Seed Services																	98		
Select	free	Southern States	101	100	100	67	100	93	95	97	97	100	100	99	99	101					97(14)
SS0705FSL	free	Southern States														100	100	100	99	97	99(5)
Stargrazer	free	Southern States	89																		88(2)
Stockman	free	Seed Res. of OR				102															
Texoma MaxQ II	novel	Pennington Seed					88	100	98												
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 2016 was grazed four years so the final report would be "2020 Cool-Season Grass Grazing Tolerance Report" archived in the UK Forage website (<https://forages.ca.uky.edu>).

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

5 Number of years of data.

**Table 18. Summary of 2000-2021 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		2018		Mean <sup>4</sup> (#trials)				
		4yr <sup>5</sup>		4yr		4yr		4yr		4yr		4yr		4yr		4yr		4yr		4yr		4yr		4yr		4yr		4yr		4yr		4yr		4yr						
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								152	135	106	106	108	115	146	154																		120(5)			
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																																						145	
Hallmark	James VanLeeuwen			115				113																														62		
Harvestar	Columbia Seeds																																					60		
Haymate	Southern States	53	115	100	118										75																							34		
Intensiv	Barenbrug USA					51																																	51	
Mammoth	DLF-Jenks			115																																				
Megabite	Turf Seed			77																																				
Niva	DLF-Jenks					76																																		
Persist	Smith Seed Services														138	107	103	100	96	115	102	123	104	131	116	137														
Potomac (certified)	Public					116				119																														
Prairie	Turner Seed			127	121																																			
Prodigy	Caudill Seed																																							
Profile	Scott Seed					116																																		
Profit	Ampac Seed																																							
Tekapo	Ampac Seed			55	74	118																																		
Takana	Smith Seed Services			99																																				
Seco	Southern States																																							
SS0708OGDT	Southern States																																							
Swante	Smith Seed Services																																							

1 Year trial was established.

2 Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in stand persistence between varieties. To find actual persistence ratings, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 2016 was grazed four years so the final report would be "2020 Cool-Season Grass Grazing Tolerance Report" archived in the UK Forage website (<https://forages.ca.uky.edu>).

3 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 2000-2021 Kentucky perennial ryegrass and festulolium (FL) grazing tolerance trials in Lexington (stand persistence shown as a percent of the mean of the commercial varieties in the trial).**

Variety	Type	Proprietor	2000 <sup>1,2</sup>		2001		2003		2007		2008		2010		2011		2012		2013		2014		2015		2016		2017		2018		Mean <sup>3</sup> (#trials)	
			4yr <sup>4</sup>	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr			
AGRLP103	-	AgResearch USA	128		86																										107(2)	
Albion	tetraploid	Grassland Oregon																					120								-	
Aries	diploid	Ampac Seed		139																											-	
Barfrest (FL)	MF 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																													101(5)	
Citadel	tetraploid	Donley Seed	107																												-	
Duo (FL)	MF x PR6	Ampac Seed	116								95	72	90	115																	89(7)	
Lasso	diploid	DLF-Jenks		130																											-	
Linn (certified)	diploid	Public	112	129	63						95	108	95	103	96																94(13)	
Maverick	tetraploid	Ampac Seed		36																											-	
Meadow Green (FL)	MF x IR <sup>6</sup>	Pure Seed													15																-	
Melpetra	tetraploid	Hood River Seed																													-	
PayDay	tetraploid	Mountain View Seeds																													96(4)	
Polly II	tetraploid	FS Growmark	36	68																											52(2)	
Power	tetraploid	Ampac Seed																													105(7)	
Quartet	tetraploid	Ampac Seed		77																												
Remington	tetraploid	Barenbrug USA																														68(2)
Remington PLUS NEA2 <sup>5</sup>	tetraploid	Barenbrug USA																														145(6)
Spring Green (FL)	MF x PR6	Rose Agri-Seed																														141(3)
TetraGain	tetraploid	Pure Seed																														105(7)
TetraMag	tetraploid	Mountain View Seeds																														101(2)
TetraSweet	tetraploid	Mountain View Seeds																														-
Victorian	diploid	Caudill Seed																														112(2)

1 Year trial was established.

2 Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in stand persistence between varieties. To find actual persistence ratings, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 2016 was grazed four years so the final report would be "2020 Cool-Season Grass Grazing Tolerance Report" archived in the UK Forage website (<https://forages.ca.uky.edu>).

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

4 Number of years of data.

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

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



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