



# 2021 Annual and Perennial Ryegrass and Festulolium Report

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## Introduction

Annual ryegrass (*Lolium multiflorum*) and perennial ryegrass (*Lolium perenne*) are high quality, productive, cool-season grasses used in Kentucky. Both have exceptionally high seedling vigor and are highly palatable to livestock. In Kentucky, winter survival can be an issue for many annual ryegrass varieties, so before planting, review winter survival results in this publication. The winter of 2017-2018 provided a good test for winter survival (Table 3).

Annual ryegrasses are increasing in use across Kentucky as more winter-hardy varieties are released and promoted. Annual ryegrass is productive for three to five months and is used primarily for late fall and early to late spring pasture. Winter growth occurs only during mild winters in Kentucky. This crop has garnered increased interest for high-quality baleage. There are two main types of annual ryegrasses [Italian and Westerwolds (the most commonly used annual ryegrass in Kentucky)]. The Westerwolds type is a true annual in that stands seeded in the spring produce seedheads that summer and little regrowth occurs after seedheads are produced. Westerwolds ryegrass varieties are commonly used in the lower South (Florida to Texas) because they can be seeded in the fall and will survive the winter. Many varieties also survive Kentucky winters. Italian ryegrass is native to Southern Europe and is not a true annual. Italian ryegrasses provide high yields of quality forage and show quick regrowth. If planted in the spring, no or few seedheads will grow that summer (vernalization is required). Spring planting of Italian ryegrass is common in northern states (e.g., Wisconsin, Minnesota, etc.) for summer grazing, but most varieties do not dependably survive Kentucky summers. Italian ryegrasses are almost always planted late summer to early fall in Kentucky and typically provide forage production into early summer, often one to two months later than Westerwolds types. Both diploid (two sets of chromosomes) and tetraploid (four sets of chromosomes) varieties of annual ryegrass exist.

Perennial ryegrass can be used as a short-lived hay or pasture plant and has growth characteristics similar to tall fescue. It is more persistent than Italian ryegrass but less persistent than other cool-season grass species (e.g., tall fescue and orchardgrass). Perennial ryegrass usually survives two to three years in Kentucky. It tillers more profusely but is lower growing than Italian ryegrass and will not form a seedhead in the seeding

year. Both diploid (two sets of chromosomes) and tetraploid (four sets of chromosomes) varieties of perennial ryegrass exist. Tetraploids have larger tillers and seedheads and wider leaves. Tetraploid types tend to be taller and less dense than diploid types even in early stages of regrowth. Diploid types produce more tillers, have better stand persistence, and are more tolerant to heavy grazing.

Intermediate or hybrid ryegrass (*Lolium hybridum*) is the result of a cross between Italian ryegrass and perennial ryegrass. It is not as winter hardy as perennial ryegrass, but it is higher yielding. It is also more persistent and winter hardy than Italian ryegrass. Its uses are similar to those of perennial ryegrass but it typically only survives two years or fewer in Kentucky.

Both forage and turf types of annual and perennial ryegrasses are available. Turf types are low growing and have poor yield. Turf types are also infected with a fungal endophyte that lives inside the plant, protecting it from insect attack but producing a toxin that reduces performance of grazing animals. All turf types are infected. Plant only forage-type varieties for grazing, hay, or silage.

Festuloliums are hybrids between various fescues and ryegrasses with higher quality than tall fescue and improved stand survival over perennial ryegrass. Their use in Kentucky is still limited since they do not survive as long as tall fescue but some of the newer varieties are more adapted to Kentucky environmental conditions, especially those with more tall fescue in their background.

This report provides yield data on annual and perennial ryegrass varieties in trials in Kentucky as well as guidelines for selecting varieties. Tables 14, 15, and 16 show summaries of all annual and perennial ryegrass and festulolium varieties tested in Kentucky for the last 17 years. The UK Forage Extension website

Table 1. Temperature and rainfall at Lexington, Kentucky in 2019, 2020, and 2021<sup>1</sup>.

	2019				2020				2021 <sup>2</sup>			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP <sup>1</sup>	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	33	+2	4.11	+1.25	40	+9	3.72	+0.86	34	+3	4.51	+1.65
FEB	42	+7	7.64	+4.43	38	+3	5.14	+1.93	31	-4	4.60	+1.39
MAR	43	-1	3.49	-0.91	51	+7	3.79	-0.61	50	+6	5.12	+0.72
APR	54	+4	4.76	+0.88	52	-3	4.92	+1.04	54	-1	2.72	-1.16
MAY	69	+5	4.49	+0.02	62	-2	5.69	+1.22	62	-2	4.34	-0.13
JUN	73	+1	6.13	+2.47	72	0	2.56	-1.10	73	+1	6.26	+2.60
JUL	79	+3	3.30	-1.70	79	+3	3.23	-1.77	75	-1	5.90	+0.90
AUG	77	+2	2.42	-1.51	75	0	3.41	-0.52	76	+1	6.16	+2.23
SEP	77	+9	0.18	-3.02	68	0	4.43	+0.83	69	+1	3.03	-0.17
OCT	61	+4	7.55	+5.58	57	0	4.98	+2.41	62	+5	3.68	-1.11
NOV	41	-4	5.39	+2.00	49	+4	2.18	-1.21				
DEC	43	+7	5.74	+1.76	36	0	2.27	-1.71				
Total			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. Descriptive scheme for the stages of development in perennial forage grasses.**

Code	Description	Remarks
<b>Leaf development</b>		
11	First leaf unfolded	Applicable to regrowth of established (plants) and to primary growth of seedlings.
12	2 leaves unfolded	Further subdivision by means of leaf development index (see text).
13	3 leaves unfolded	
•	•••••	
19	9 or more leaves unfolded	
<b>Sheath elongation</b>		
20	No elongated sheath	Denotes first phase of new spring growth after overwintering. This character is used instead of tillering which is difficult to record in established stands.
21	1 elongated sheath	
22	2 elongated sheaths	
23	3 elongated sheaths	
•	•••••	
29	9 or more elongated sheaths	
<b>Tillering (alternative to sheath elongation)</b>		
21	Main shoot only	Applicable to primary growth of seedlings or to single tiller transplants.
22	Main shoot and 1 tiller	
23	Main shoot and 2 tillers	
24	Main shoot and 3 tillers	
•	•••••	
29	Main shoot and 9 or more tillers	
<b>Stem elongation</b>		
31	First node palpable	More precisely an accumulation of nodes. Fertile and sterile tillers distinguishable.
32	Second node palpable	
33	Third node palpable	
34	Fourth node palpable	
35	Fifth node palpable	
37	Flag leaf just visible	
39	Flag leaf ligule/collar just visible	
<b>Booting</b>		
45	Boot swollen	
<b>Inflorescence emergence</b>		
50	Upper 1 to 2 cm of inflorescence visible	
52	¼ of inflorescence emerged	
54	½ of inflorescence emerged	
56	¾ of inflorescence emerged	
58	Base of inflorescence just visible	
<b>Anthesis</b>		
60	Preanthesis	Inflorescence-bearing internode is visible. No anthers are visible.
62	Beginning of anthesis	First anthers appear.
64	Maximum anthesis	Maximum pollen shedding.
66	End of anthesis	No more pollen shedding.
<b>Seed ripening</b>		
75	Endosperm milky	Inflorescence green.
85	Endosperm soft doughy	No seeds loosening when inflorescence is hit on palm.
87	Endosperm hard doughy	Inflorescence losing chlorophyll; a few seeds loosening when inflorescence hit on palm
91	Endosperm hard	Inflorescence-bearing internode losing chlorophyll; seeds loosening in quantity when inflorescence hit on palm.
93	Endosperm hard and dry	Final stage of seed development; most seeds shed.

Source: J. Allan Smith and Virgil W. Hayes. 14th International Grasslands Conference Proc. p. 416-418. June 14-24, 1981, Lexington, Kentucky.

(<https://forages.ca.uky.edu>) contains electronic versions of all forage variety testing reports from Kentucky and surrounding states, and 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 trials, such as those presented in this publication. Choose high-yielding varieties, but choose varieties that are productive during the desired season of use.

**Seed quality.** Buy premium-quality seed that is high in germination, high in purity, and free from weed seed. Buy certified seed or proprietary seed of an improved variety. An improved variety is one that has performed well in independent trials. Other information on the label will include the test date (which must be within the previous nine months), the level of germination, and percentage of other crop and weed seed. Order seed well in advance of planting time to assure that it will be available when needed.

**Important:** When seeding perennial ryegrasses for horse or cattle pastures (of any kind), insist on an endophyte-free variety. Most forage types of perennial ryegrass are endophyte free, and most new turf types are infected. This endophyte is similar to the endophyte of tall fescue and produces alkaloids that are toxic to cattle and horses.

## Description of the Tests

Data from eight studies are reported. Annual ryegrass tests were established in the fall of 2017, 2018, and 2019 at Lexington. Perennial ryegrass tests (2018, 2019, and 2020) and festulolium tests (2019 and 2020) were established at Lexington. The soil at Lexington is a well-drained silt loam (Maury) and is well suited for ryegrass production.

Seedlings were made at the rate of 25 pounds per acre into a prepared seedbed with a disk drill. Plots were 5 feet by 20 feet in a randomized complete block design with four replications with a harvested plot area of 5 feet by 15 feet. For the perennial tests nitrogen was top-dressed at 60 pounds per acre of actual nitrogen in March, May, and August. For the annual tests nitrogen was top-dressed at 60 pounds per acre in March and 60 pounds after the first spring harvest. The tests were harvested using a sickle-type forage plot harvester. The first cutting was harvested at each location when all ryegrass varieties had reached at least the boot stage. Fresh weight samples were taken at each harvest to calculate dry matter production. Management practices for these tests regarding establishment, fertility (P, K, and lime are based on regular soil tests), weed control, and harvest timing were in accordance with University of Kentucky recommendations.

## Results and Discussion

Weather data for Lexington are presented in Table 1.

Ratings for maturity (see Table 2 for maturity scale) and dry matter yields (tons/A) are reported in tables 3 through 10. Yields are given by cutting date for 2021 and as total annual production. Stated yields are adjusted for percent weeds; therefore, the

**Table 3. Dry matter yields, winter injury, plant height, maturity, and stand persistence of annual ryegrass varieties sown September 8, 2017, at Lexington, Kentucky (see Table 11 and Table 14 for designation of Italian or Westerwolds type and diploid or tetraploid type varieties).**

Variety	Winter Injury <sup>1</sup> Jan 29	Plant Height (in) May 1	Maturity <sup>2</sup>		Percent Stand			Yield (tons/acre)			
			2018		2017	2018		2018			
			May 1	May 22	Oct 31	Mar 14	May 4	May 1	May 22	Jun 14	Total
<b>Commercial Varieties-Available for Farm Use</b>											
Centurion	3.3	20.0	32.0	54.5	96	89	91	1.72	1.06	0.22	3.00*
Winterhawk	5.5	17.0	31.8	57.0	93	79	84	1.64	1.10	0.15	2.89*
Bruiser	4.8	19.0	32.0	57.5	99	94	95	1.57	1.20	0.12	2.89*
Jackson	4.5	16.5	31.5	57.0	97	94	93	1.33	1.16	0.21	2.70*
Marshall	2.5	17.3	31.8	56.5	95	87	91	1.49	0.97	0.10	2.56*
TetraPrime	6.8	11.8	31.0	55.5	88	39	86	1.05	1.18	0.32	2.54*
Koga	7.0	14.8	31.5	56.5	69	38	50	0.64	1.52	0.25	2.41*
Jumbo	7.5	13.0	31.0	62.0	95	14	33	0.87	1.17	0.20	2.24
Gulf	7.5	14.5	31.3	61.5	95	39	61	1.14	0.90	0.18	2.23
Feast II	8.8	12.0	31.3	59.0	95	14	51	0.51	1.37	0.34	2.22
Nelson	7.3	13.3	31.3	62.0	88	16	36	0.63	1.04	0.20	1.87
Melquatro	8.0	11.5	31.3	61.0	75	29	36	0.37	1.17	0.31	1.85
Maximus	8.3	11.0	31.0	61.5	93	9	23	0.55	0.84	0.22	1.61
<b>Experimental Varieties</b>											
M2CVS	3.8	19.0	31.8	55.0	93	86	86	1.69	1.15	0.16	3.01*
BARLM17538	7.3	13.8	31.3	58.5	94	51	63	1.11	1.33	0.33	2.77*
WMWL	4.8	17.0	32.0	58.0	96	75	83	1.48	1.10	0.12	2.70*
ME94	5.5	16.3	31.8	60.0	91	81	83	1.26	1.26	0.14	2.67*
ME4	3.8	19.0	32.0	56.5	90	78	83	1.50	0.97	0.18	2.65*
BARLM17425	7.3	10.8	31.3	61.0	87	28	41	0.67	1.31	0.38	2.35*
PPG-LWT-105	7.8	13.5	31.3	62.0	91	18	35	0.76	1.13	0.26	2.15
BARHAAO	7.8	13.8	31.3	62.0	88	16	26	0.77	0.92	0.12	1.81
BARLM17477	7.3	11.0	31.0	61.5	73	11	24	0.63	0.98	0.21	1.81
BARLM17514	8.0	9.5	31.0	60.5	89	5	14	0.46	1.06	0.30	1.81
BARLM17534	8.3	8.5	31.0	62.0	70	11	14	0.21	0.77	0.13	1.11
Mean	6.4	14.3	31.9	59.1	89	46	58	1.00	1.11	0.21	2.32
CV,%	16.1	18.6	1.4	3.3	10	36	23	46.55	20.06	55.19	23.40
LSD,0.05	1.4	3.7	0.6	2.8	13	23	18	0.66	0.31	0.17	0.77

<sup>1</sup> Winter injury score based on a scale of 1 to 9 with 9 being the greatest amount of injury.

<sup>2</sup> Maturity rating scale: 37 = flag leaf emergence, 45 = boot swollen, 50 = beginning of inflorescence emergence, 58 = complete emergence of inflorescence, 62 = beginning of pollen shed. See Table 2 for complete scale.

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

tonnage given is for crop only. Varieties are listed by total yield in descending order. Experimental varieties, listed separately at the bottom of the tables, are not available commercially.

In most years, annual ryegrasses can be expected to die or become unproductive after mid-June in their first summer. Unlike annual ryegrasses, perennials should be productive under Kentucky conditions for an average of two to three growing seasons.

Statistical analyses were performed on all data (including experimentals) to determine if the apparent differences are truly due to varietal differences or just due to chance. Varieties not significantly different from the top variety in the total yield column are marked with one asterisk (\*). To determine if two varieties are truly different, compare the difference between them 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 the given locations. The coefficient of variation (CV) is a measure of the variability of the data and is included for each column of means. Low variability is desirable; increased variability within a study results in higher CVs and larger LSDs.

Tables 12, 13, and 14 show information about proprietors/distributors for all annual and perennial ryegrass and festulolium

varieties included in tests discussed in this report. Varieties are listed in alphabetical order by species, with the experimental varieties at the bottom. Remember that experimental varieties are not available for farm use; commercial varieties can be purchased from agricultural distributors. Remember to consider the relative spring maturity and the distribution of yield across the growing season when evaluating productivity of ryegrass varieties (tables 3 through 10).

### How to Interpret the Summary Tables

Tables 14, 15, and 16 are summaries of yield data from 2001 to 2021 of commercial varieties that have been entered in the Kentucky trials. In Table 14, the data are listed as a percentage of Marshall. In other words, the mean for all varieties is expressed as a percent of Marshall, with Marshall set as 100. Varieties with percentages over 100 yielded better than Marshall and those with percentages less than 100 yielded less than Marshall. In tables 15 and 16, 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 yielded better than average, and varieties with percentages less than 100 yielded lower than average. Direct, statistical comparisons of varieties cannot be made using the

**Table 4. Dry matter yields, seedling vigor, winter injury, plant height, maturity and stand persistence of annual ryegrass varieties sown September 4, 2018, at Lexington, Kentucky (see Table 11 and Table 14 for designation of Italian or Westerwolds type and diploid or tetraploid type varieties).**

Variety	Seedling Vigor <sup>1</sup> Sep 28, 2018	Winter Injury <sup>2</sup> Feb 6, 2019	Plant Height(in) Apr 22, 2019	Maturity <sup>3</sup>			Percent Stand			Yield (tons/acre)				
				2019			2018	2019		2019				
				Apr 22	May 14	Jun 5	Sep 28	Mar 22	Jul 16	Apr 22	May 14	Jun 5	Jul 2	Total
<b>Commercial Varieties-Available for Farm Use</b>														
Marshall	4.9	1.8	20.5	32.3	45.0	61.5	100	100	4	2.16	0.56	0.65	0.50	3.86*
Koga	4.3	1.8	17.0	32.0	46.3	57.5	100	100	96	1.80	0.66	0.67	0.59	3.72*
Winterhawk	4.8	2.0	20.0	32.5	45.0	62.0	100	100	4	2.00	0.43	0.71	0.56	3.70*
Jackson	4.4	3.5	20.5	32.5	46.3	61.5	100	99	4	2.01	0.56	0.67	0.43	3.67*
TAMTBO	4.6	3.3	17.5	32.3	51.5	62.0	100	90	3	1.62	0.73	0.70	0.48	3.53*
Nelson	4.6	2.3	17.5	31.8	49.8	61.5	100	96	2	1.75	0.58	0.65	0.53	3.51*
TetraPrime	3.8	1.3	16.5	31.3	45.0	54.0	100	100	100	1.64	0.78	0.52	0.51	3.46*
Maximus	4.4	2.0	15.5	32.0	56.0	62.0	100	43	12	1.30	0.71	0.66	0.57	3.24
Double Diamond	4.5	3.0	17.0	32.5	51.5	62.0	100	94	10	1.57	0.53	0.57	0.57	3.23
Jumbo	4.5	2.8	17.0	32.0	51.5	61.5	100	94	1	1.65	0.62	0.63	0.30	3.20
Master	4.1	3.5	15.5	32.3	55.0	61.5	100	69	1	1.44	0.64	0.66	0.43	3.18
Trinova	4.3	3.3	15.0	31.8	56.0	62.0	100	75	2	1.30	0.69	0.55	0.48	3.02
Baqueuano	4.0	1.5	15.5	32.0	54.5	62.0	100	79	3	1.37	0.59	0.66	0.36	2.99
Feast II	4.4	4.5	12.0	31.0	45.0	54.5	100	94	93	0.69	0.68	0.52	0.63	2.52
Gulf	4.8	2.8	13.5	31.8	56.0	61.5	100	40	1	0.69	0.64	0.51	0.32	2.16
<b>Experimental Varieties</b>														
BARLM17425	3.1	1.8	18.5	32.3	46.3	61.5	97	98	69	1.84	0.71	0.67	0.60	3.84*
KYLM1703	2.9	2.0	18.0	32.3	49.3	62.0	95	97	3	1.84	0.72	0.61	0.49	3.66*
K014-WEMA	4.1	1.3	19.5	32.3	45.0	61.5	100	99	9	1.95	0.49	0.57	0.61	3.62*
ME4	4.8	2.8	21.0	32.5	45.0	61.5	100	98	4	2.00	0.53	0.62	0.44	3.60*
BARLM17477	2.0	3.5	19.5	32.3	49.8	62.0	91	92	7	2.04	0.53	0.56	0.45	3.58*
M2CVS	4.0	1.3	21.5	32.5	46.3	61.5	100	100	3	2.16	0.45	0.55	0.37	3.54*
K014-WM	4.3	1.5	18.5	32.5	46.3	61.5	100	100	7	1.90	0.49	0.56	0.48	3.42*
ME94	4.5	1.3	21.0	32.5	45.0	61.5	100	100	0	1.88	0.50	0.64	0.35	3.37*
BARLM17538	3.1	1.3	17.0	32.0	47.5	61.5	99	99	48	1.71	0.54	0.55	0.54	3.34
WMWL	4.5	4.3	20.0	32.8	45.0	62.0	100	100	1	1.98	0.43	0.50	0.38	3.29
BARLM17514	3.3	3.5	18.0	32.3	51.0	61.5	99	97	11	1.51	0.65	0.65	0.44	3.24
PPG-LWT105	4.1	2.5	17.5	32.0	52.0	62.0	100	98	8	1.64	0.57	0.49	0.52	3.22
K014-WLS	4.3	1.0	19.5	32.8	48.5	62.0	100	98	4	1.70	0.65	0.47	0.39	3.21
BARLM17534	3.0	2.5	16.0	32.0	50.5	61.5	100	95	2	1.54	0.63	0.57	0.46	3.21
K014-WEAR	4.1	2.5	18.0	32.0	50.8	62.0	100	91	4	1.64	0.56	0.60	0.41	3.21
KYLM1601	2.8	1.8	17.0	32.3	48.0	62.0	99	98	3	1.65	0.50	0.55	0.31	3.00
KYLM1701	3.0	2.8	18.5	32.5	48.5	62.0	96	94	0	1.60	0.61	0.46	0.32	2.99
BARHAAO	4.8	2.0	20.0	32.8	53.0	62.0	100	98	55	1.63	0.39	0.52	0.31	2.84
Mean	4.0	2.4	17.7	32.2	49.3	61.2	99	89	17	1.64	0.58	0.58	0.45	3.25
CV,%	40.4	75.5	10.1	1.6	4.8	1.8	1	7	45	14.10	25.05	20.99	28.33	10.90
LSD,0.05	0.6	2.5	2.5	0.7	3.7	6.5	1	9	10	0.32	0.20	0.17	0.18	0.50

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

<sup>2</sup> Winter injury score based on a scale of 1 to 9 with 9 being the greatest amount of injury.

<sup>3</sup> Maturity rating scale: 37 = flag leaf emergence, 45 = boot swollen, 50 = beginning of inflorescence emergence, 58 = complete emergence of inflorescence, 62 = beginning of pollen shed. See Table 2 for complete scale.

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

tables 14, 15, and 16 summaries, but these comparisons do help to identify varieties for further consideration. Varieties that have performed better than average over many years and at several locations have stable performance; others may have performed 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 the footnotes in tables 14, 15, and 16 to determine the yearly report that should be referenced.

## Summary

Selecting a good variety of annual or perennial ryegrass or festulolium is an important first step in establishing a productive stand of grass. Proper management, beginning with seedbed preparation and continuing throughout the life of the stand, is necessary for even the highest-yielding variety to produce to its genetic potential.

The following is a list of University of Kentucky Cooperative Extension publications related to ryegrass management. They are available from your county Extension office and are listed in the Publications section of the UK Forage website (<https://forages.ca.uky.edu>).

- Lime and Fertilizer Recommendations (AGR-1)
- Grain and Forage Crop Guide for Kentucky (AGR-18)
- Establishing Forage Crops (AGR-64)
- Forage Identification and Use Guide (AGR-175)
- Annual Ryegrass (AGR-179)
- New Recommendations for Perennial Ryegrass Seedings for Kentucky Horse Farms (ID-142)
- Rotational Grazing (ID-143)
- Establishing and Managing Horse Pastures (ID-147)
- Festulolium Hybrid Grass (see the UK Forage website under publications and grasses)



Table 5. Dry matter yields, seedling vigor, injury rating, plant height, maturity, and stand persistence of annual ryegrass varieties sown August 30, 2019, at Lexington, Kentucky (see Table 11 and Table 14 for designation of Italian or Westerwolds type and diploid or tetraploid type varieties).

Variety	Seedling Vigor <sup>1</sup>				Winter Injury <sup>2</sup>				Plant Height (in)				Maturity <sup>3</sup>				Percent Stand				Yield (tons/acre)			
	Oct 11, 2019		Dec 9, 2019		Apr 1		Apr 28		Apr 1		Apr 28		May 21		Jun 8		Oct 11		2020		2020		2020	
	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available	Available
Commercial Varieties-Available for Farm Use																								
Meroa	4.8	4	12	14	31.5	31.8	46.3	57.5	100	100	100	1.16	0.64	1.04	0.84	0.62	0.27	4.56*						
Nelson	5.0	43	12	15	31.0	32.0	53.5	62.0	100	92	1.35	0.80	0.84	0.84	0.50	0.32	4.37*							
Koga	4.9	3	13	15	31.3	32.0	46.8	57.5	100	100	1.15	0.64	0.99	0.70	0.54	0.23	4.25*							
Marshall	4.9	4	15	16	31.3	32.0	53.5	60.0	100	97	1.07	0.72	0.92	0.76	0.45	0.30	4.22*							
Bruiser	4.5	30	16	14	31.5	31.8	52.5	61.5	100	98	0.91	0.73	0.87	0.77	0.55	0.22	4.05*							
Hellen	4.9	34	12	15	31.0	31.8	47.3	57.0	100	93	1.32	0.49	0.77	0.75	0.40	0.28	4.01*							
Jackson	4.5	7	16	14	31.5	31.5	53.0	61.0	100	100	1.04	0.83	0.76	0.73	0.39	0.24	3.99*							
Frostproof	4.4	6	16	14	31.8	31.5	52.5	62.0	100	99	0.98	0.70	0.81	0.77	0.38	0.29	3.93							
Attain	4.0	26	13	15	31.3	31.8	54.5	61.5	100	93	0.89	0.62	0.83	0.81	0.52	0.23	3.89							
Winterhawk	4.6	2	17	14	31.8	31.3	53.5	61.5	100	100	0.94	0.85	0.73	0.72	0.41	0.19	3.84							
TetraPrime	3.4	2	13	14	31.0	32.0	45.0	56.0	100	100	0.43	0.60	1.02	0.70	0.55	0.35	3.65							
Feast II	4.5	59	10	13	31.0	31.3	49.0	59.0	100	72	0.90	0.36	0.83	0.82	0.45	0.29	3.64							
Gulf	4.6	70	11	15	31.3	32.0	56.0	61.5	100	63	1.09	0.27	0.77	0.63	0.39	0.21	3.36							
Rapido	4.6	68	11	15	31.0	32.0	56.0	61.5	100	80	1.17	0.32	0.65	0.64	0.34	0.15	3.26							
Experimental Varieties																								
ME94	4.9	2	15	15	31.3	32.0	49.3	58.0	100	100	1.24	0.79	0.93	0.76	0.44	0.28	4.45*							
ME4	4.9	7	15	15	31.5	32.0	53.0	59.0	100	100	1.11	0.86	0.85	0.79	0.40	0.34	4.34*							
SELWT110	4.5	6	12	15	31.0	32.0	45.0	58.0	100	99	0.93	0.69	0.98	0.83	0.58	0.33	4.33*							
PPG-LMT106-102	4.1	7	12	14	31.0	32.0	45.0	56.5	100	100	0.94	0.61	1.05	0.80	0.55	0.26	4.21*							
PPG-LMT104M	4.4	1	13	14	31.0	31.5	45.0	58.0	100	100	0.99	0.73	0.94	0.83	0.43	0.26	4.19*							
PPG-LMT105	4.1	7	12	14	31.0	32.0	45.0	57.5	100	98	0.93	0.66	0.87	0.73	0.53	0.24	3.96							
WMWL	4.6	32	15	15	31.0	31.8	50.8	60.5	100	97	1.00	0.68	0.80	0.78	0.38	0.28	3.92							
M2CVS	3.5	0	17	15	31.8	31.5	53.0	60.0	100	100	0.68	0.86	0.92	0.81	0.36	0.25	3.87							
WMWL2	3.4	2	18	14	32.0	31.8	54.0	60.0	100	100	0.66	0.92	0.66	0.80	0.49	0.30	3.83							
SELWTB219	3.0	0	15	14	31.3	31.5	46.8	56.5	100	100	0.61	0.73	0.84	0.80	0.53	0.25	3.76							
KYLM1701	2.0	0	15	13	31.0	31.0	52.5	58.5	98	98	0.34	0.91	0.79	0.82	0.60	0.26	3.72							
SELWTB119	2.1	0	15	14	31.8	31.8	50.8	61.0	100	100	0.50	0.80	0.88	0.76	0.57	0.20	3.70							
Mean	4.2	16	14	14	31.3	31.7	50.4	59.3	100	95	0.94	0.67	0.86	0.77	0.47	0.26	3.97							
CV%	16.5	79	8	6	1.2	1.2	4.5	2.4	1	9	28.03	14.52	20.24	16.67	21.84	28.84	10.25							
LSD <sub>0.05</sub>	0.7	18	2	1	0.5	0.6	3.2	2.0	1	12	0.37	0.14	0.24	0.18	0.15	0.11	0.57							

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

<sup>2</sup> Rating taken after a cold spell after the November 6, 2019, harvest.

<sup>3</sup> Maturity rating scale: 37 = flag leaf emergence, 45 = boot swollen, 50 = beginning of inflorescence emergence, 58 = complete emergence of inflorescence, 62 = beginning of pollen shed. See Table 2 for complete scale.

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

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**Table 6. Dry matter yields, seedling vigor, maturity, and stand persistence of perennial ryegrass varieties sown September 4, 2018, at Lexington, Kentucky (see Table 12 and Table 15 or designation of diploid or tetraploid varieties).**

Variety	Seedling Vigor <sup>1</sup> Sep 28, 2018		Maturity <sup>2</sup>		Percent Stand						Yield (tons/acre)									
	2019		2020		2021		2018		2019		2020		2021		2020		2021			
	May 13	Jun 10	May 10	May 18	May 20	Jun 22	Sep 28	Mar 22	Mar 22	Mar 22	Mar 22	Mar 22	Mar 22	Mar 22	Mar 22	Mar 22	Mar 22	Mar 22		
<b>Commercial Varieties-Available for Farm Use</b>																				
TetraMag	5.0	47.5	61.5	45.0	49.3	58.0	100	100	100	99	87	79	50	2.76	2.04	1.15	0.54	0.23	1.92	6.72*
Remington	4.6	45.0	62.0	39.0	37.0	58.0	100	100	100	98	98	97	85	2.23	1.65	0.79	0.64	0.55	1.99	5.86
Remington PLUS NEA2 <sup>3</sup>	4.3	45.0	62.0	40.5	37.0	58.0	100	100	100	97	95	74	2.33	1.66	0.69	0.71	0.43	1.83	5.82	
Linn	5.0	58.0	60.0	57.5	56.0	29.0	100	100	86	95	68	58	48	2.40	1.59	0.75	0.47	0.22	1.45	5.43
PayDay	4.8	52.0	62.0	50.0	48.0	58.0	100	100	100	90	88	88	53	2.08	1.69	0.91	0.41	0.18	1.50	5.26
Calibra	5.0	48.8	62.0	46.3	50.3	58.0	100	100	100	100	87	84	43	2.02	1.37	0.80	0.57	0.21	1.58	4.97
TetraSweet	4.9	50.5	62.0	49.3	52.0	58.0	100	100	100	96	91	40	1.87	1.46	0.90	0.39	0.22	1.51	4.84	
<b>Experimental Varieties</b>																				
BARLPF253	4.3	49.3	60.0	46.3	43.0	57.5	100	100	100	82	63	53	1.79	1.41	0.75	0.53	0.30	1.58	4.79	
Mean	4.7	49.5	61.4	46.7	46.6	54.3	100	100	98	99	88	82	55	2.18	1.61	0.84	0.53	0.29	1.67	5.46
CV%	8.1	3.6	0.6	4.0	5.8	0.7	0	5	1	13	17	32	10.72	16.13	24.68	28.96	47.79	15.80	8.43	
LSD0.05	0.6	2.6	0.5	2.8	4.0	0.5	0	8	2	17	20	26	0.34	0.38	0.31	0.23	0.21	0.39	0.68	

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

<sup>2</sup> Maturity rating scale: 37 = flag leaf emergence, 45 = boot swollen, 50 = beginning of inflorescence emergence, 58 = complete emergence of inflorescence, 62 = beginning of pollen shed. See Table 2 for complete scale.

<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 7. Dry matter yields, seedling vigor, plant height, maturity, and stand persistence of perennial ryegrass varieties sown August 30, 2019, at Lexington, Kentucky (see Table 12 and Table 15 for designation of diploid or tetraploid varieties).**

Variety	Seedling Vigor <sup>1</sup> Oct 11, 2019	Plant Height (in) May 7, 2020	Maturity <sup>2</sup>		Percent Stand						Yield (tons/acre)							
			2020		2021		2019		2020		2021		2020		2021			
			May 7	Jun 17	May 20	Jun 22	Oct 11	Oct 11	Mar 17	Oct 27	Mar 24	Oct 22	Mar 24	Oct 22	Mar 24	Oct 22	Mar 24	Oct 22
<b>Commercial Varieties-Available for Farm Use</b>																		
TetraMag	4.1	23	46.3	56.0	51.0	49.3	100	100	100	95	95	93	4.43	2.11	0.45	0.43	2.99	7.42*
Boost	3.5	21	48.5	56.5	55.0	29.0	100	100	100	100	74	74	3.98	2.23	0.27	0.53	3.03	7.01*
Barvitra	4.5	26	49.8	58.0	56.0	52.0	100	100	100	76	78	76	4.58	1.56	0.24	0.45	2.25	6.83*
Linn	4.6	30	54.0	58.0	60.5	29.0	100	100	100	98	98	54	4.01	1.97	0.20	0.32	2.49	6.50
TetraSweet	4.4	17	43.3	29.0	54.0	50.3	100	100	100	100	100	100	3.29	1.79	0.45	0.62	2.86	6.16
Power	4.4	17	40.5	29.0	53.5	43.5	100	100	100	100	100	100	3.23	1.90	0.48	0.53	2.91	6.14
Calibra	3.5	16	43.5	29.0	51.0	41.5	100	100	100	100	99	99	3.23	1.79	0.45	0.52	2.77	6.00
PayDay	4.6	17	42.0	29.0	54.0	50.8	100	100	100	100	100	100	3.16	1.67	0.46	0.52	2.65	5.81
Remington PLUS NEA2 <sup>3</sup>	2.0	15	40.5	29.0	39.0	57.5	100	100	100	100	100	100	2.86	1.48	0.44	0.95	2.88	5.74
Remington	2.9	15	39.0	29.0	37.0	58.0	100	100	100	100	100	100	2.97	1.07	0.43	0.77	2.27	5.24
<b>Experimental Varieties</b>																		
PI2B2	2.1	24	50.8	57.0	54.5	36.3	100	100	100	100	100	84	3.80	2.00	0.26	0.35	2.61	6.41
PPG-FPRT119	4.1	21	43.5	56.0	47.8	58.0	100	100	100	99	99	96	3.68	1.65	0.40	0.40	2.46	6.14
Mean	3.7	20	45.1	43.0	51.1	46.3	100	100	100	97	97	90	3.60	1.77	0.38	0.53	2.68	6.28
CV%	20.3	7	6.5	1.0	4.7	19.7	0	4	0	4	3	18	8.80	22.23	29.45	23.87	16.46	9.90
LSD0.05	1.1	2	4.2	0.6	3.5	13.1	0	5	23	0.16	0.18	0.63	0.89					

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

<sup>2</sup> Maturity rating scale: 37 = flag leaf emergence, 45 = boot swollen, 50 = beginning of inflorescence emergence, 58 = complete emergence of inflorescence, 62 = beginning of pollen shed. See Table 2 for complete scale.

<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 8. Dry matter yields, seedling vigor, maturity, and stand persistence of perennial ryegrass varieties sown August 28, 2020, at Lexington, Kentucky (see Table 12 and Table 15 for designation of diploid or tetraploid varieties).**

Variety	Seedling Vigor <sup>1</sup> Sep 24, 2020	Maturity <sup>2</sup> 2021			Percent Stand 2021			Yield (tons/acre) 2021			
		Mat 18	Jun 22	Oct 22	Sep 24	Mar 24	Oct 22	May 18	Jun 22	Oct 20	Total
<b>Commercial Varieties-Available for Farm Use</b>											
TetraMag	4.4	45.0	43.5	100	100	100	100	3.17	0.50	0.52	4.19*
Elena	4.4	46.5	29.0	100	100	100	100	2.64	0.50	0.35	3.49*
Boost	4.4	51.5	29.0	100	100	100	100	2.39	0.36	0.36	3.11
Linn	4.6	56.0	57.0	100	100	81	100	2.56	0.32	0.13	3.01
Remington	4.3	37.0	29.0	100	100	100	100	2.02	0.40	0.46	2.88
Remington PLUS NEA2 <sup>3</sup>	3.7	37.0	43.0	100	100	100	100	1.83	0.41	0.42	2.65
PayDay	4.3	44.3	29.0	100	100	100	100	1.96	0.35	0.31	2.62
Power	4.3	39.0	29.0	100	100	100	100	1.87	0.27	0.39	2.53
TetraSweet	4.8	40.3	29.0	100	100	100	100	1.72	0.26	0.35	2.32
<b>Experimental Varieties</b>											
BARLPF237	3.8	37.0	34.3	100	100	100	100	2.14	0.43	0.40	2.97
Mean	4.3	43.4	35.2	100	100	98	100	2.23	0.38	0.37	2.98
CV%	9.4	8.6	20.3	0	0	3	18.50	35.69	18.71	17.38	
LSD,0.05	0.6	5.4	10.4	0	0	4	0.60	0.20	0.10	0.75	

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

<sup>2</sup> Maturity rating scale: 37 = flag leaf emergence, 45 = boot swollen, 50 = beginning of inflorescence emergence, 58 = complete emergence of inflorescence, 62 = beginning of pollen shed. See Table 2 for complete scale.

<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 9. Dry matter yields, seedling vigor, plant height, maturity, and stand persistence of festulolium varieties sown August 30, 2019, at Lexington, Kentucky (see Table 13 and Table 16 for ryegrass and fescue genetic background of these varieties).**

Variety	Seedling Vigor <sup>1</sup> Oct 11, 2019	Plant Height(in) Apr 29, 2020	Maturity <sup>2</sup>			Percent Stand			Yield (tons/acre)							
			2020	2021	2021	2019	2020	2021	2020	2021	2021					
	Apr 29	Jun 8	May 13	Jun 14	Oct 11	Mar 17	Oct 27	Mar 24	Oct 22	2020	2021	2021	2021			
<b>Commercial Varieties-Available for Farm Use</b>																
Perseus	5.0	19	40.5	58.0	46.3	62.0	100	94	93	91	5.46	1.52	0.98	0.70	3.19	8.66*
Perun	4.0	19	43.5	59.0	48.8	62.0	100	97	97	95	4.71	1.65	0.93	0.71	3.28	7.99*
Lofa	5.0	21	42.0	58.0	46.3	62.0	100	78	79	79	4.60	1.60	1.09	0.46	3.15	7.76*
SpringGreen	4.8	26	45.0	61.0	47.5	62.0	100	98	97	97	4.60	1.57	0.81	0.58	2.95	7.56*
Duo	5.0	26	43.5	62.0	47.5	62.0	100	70	65	66	4.43	1.56	0.89	0.43	2.88	7.31
Hykor	2.0	23	45.0	29.0	58.0	29.0	100	100	100	100	3.46	1.77	0.73	0.96	3.47	6.93
Fojtan	2.3	14	40.3	29.0	57.0	29.0	98	98	98	98	2.83	1.64	0.75	0.94	3.33	6.16
<b>Experimental Varieties</b>																
ORRUS	4.1	16	38.8	58.0	46.3	62.0	100	98	97	93	4.23	1.51	0.92	0.60	3.03	7.26
Mean	4.0	20	42.3	51.8	49.7	53.8	100	92	91	90	4.29	1.60	0.89	0.67	3.16	7.45
CV%	13.2	13	10.0	1.5	4.7	0.0	0	1	83	7	11.95	23.27	20.01	19.28	16.74	11.87
LSD,0.05	0.8	4	6.2	1.2	3.4	0.0	0	1	11	9	0.75	0.55	0.26	0.19	0.73	1.30

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

<sup>2</sup> Maturity rating scale: 37 = flag leaf emergence, 45 = boot swollen, 50 = beginning of inflorescence emergence, 58 = complete emergence of inflorescence, 62 = beginning of pollen shed. See Table 2 for complete scale.

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

**Table 10. Dry matter yields, seedling vigor, maturity, and stand persistence of festulium varieties sown August 28, 2020, at Lexington, Kentucky (see Table 13 and Table 16 for ryegrass and fescue genetic background of these varieties).**

Variety	Seedling Vigor <sup>1</sup> Sep 24, 2020	Maturity <sup>2</sup> 2021 May 6	Percent Stand			Yield (tons/acre)			
			2020		2021	2021			
			Sep 24	Mar 24	Oct 22	May 6	Jun 14	Oct 20	Total
<b>Commercial Varieties-Available for Farm Use</b>									
Perseus	4.3	41.8	100	100	100	3.10	1.50	0.66	5.27*
Lofa	4.8	39.0	100	100	100	3.21	1.51	0.51	5.23*
Perun	3.8	49.8	100	100	100	2.80	1.31	0.75	4.85*
SpringGreen	3.9	48.8	100	100	100	3.02	1.22	0.40	4.64
Duo	5.0	54.0	100	100	100	2.97	1.26	0.40	4.63
Hykor	3.0	56.0	100	100	100	2.36	1.19	0.92	4.47
Mahulena	2.4	57.5	100	100	100	2.23	1.17	0.86	4.26
<b>Experimental Varieties</b>									
FPF6	2.8	54.0	100	100	100	2.16	1.22	1.05	4.43
FPF7B	2.8	56.0	100	100	100	2.03	1.16	1.03	4.23
FPF8B	3.0	49.0	100	100	100	1.76	1.22	1.01	3.99
FPF9B	2.6	50.3	100	100	100	1.74	1.23	1.00	3.98
FPF5	3.0	55.0	100	100	100	2.09	1.00	0.75	3.84
Mean	3.4	50.9	100	100	100	2.46	1.25	0.78	4.48
CV,%	10.5	6.5	0	0	0	8.38	16.03	18.39	8.06
LSD,0.05	0.5	4.8	0	0	0	0.30	0.29	0.21	0.52

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

<sup>2</sup> Maturity rating scale: 37 = flag leaf emergence, 45 = boot swollen, 50 = beginning of inflorescence emergence, 58 = complete emergence of inflorescence, 62 = beginning of pollen shed. See Table 2 for complete scale.

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

**Table 11. Proprietors and type information of annual ryegrass varieties in current trials.**

Variety	Type	Proprietor/KY Distributor
<b>Commercial Varieties-Available for Farm Use</b>		
Attain	Westerwold tetraploid	Smith Seed
Bruiser	Westerwold diploid	Ampac Seed
Feast II	Italian tetraploid	Ampac Seed
Frostproof	Westerwold diploid	Smith Seed
Gulf	Westerwold diploid	Public
Hellen	Westerwold tetraploid	Smith Seed
Jackson	Westerwold diploid	The Wax Company
Koga	Westerwold tetraploid	Smith Seed
Marshall	Westerwold diploid	The Wax Company
Meroa	Italian tetraploid	Smith Seed
Nelson	Westerwold tetraploid	The Wax Company
Rapido	Westerwold diploid	Smith Seed
TetraPrime	Italian tetraploid	Mountain View Seeds
Winterhawk	Westerwold diploid	Oregro Seeds
<b>Experimental Varieties</b>		
KYLM1701	Westerwold tetraploid	KY Agri. Exp. Station
M2CVS	Westerwold diploid	The Wax Company
ME4	Westerwold diploid	The Wax Company
ME-94	Westerwold diploid	The Wax Company
PPG-LMT104M	Italian tetraploid	Mountain View Seeds
PPG-LMT105	Italian tetraploid	Mountain View Seeds
PPG-LMT106-102	Italian tetraploid	Mountain View Seeds
SELWT110	Westerwold tetraploid	Smith Seed
SELWTB119	Westerwold tetraploid	Smith Seed
SELWTB219	Westerwold tetraploid	Smith Seed
WMWL	-- <sup>1</sup>	The Wax Company
WMWL2	-- <sup>1</sup>	The Wax Company

<sup>1</sup> Type was not provided by the company.



**Table 12. Proprietors and type information of perennial ryegrass varieties in current trials.**

Variety	Type	Proprietor/KY Distributor
<b>Commercial Varieties-Available for Farm Use</b>		
Barvitra	tetraploid	Barenbrug USA
BG34	diploid	Barenbrug USA
Boost	tetraploid	Allied Seed
Calibra	tetraploid	DLF Pickseed
Elena	tetraploid	Allied Seed
Linn (certified)	diploid	Public
Melpetra	tetraploid	Hood River Seed
PayDay	tetraploid	Mountain View Seeds
Power	tetraploid	Allied Seed
Remington	tetraploid	Barenbrug USA
Remington PLUS NEA2	tetraploid	Barenbrug USA
TetraMag	tetraploid	Mountain View Seeds
TetraSweet	tetraploid	Mountain View Seeds
<b>Experimental Varieties</b>		
BARLPF237	tetraploid	Barenbrug USA
BARLPF253	diploid	Barenbrug USA
PI2B2	diploid	Oregro Seeds
PPG-FPRT119	tetraploid	Mountain View Seeds

**Table 13. Proprietors and genetic background of festulolium varieties in current trials.**

Variety	Type <sup>1</sup>	Proprietor/KY Distributor
<b>Commercial Varieties-Available for Farm Use</b>		
Duo	MF x PR	Ampac Seed
Fojtan	(TF x IR) x TF	DLF Pickseed
Hykor	(TF x IR) x TF	DLF Pickseed
Lofa	(TF x Int) x Int	DLF Pickseed
Mahulena	(TF x IR) x TF	DLF Pickseed
Perseus	MF x IR	DLF Pickseed
Perun	MF x IR	DLF Pickseed
Spring Green	MF x PR	Turf Seed
<b>Experimental Varieties</b>		
FPF5	(TF x IR) x TF	DLF Pickseed
FPF6	(TF x IR) x TF	DLF Pickseed
FPF7B	(TF x IR) x TF	DLF Pickseed
FPF8B	(TF x IR) x TF	DLF Pickseed
FPF9B	(TF x IR) x TF	DLF Pickseed
ORRUS	... <sup>2</sup>	Oregro Seeds

<sup>1</sup> MF = meadow fescue, TF = tall fescue, IR = Italian ryegrass, PR = perennial ryegrass, Int = intermediate ryegrass, AR = annual ryegrass

<sup>2</sup> Type was not provided by the company.

Table 14. Summary of Kentucky annual ryegrass yield trials 2003-2020 (yield shown as a percentage of the yield value of Marshall).

Variety	Type	Proprietor	Lexington <sup>1</sup>																	Mean <sup>4</sup> (#trials)				
			03-3	04	05	06	07	08	09	10	10	11	12	12	13	14	15	16	17		18	19		
Abundant	tetraploid	Ampac Seed				12																		
Acrobat	-5	Proseeds Marketing					144																	
AE110	Westerwold tetraploid	Pickseed USA, Inc.							89	100													95(2)	
Amp	Westerwold tetraploid	Columbia Seeds										75												
Assist	Westerwold diploid	SaddleButte										88												
Attain	Westerwold tetraploid	Smith Seed Services						111														92	91(3)	
Barqueano	Westerwold tetraploid	Smith Seed Services																						
Barmultra II	Italian tetraploid	Barenbrug USA						133					103	95	125	108		77						
Big Bang	Westerwold tetraploid	Brett Young																			67			
Big Boss	Westerwold tetraploid	Smith Seed Services						98				86	38	73									86(3)	
Big Daddy	Westerwold tetraploid	FFR/Sou. St.						86	98	82													89(3)	
Bill	Westerwold diploid	Smith Seed Services																			62			
Brangus	Italian tetraploid	KB SeedSolutions						94																
Bruiser	Westerwold diploid	Ampac Seed						65	105	100	104	86	100	105	95	86	113						96(10)	
Centurion	Westerwold diploid	Mountain View Seeds										97	132	100	117								112(4)	
DH-3	Italian tetraploid	Allied Seed						91	27		89												69(3)	
Diamond T	Italian tetraploid	Oregro Seeds						8																
Dixie Gold	Westerwold tetraploid	Caudill Seed												19										
DoubleDiamond	Westerwold tetraploid	Oregro Seeds																						
Dyna-Gain	Westerwold diploid	Columbia Seeds													71									
Ed	Westerwold diploid	Smith Seed Services									96												98(2)	
Fantastic	Westerwold diploid	Ampac Seed				48	84																86(3)	
Feast II	Italian tetraploid	Ampac Seed					35	113	109	81	93	71	47	56	88	80	87	65	86				80(12)	
Flying A	Westerwold diploid	Oregro Seeds					39	59																
Fox	Italian diploid	DLF Pickseed								109														
Fria	Westerwold diploid	Allied Seed								95	87	89	104	81	85	98							89(6)	
Frostproof	Westerwold diploid	Smith Seed Services														96							95(2)	
GR-AS10	Italian	Ampac Seed								113														
Graze-N-Gro	Westerwold diploid	Seed Research of OR	114																				91(2)	
Green Farm	Westerwold diploid	Smith Seed Services												85										
Gulf	Westerwold diploid	Public									76	72	27	69	60	87	87	56	80					70(12)
Hellen	Westerwold tetraploid	Smith Seed Services																						
Hercules	Westerwold tetraploid	Barenbrug USA																						
HS-1	Italian diploid	KB SeedSolutions								72														
Jackson	Westerwold diploid	The Wax Co.		66	100	62	103	59	101	99	106	100	77	69	100	97	105	95	95				94(16)	
Jumbo	Westerwold tetraploid	Barenbrug USA	112																				94(3)	
KB Royal	Italian diploid	KB SeedSolutions								83														
Koga	Westerwold tetraploid	Smith Seed Services																	94	96	101			
Kospeed	Westerwold diploid	Smith Seed Services												80	92								86(2)	
Kowinearly	Westerwold diploid	Smith Seed Services												95	96								96(2)	
LHT-102	Intermediate	Ampac Seed										100												
Marshall	Westerwold diploid	The Wax Co.	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100(17)	
Master	Westerwold tetraploid	Smith Seed Services																						
Maximo	Intermediate tetraploid	Pickseed USA, Inc.								101														
Maximus	Westerwold tetraploid	Barenbrug USA																						
Melquatro	Italian tetraploid	Hood River Seed													135								74(2)	
Meroa	Westerwold diploid	Smith Seed Services													93	102							104(2)	

continued

**Table 14. Summary of Kentucky annual ryegrass yield trials 2003-2020 (continued).**

Variety	Type	Proprietor	Lexington <sup>1</sup>																	Mean <sup>4</sup> (#trials)				
			03 <sup>2,3</sup>	04	05	06	07	08	09	10	10	11	12	12	13	14	15	16	17		18	19		
MX 108	Westerwold tetraploid	Pickseed USA, Inc.									95	114											105(2)	
Nelson	Westerwold tetraploid	The Wax Co.								86			93	65	77	105	97	73	91	104			91(8)	
Oryx	Italian diploid	Hood River Seed														100							-	
Primecut	Westerwold brand	Oregro Seeds									94										77		-	
Rapido	Westerwold diploid	Smith Seed Services																					-	
Striker	Westerwold tetraploid	Seed Research of OR			90																		-	
TAMTBO	Westerwold tetraploid	Tex. Ag Exp Sta.					47		101		108	95			79								87(6)	
Tam 90	Italian diploid	Tex. Ag Exp Sta.					49							78									64(2)	
TetraPrime	Italian tetraploid	Mountain View Seeds										101		96	104	91	99	90	86				95(7)	
TetraPro	Italian tetraploid	Tex. Ag Exp Sta.					40																-	
TillageRootMax	Westerwold diploid	Cover Crop Solutions									82	90											86(2)	
T-Rex	Westerwold tetraploid	SaddleButte			11																		-	
Trinova	Westerwold tetraploid	Smith Seed Services																	78				-	
Ugne	Italian tetraploid	Hood River Seed														102							-	
Verdure	Westerwold tetraploid	Smith Seed Services							86				42	58									72(2)	
Winterhawk	Westerwold diploid	Oregro Seeds							104		117	92		119							113	96	91	105(7)

<sup>1</sup> In annual ryegrass, low-yielding varieties usually result from winterkill. Note: Due to severe winterkill, yield results from the 2006 and 2013 plantings were not included in the overall mean.

<sup>2</sup> Year trial was established.

<sup>3</sup> Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in forage yield between varieties. To find actual yields, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 2015 was harvested one year, so the final report would be "2016 Annual and Perennial Ryegrass and Festulolium Report" archived in the UK Forage website (<https://forages.ca.uky.edu>).

<sup>4</sup> Mean only presented when respective variety was included in two or more trials.

<sup>5</sup> Type was not provided by the company.

**Table 15. Summary of Kentucky perennial ryegrass yield trials 2000-2021 (yield shown as a percentage of the mean of the commercial varieties in the trial).**

Variety	Type	Proprietor	Lexington															Princeton			Mean <sup>3,4</sup> (#trials)								
			011.2 2yr <sup>5</sup>	03 2yr	04 3yr	05 3yr	06 2yr	07 3yr	08 3yr	09 3yr	10 2yr	11 3yr	12 3yr	13 3yr	14 2yr	15 2yr	16 3yr	17 3yr	18 3yr	19 2yr		20 2yr	21 3yr						
Aires	diploid	Ampac Seed	95																						93	94(2)	104(2)		
Albion	tetraploid	Grasslands Oregon														105	103									107	103(2)		
Amazon	tetraploid	AgriBioTech			99																					95			
Anaconda	tetraploid	Caudill Seed																											
Aubisque	tetraploid	Seed Research of OR	144																										
Bandit	tetraploid	Grassland West																								106			
Barvitra	diploid	Barenbrug USA															104					109						107(2)	
Bastion C-2	tetraploid	Seed Research of OR			91																								
Bestfor	tetraploid	Improved Forages																							113	107	110(2)		
Best for Plus	hybrid tetraploid	Improved Forages	116	108	118																							114(3)	
BG-34	diploid	Barenbrug USA			83	85						87	84	85	81									83				84(8)	
Boost	tetraploid	Allied Seed					130	125	120		86	87	103	102														118(8)	
Boxer	tetraploid	AgriBioTech																									106		
Calibra	tetraploid	DLF Pickseed																											
CAS MP64	diploid	Cascade International	97																									97(13)	
Citadel	tetraploid	Ag Canada																								94	113	104(2)	
Crave	tetraploid	Ampac Seed										95																	
Elena DS	tetraploid	Allied Seed										110																110(2)	
Eurostar	tetraploid	Seed Research of OR											112																
Everlast	diploid	Caudill Seed																					104						
Feeder	diploid	Seed Research of OR																											
Grand Daddy	tetraploid	Smith Seed	118							76	92	84	86	107													111	98(9)	
Green Gold	tetraploid	Grasslands Oregon																											
Herbal	-7	ProSeeds Marketing								77																			
Impressario	tetraploid	DLF Pickseed											92																
Kentaur	tetraploid	DLF Pickseed							107																			100(2)	
Lactal	tetraploid	Brett Young																						117				112(2)	
Lasso	diploid	DLF Pickseed	98																										
LHT-102	tetraploid	Ampac Seed																											
Linn (certified)	diploid	Public	98	98	102		98	85	84	101	92	93	80	95	83	89	83	74	98	103	103	87	88				91(19)		
Manhattan	diploid	-																											
Matrix	diploid	Cropmark seeds																											
Maverick Gold	hybrid tetraploid	Ampac Seed	97																									71	84(2)
Melpetra	tetraploid	Hood River Seed															83												
Orantas	diploid	DLF Pickseed																											
Ortet	tetraploid	Oregro Seeds																											
PayDay	tetraploid	Mountain View Seeds																											
Polly II	tetraploid	FS Growmark																									110		
Polly Plus	hybrid tetraploid	Allied Seed	64																										
Power	tetraploid	Ampac Seed																											
Polim	tetraploid	DLF Pickseed																											
Quartermaster	tetraploid	Radix Research																											
Quartet	tetraploid	Ampac Seed	97																										
RAD-CPS212	hybrid tetraploid	Radix Research																											
RAD-MI125	hybrid tetraploid	Mountain View Seeds																											
Remington	tetraploid	Barenbrug USA																											103(6)

continued

**Table 15. Summary of Kentucky perennial ryegrass yield trials 2000-2021 (continued).**

Variety	Type	Proprietor	Lexington														Princeton			Mean <sup>3,4</sup> (#trials)			
			01 <sup>1,2</sup>	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18		19	00	02
			2yr <sup>5</sup>	2yr	3yr	3yr	2yr	3yr	3yr	3yr	3yr	2yr	3yr	3yr	2yr	3yr	2yr	3yr	2yr		3yr	2yr	3yr
Remington PLUS NEA2 <sup>6</sup>	tetraploid	Barenbrug USA											119	99				105	91				104(4)
Sierra	diploid	Lewis Seed Co.				89																	-
TetraGain	tetraploid	Pure Seed									111												-
TetraMag	tetraploid	Mountain View Seeds									110		136						121	118			123(6)
TetraSweet	tetraploid	Mountain View Seeds																	87	98			99(4)
Tonga	tetraploid	Kings AgriSeeds				96																	100(3)
Verseka	tetraploid	Allied Seed									75												-
Victorian	diploid	Caudill Seed																					94(2)
Yatsyn	diploid	Barenbrug USA											83								89		-

<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 forage yield between varieties. To find actual yields, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 2012 was harvested three years, so the final report would be "2015 Annual and Perennial Ryegrass and Festulolium Report" archived in the UK Forage website (<https://forages.ca.uky.edu>).

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

<sup>4</sup> In perennial ryegrass, low-yielding varieties usually result from winterkill or summer mortality.

<sup>5</sup> Number of years of data.

<sup>6</sup> Remington PLUS NEA2 contains a non-toxic (novel) endophyte.

<sup>7</sup> Type was not provided by the company.



**Table 16. Summary of Kentucky festulolium yield trials 2001-2021 (yield shown as a percentage of the mean of the commercial varieties in the trial).<sup>1</sup>**

Variety	Type <sup>2</sup>	Proprietor	Lexington														Mean <sup>5</sup> (#trials)		
			2001 <sup>3,4</sup>	2005	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2019				
			2yr <sup>6</sup>	3yr	3yr	3yr	3yr	3yr	2yr	3yr	2yr	3yr	3yr	3yr	2yr				
Agula	MF x IR	Allied Seed					94												-
Barfest	MF x PR	Barenbrug USA					105	101	107	119	91	92	92						101(7)
Bonus	MF x IR	Allied Seed					93	46	32	34									51(4)
Duo	MF x PR	Ampac Seed		89	98	99	95	106	103	96	96	83	83	80	98				94(12)
Felina	(TF x IR) x TF	DLF Pickseed	104				132	118	134	114	96								116(6)
Fojtan	(TF x IR) x TF	DLF Pickseed					112	101	124	92	72	94	100	108	82				98(9)
Gain	MF x IR	Allied Seed					103	77	52	75									77(4)
Hostyn	MF x IR	DLF Pickseed								107	110	106		108					108(4)
Hykor	(TF x IR) x TF	DLF Pickseed					133	141	153	131	119	121	112		93				125(8)
InaMerlin	MF x IR	Hood River Seed												88	77				83(2)
Kenfest	MF x AR	KY Agr. Exp Station													97				-
Lofa	(TF x Int) x Int	DLF Pickseed					105	107	110	128	112	91	109	108	104				108(9)
Mahulena	(TF x IR) x TF	DLF Pickseed								131	109	107		111	114				114(5)
Meadow Green	- <sup>7</sup>	Pure Seed								37	34								36(2)
Perseus	MF x IR	DLF Pickseed					132	114	126	123	110	109	105	112	116				116(9)
Perun	MF x IR	DLF Pickseed					127	114	107	131	110	102	99	110	107				112(9)
Rebab	(TF x IR) x TF	DLF Pickseed								94	77								86(2)
Spring Green	MF x PR	Turf-Seed	96	111	114	101	113	112	114	110	103	107	92	94	101				105(13)
Sweet Tart	MF x IR	ProSeeds Marketing			88		82	63	62										74(4)

<sup>1</sup> The festuloliums were in fescue trials from 2001-2005 and in perennial ryegrass trials from 2008-2009.

<sup>2</sup> MF = meadow fescue, TF = tall fescue, IR = Italian ryegrass, PR = perennial ryegrass, Int = intermediate ryegrass.

<sup>3</sup> Year trial was established.

<sup>4</sup> Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in forage yield between varieties.

To find actual yields, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 2012 was harvested three years, so the final report would be "2015 Annual and Perennial Ryegrass and Festulolium Report" archived in the UK Forage website (<https://forages.ca.uky.edu>).

<sup>5</sup> Mean only presented when respective variety was included in two or more trials.

<sup>6</sup> Number of years of data.

<sup>7</sup> Type was not provided by the company.

