University of Kentucky
College of Agriculture, Food and Environment
Agricultural Experiment Station

2020 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.

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. Two main types of annual ryegrasses are used. The most commonly used type in Kentucky is Italian ryegrass. The other is sometimes referred to as Westerwolds ryegrass. 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 current 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.

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). 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 less 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

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

	2017				2018				2019				2020[2]			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP[1]	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	40	+9	6.81	+3.95	31	0	2.01	-0.85	33	+2	4.11	+1.25	40	+9	3.72	+0.86
FEB	47	+12	4.46	+1.25	45	+10	9.77	+6.56	42	+7	7.64	+4.43	38	+3	5.14	+1.93
MAR	48	+4	3.34	-1.06	42	-2.	5.16	+0.76	43	-1	3.49	-0.91	51	+7	3.79	-0.61
APR	62	+7	4.17	+0.29	50	-5	5.52	+1.64	54	+4	4.76	+0.88	52	-3	4.92	+1.04
MAY	66	+2	7.74	+3.27	73	+9	8.39	+3.92	69	+5	4.49	+0.02	62	-2	5.69	+1.22
JUN	73	+1	7.68	+4.02	76	+4	6.42	+2.76	73	+1	6.13	+2.47	72	0	2.56	-1.10
JUL	76	0	4.49	-0.51	77	+1	6.15	+1.15	79	+3	3.30	-1.70	79	+3	3.23	-1.77
AUG	74	-1	6.66	+2.73	77	+2	6.45	+2.52	77	+2	2.42	-1.51	75	0	3.41	-0.52
SEP	69	+1	4.72	+1.52	74	+6	12.88	+9.68	77	+9	0.18	-3.02	68	0	4.43	-+0.83
OCT	60	+3	6.06	+3.49	59	+2	6.54	+3.97	61	+4	7.55	+5.58	57	0	4.98	+2.41
NOV	47	+2	3.09	-0.30	42	-3	5.64	+2.25	41	-4	5.39	+2.00				
DEC	35	-1	2.66	-1.32	40	+4	7.35	+3.37	43	+7	5.74	+1.76				
Total			61.88	+17.33			82.28	+37.73			55.20	+10.65			41.47	+4.29

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

adapted to Kentucky environmental conditions.

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

Table 2. Descriptive scheme for the stages of development in perennial forage grasses

Code	Description	Remarks
	Leaf development	
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	
	Sheath elongation	
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	
	Tillering (alternative to sheath elongation)	
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	
	Stem elongation	
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	
	Booting	
45	Boot swollen	
	Inflorescence emergence	
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	
	Anthesis	
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.
	Seed ripening	
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.

Description of the Tests

Data from nine studies are reported. Annual ryegrass tests were established in the fall of 2016, 2017, 2018, and 2019 at Lexington. Perennial ryegrass tests (2017, 2018, and 2019) and festulolium tests (2017 and 2019) were established at Lexington. The soil at Lexington is a well-drained silt loam (Maury) and is well suited for ryegrass production.

Seedings 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

Table 3. Dry matter yields, seedling vigor, plant height, maturity, and stand persistence of annual ryegrass varieties sown September 7, 2016, at Lexington, Kentucky (see Table 12 for designation of Italian or Westerwolds type and diploid or tetraploid type varieties).

Variety	Seedling Vigor[1] Oct 4, 2016	Plant Height (in) Apr 18, 2017	Maturity[2] 2017		Percent Stand 2016	Percent Stand 2017	Yield (tons/acre) 2017			
			Apr 18	May 18	Oct 4	Mar 14	Apr 18	May 18	Jun 20	Total
Commercial Varieties-Available for Farm Use										
Barmultra II	4.0	16	32.0	54.5	98	100	1.55	1.49	0.66	3.69*
Ugne	3.8	14	35.5	56.0	95	97	1.50	1.44	0.55	3.49*
Centurion	4.8	20	39.0	52.5	100	100	1.95	1.21	0.28	3.44*
Marshall	4.9	21	40.5	54.0	100	100	1.89	1.19	0.35	3.43*
Fria	4.8	20	42.0	53.5	100	100	1.90	1.01	0.46	3.36*
Jackson	4.6	20	40.5	54.0	99	99	1.82	1.21	0.30	3.34*
Nelson	4.8	19	37.5	56.5	98	99	1.67	1.19	0.45	3.32*
Frostproof	4.0	21	40.5	54.0	99	99	1.91	1.14	0.23	3.28*
TetraPrime	3.9	14	32.0	51.5	97	99	1.20	1.54	0.36	3.11
Gulf	4.9	21	45.0	56.5	99	99	1.77	0.94	0.27	2.98
Bruiser	5.0	21	40.5	53.0	100	100	1.86	0.92	0.19	2.96
Feast II	5.0	12	31.8	54.5	99	98	1.21	1.19	0.35	2.75
Experimental Varieties										
M2CVS	4.1	21	39.0	53.5	99	99	1.88	1.35	0.36	3.59*
ME94	4.9	22	43.5	54.0	100	100	1.96	1.06	0.29	3.31*
ME4	5.0	22	40.5	54.0	100	100	2.00	1.07	0.20	3.27*
PPG-LWT105	2.9	10	31.8	51.0	100	100	0.96	1.27	0.30	2.53
Mean	4.4	18	38.2	53.9	99	99	1.69	1.20	0.35	3.24
CV,%	7.4	7	7.0	3.2	1	1	9.20	18.95	37.75	9.28
LSD,0.05	0.5	2	3.8	2.5	2	2	0.22	0.32	0.19	0.43

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] 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.

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 11. Yields are given by cutting date for 2020 and as total annual production. Stated yields are adjusted for percent weeds; therefore, the 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 11).

Tables 15, 16, and 17 are summaries of yield data from 2001 to 2020 of commercial varieties that have been entered in the Kentucky trials. 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 Tables 15, 16, and 17 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

Table 4. Dry matter yields, winter injury, plant height, maturity, and stand persistence of annual ryegrass varieties sown September 8, 2017, at Lexington, Kentucky (see Table 12 for designation of Italian or Westerwolds type and diploid or tetraploid type varieties).

Variety	Winter Injury1 Jan 29	Plant Height (in) May 1	Maturity2 2018		Percent Stand 2017	Percent Stand 2018		Yield (tons/acre) 2018			
			May 1	May 22	Oct 31	Mar 14	May 4	May 1	May 22	Jun 14	Total
Commercial Varieties-Available for Farm Use											
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
Experimental Varieties											
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

[1] Winter injury score based on a scale of 1 to 9 with 9 being the greatest amount of injury.
[2] 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.

types. These details may influence variety choice, and the information can be found in the yearly reports. See the footnotes in Tables 15, 16, and 17 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 at www.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)

Authors

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Table 5. Dry matter yields, seedling vigor, winter injury, plant height, maturity and stand persistence of annual rygrass varieties sown September 4, 2018 at Lexington, Kentucky (see Table 12 for designation of Italian or Westerwolds type and diploid or tetraploid type varieties).

Variety	Seedling Vigor[1] Sep 28, 2018	Winter Injury[2] Feb 6, 2019	Plant Height(in) Apr 22, 2019	Maturity[3] 2019			Percent Stand 2018	Percent Stand 2019		Yield (tons/acre) 2019				
				Apr 22	May 14	Jun 5	Sep 28	Mar 22	Jul 16	Apr 22	May 14	Jun 5	Jul 2	Total
Commercial Varieties-Available for Farm Use														
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
Baqeuano	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
Experimental Varieties														
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

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Winter injury score based on a scale of 1 to 9 with 9 being the greatest amount of injury.
[3] 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 6. 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 12 for designation of Italian or Westerwolds type or diploid or tetraploid type varieties).

	Seedling Vigor[1]	Injury[2]	Plant Height (in)		Maturity[3]				Percent Stand		Yield (tons/acre)						
									2019	2020	2019	2020					
Variety	Oct 11, 2019	Dec 9, 2019	Apr 1	Apr 28	Apr 1	Apr 28	May 21	Jun 8	Oct 11	Mar 17	Nov 6	Apr 1	Apr 28	May 21	Jun 8	Jun 25	Total
Commercial Varieties-Available for Farm Use																	
Meroa	4.8	4	12	14	31.5	31.8	46.3	57.5	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	0.56	0.80	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,0.05	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

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Rating taken after a cold spell after the Nov 6, 2019 harvest.
[3] 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 7. Dry matter yields, seedling vigor, maturity, and stand persistence of perennial ryegrass varieties sown September 8, 2017, at Lexington, Kentucky (see Table 13 for designation of diploid or tetraploid varieties).

Variety	Seedling Vigor[1]	Maturity[2]					Percent Stand							Yield (tons/acre)						
		2018		2019		2020	2017	2018		2019		2020		2018	2019	2020				3-year
	Oct 12, 2017	May 9	Jun 15	May 14	Jun 10	May 18	Oct 12	Mar 14	Oct 19	Mar 22	Oct 25	Mar 17	Oct 27	Total	Total	May 18	Jun 17	Oct 22	Total	Total
Commercial Varieties-Available for Farm Use																				
TetraMag	4.4	45.0	60.0	45.0	62.0	45.0	100	100	100	99	86	81	64	4.75	1.49	0.81	0.49	0.18	1.48	7.72*
Remington	3.5	32.3	60.0	45.0	62.0	39.0	100	100	100	100	94	92	93	4.28	1.14	0.59	0.43	0.27	1.29	6.71*
PayDay	3.6	35.3	60.0	48.8	62.0	45.0	100	100	100	100	76	76	61	4.02	1.43	0.57	0.38	0.29	1.23	6.68*
TetraSweet	4.0	40.3	60.0	50.0	62.0	47.8	100	100	100	100	79	78	76	3.49	1.62	0.69	0.41	0.29	1.39	6.51
Calibra	3.8	41.8	59.5	47.5	62.0	46.3	100	100	100	100	77	74	59	3.58	1.40	0.42	0.47	0.21	1.10	6.08
BG34	4.0	32.0	58.0	46.3	62.0	43.5	100	100	99	96	29	24	14	3.28	1.10	0.36	0.25	0.17	0.79	5.16
Linn	4.1	47.5	60.0	58.0	60.0	54.8	100	100	83	83	43	28	14	2.72	1.26	0.42	0.06	0.11	0.60	4.58
Experimental Varieties																				
BARLP17237	3.4	35.3	60.0	45.0	60.0	42.0	100	100	100	100	91	91	90	4.05	1.35	0.60	0.63	0.27	1.51	6.90*
BARLM16238	4.5	36.5	59.5	53.5	62.0	49.0	100	100	99	90	51	46	48	3.21	1.26	0.52	0.34	0.23	1.09	5.57
BARLP17253	3.8	32.0	58.5	45.0	62.0	42.0	100	100	100	98	58	56	48	3.33	1.17	0.38	0.32	0.19	0.89	5.39
Mean	3.9	37.8	59.6	48.4	61.6	45.4	100	100	98	96	68	65	57	3.67	1.32	0.54	0.38	0.22	1.14	6.13
CV,%	11.6	13.1	1.4	2.8	0.0	8.7	0	0	3	4	25	27	32	16.35	17.65	39.67	35.77	35.79	26.61	13.03
LSD,0.05	0.7	7.2	1.2	2.0	0.0	5.7	0	0	5	6	25	25	26	0.82	0.34	0.31	0.20	0.12	0.44	1.16

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] 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 8. Dry matter yields, seedling vigor, maturity, and stand persistence of perennial ryegrass varieties sown September 4, 2018, at Lexington, Kentucky (see Table 13 for designation of diploid or tetraploid varieties).

Variety	Seedling Vigor[1]	Maturity[2]			Percent Stand					Yield (tons/acre)					
		2019		2020	2018	2019		2020		2019	2020				2-year
	Sep 28, 2018	May 13	Jun 10	May 18	Sep 28	Mar 22	Oct 18	Mar 17	Oct 27	Total	May 18	Jun 23	Oct 23	Total	Total
Commercial Varieties-Available for Farm Use															
TetraMag	5.0	47.5	61.5	45.0	100	100	99	99	87	2.76	1.21	0.49	0.34	2.04	4.80*
Linn	5.0	58.0	60.0	57.5	100	100	86	95	68	2.40	0.91	0.20	0.49	1.59	3.99
Remington PLUS NEA2[3]	4.3	45.0	62.0	40.5	100	100	100	100	97	2.33	0.79	0.50	0.37	1.66	3.99
Remington	4.6	45.0	62.0	39.0	100	100	100	100	98	2.23	0.78	0.44	0.42	1.65	3.88
PayDay	4.8	52.0	62.0	50.0	100	100	100	100	90	2.08	1.02	0.27	0.39	1.69	3.77
Calibra	5.0	48.8	62.0	46.3	100	100	100	100	87	2.02	0.73	0.33	0.31	1.37	3.38
TetraSweet	4.9	50.5	62.0	49.3	100	100	100	100	96	1.87	0.78	0.31	0.36	1.46	3.33
Experimental Varieties															
BARLPF253	4.3	49.3	60.0	46.3	100	100	100	100	82	1.79	0.70	0.35	0.36	1.41	3.21
Mean	4.7	49.5	61.4	46.7	100	100	98	99	88	2.18	0.87	0.36	0.38	1.61	3.79
CV,%	8.1	3.6	0.6	4.0	0	0	5	1	13	10.72	19.22	34.61	30.18	16.13	9.13
LSD,0.05	0.6	2.6	0.3	2.8	0	0	8	2	17	0.34	0.24	0.18	0.17	0.38	0.51

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] 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.
[3] 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 perennial ryegrass varieties sown August 30, 2019, at Lexington, Kentucky (see Table 13 for designation of diploid or tetraploid varieties).

Variety	Seedling Vigor[1] Oct 11, 2019	Plant Height (in) May 7	Maturity[2] 2020		Percent Stand 2019	Percent Stand 2020		Yield (tons/acre) 2020			
			May 7	Jun 17	Oct 11	Mar 17	Oct 27	May 7	Jun 17	Oct 23	Total
Commercial Varieties-Available for Farm Use											
Barvitra	4.5	26	49.8	58.0	100	100	76	3.10	1.28	0.20	4.58*
TetraMag	4.1	23	46.3	56.0	100	100	95	3.27	0.87	0.29	4.43*
Linn	4.6	30	54.0	58.0	100	100	98	3.22	0.61	0.18	4.01
Boost	3.5	21	48.5	56.5	100	100	100	2.96	0.73	0.29	3.98
TetraSweet	4.4	17	43.3	29.0	100	100	100	2.44	0.53	0.33	3.29
Power	4.4	17	40.5	29.0	100	100	100	2.55	0.48	0.21	3.23
Calibra	3.5	16	43.5	29.0	100	100	100	2.45	0.49	0.29	3.23
PayDay	4.6	17	42.0	29.0	100	100	100	2.39	0.52	0.25	3.16
Remington	2.9	15	39.0	29.0	100	100	100	2.11	0.61	0.25	2.97
Remington PLUS NEA2[3]	2.0	15	40.5	29.0	100	100	100	2.08	0.48	0.30	2.86
Experimental Varieties											
PI2B2	2.1	24	50.8	57.0	100	100	100	3.01	0.56	0.23	3.80
PPG-FPRT119	4.1	21	43.5	56.0	100	100	99	2.85	0.66	0.17	3.68
Mean	3.7	20	45.1	43.0	100	100	97	2.70	0.65	0.25	3.60
CV,%	20.3	7	6.5	0.1	0	0	4	8.50	20.05	40.51	8.80
LSD,0.05	1.1	2	4.2	0.6	0	0	6	0.33	0.19	0.15	0.46

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] 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.
[3] 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 10. Dry matter yields, seedling vigor, plant height, maturity, and stand persistence of festulolium varieties sown September 8, 2017, at Lexington, Kentucky (see Table 14 for ryegrass and fescue genetic background of these varieties).

Variety	Seedling Vigor[1] Oct 12, 2017	Plant Height (in) May 9, 2018	Maturity[2] 2018		2019		2020		Percent Stand 2017	2018		2019		2020		Yield (tons/acre) 2018	2019	2020				3-year Total
			May 9	Jun 15	May 14	Jun 10	May 11	Jun 8	Oct 12	Mar 14	Oct 19	Mar 22	Oct 25	Mar 17	Oct 27	Total	Total	May 11	Jun 8	Oct 22	Total	
Commercial Varieties-Available for Farm Use																						
Mahulena	2.0	25	56.0	29.0	60.0	29.0	56.5	29.0	100	100	100	100	100	100	100	3.83	1.52	1.31	0.45	0.57	2.33	7.68*
Perseus	3.0	19	40.5	58.5	50.3	61.5	39.0	61.0	100	100	58	46	48	49	36	4.15	1.91	0.78	0.52	0.19	1.49	7.54*
Perun	3.0	21	40.5	58.5	55.0	61.0	43.5	61.0	100	100	51	36	35	35	20	4.46	1.62	0.71	0.45	0.20	1.36	7.45*
Lofa	3.0	21	39.0	58.0	52.5	61.5	42.0	62.0	100	100	61	60	55	50	30	4.14	1.72	0.83	0.52	0.10	1.46	7.31*
Fojtan	2.0	16	48.8	29.0	58.0	29.0	54.0	29.0	100	100	100	100	100	100	100	3.67	1.40	1.15	0.43	0.65	2.23	7.30*
Kenfest	2.8	19	37.3	56.5	51.5	62.0	40.5	61.0	100	100	87	87	48	37	24	3.88	1.47	0.66	0.49	0.04	1.18	6.53
SpringGreen	3.0	16	42.0	58.5	52.0	62.0	40.5	62.0	100	100	97	96	74	74	70	3.38	1.50	0.82	0.51	0.15	1.48	6.36
Duo	4.3	19	47.0	60.0	51.0	62.0	30.2	61.0	100	94	95	87	54	55	38	3.06	1.27	0.45	0.43	0.19	1.07	5.40
InaMerlin	3.8	23	41.8	60.0	56.0	61.3			100	100	31	23	4	2	1	4.12	1.06	0.00	0.00	0.00	0.00	5.17
Experimental Varieties																						
KYFL1301	3.3	19	39.0	58.0	50.3	62.0	43.5	60.0	100	100	93	96	81	79	63	4.91	2.08	1.16	0.64	0.18	1.99	8.98*
Mean	3.0	20	43.2	52.6	53.7	55.0	43.3	54.0	100	99	77	73	60	58	48	3.96	1.56	0.81	0.45	0.23	1.50	7.02
CV,%	14.1	14	9.4	1.9	3.8	1.0	14.5	2.6	0	3	31	33	34	34	39	17.85	26.69	47.57	34.06	49.04	29.89	19.67
LSD,0.05	0.6	4	5.9	1.5	3.0	0.8	9.2	2.1	0	4	35	35	29	28	27	1.03	0.60	0.57	0.22	0.16	0.66	2.04

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] 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. Dry matter yields, seedling vigor, plant height, maturity, and stand persistenxce of festulolium varieties sown August 30, 2019, at Lexington, Kentucky (see Table 14 for ryegrass and fescue genetic background of these varieties).

Variety	Seedling Vigor[1] Oct 11, 2019	Plant Height (in) Apr 29	Maturity[2] 2020		Percent Stand 2019	Percent Stand 2020		Yield (tons/acre) 2020			
			Apr 29	Jun 8	Oct 11	Mar 17	Oct 27	Apr 29	Jun 8	Oct 23	Total
Commercial Varieties-Available for Farm Use											
Perseus	5.0	19	40.5	58.0	100	100	94	3.20	1.59	0.67	5.46*
Perun	4.0	19	43.5	59.0	100	100	97	2.65	1.49	0.56	4.71*
Lofa	5.0	21	42.0	58.0	100	100	78	2.82	1.46	0.32	4.60
SpringGreen	4.8	26	45.0	61.0	100	100	98	2.88	1.30	0.42	4.60
Duo	5.0	26	43.5	62.0	100	100	70	2.67	1.32	0.45	4.43
Hykor	2.0	23	45.0	29.0	100	100	100	1.74	0.67	1.05	3.46
Fojtan	2.3	14	40.3	29.0	100	98	98	1.26	0.76	0.81	2.83
Experimental Varieties											
ORRUS	4.1	16	38.8	58.0	100	100	98	2.50	1.21	0.52	4.23
Mean	4.0	20	42.3	51.8	100	100	92	2.47	1.22	0.60	4.29
CV,%	13.2	13	10.0	1.5	0	1	8	13.65	13.30	36.43	11.95
LSD,0.05	0.8	4	6.2	1.2	0	1	11	0.50	0.24	0.32	0.75

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] 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 12. Proprietors and type information of annual ryegrass varieties in current trials.

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

[1] Type was not provided by the company.

Table 13. Proprietors and type information of perennial ryegrass varieties in current trials.

Variety	Type	Proprietor/KY Distributor
Commercial Varieties-Available for Farm Use		
Barvitra	tetraploid	Barenbrug USA
BG34	diploid	
Boost	tetraploid	Allied Seed
Calibra		DLF Pickseed
Elena		Allied Seed
Linn (certified)	diploid	Public
Melpetra	tetraploid	Hood River Seed
PayDay		Mountain View Seeds
Power		Allied Seed
Remington		Barenbrug USA
Remington PLUS NEA2		
TetraMag		Mountain View Seeds
TetraSweet		
Experimental Varieties		
BARLP16238	diploid	Barenbrug USA
BARLP17237	tetraploid	
BARLP17253	diploid	
BARLPF253	- -[1]	
PI2B2	diploid	Oregro Seeds
PPG-FPRT119	tetraploid	Mountain View Seeds

[1] Type was not provided by the company.

Table 14. Proprietors and genetic background of festulolium varieties in current trials.

Variety	Type[1]	Proprietor/KY Distributor
Commercial Varieties-Available for Farm Use		
Duo	MF x PR	Ampac Seed
Fojtan	(TF x IR) x TF	DLF Pickseed
Hykor		
InaMerlin	MF x IR	Hood River Seed
Kenfest	MF xAR	KY Agric. Exp. Station
Lofa	(TF x Int) x Int	DLF Pickseed
Mahulena	(TF x IR) x TF	
Perseus	MF x IR	
Perun		
Spring Green	MF x PR	Turf Seed
Experimental Varieties		
KYFL1301	MF x AR	KY Agric. Exp. Station
ORRUS	- -[2]	Oregro Seeds

[1] MF=meadow fescue, TF=tall fescue, IR=Italian ryegrass, PR=perennial ryegrass, Int=intermediate ryegrass, AR=annual ryegrass.
[2] Type was not provided by the company.

Table 15. Summary of Kentucky annual ryegrass yield trials 2003-2020 (yield shown as a percentage of the yield value of Marshall).

Variety	Type	Proprietor	Lexington[1]																			Mean[4] (#trials)
			03[2,3]	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					52	69					92	91(3)
Baqeuano	Westerwold tetraploid	Smith Seed Services																		77		–
Barmultra II	Italian tetraploid	Barenbrug USA								133				103	95		125	108				117(4)
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	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																		84		–
Dyna-Gain	Westerwold diploid	Columbia Seeds													71							–
Ed	Westerwold diploid	Smith Seed Services								96					101	100						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			93	95(2)
GR-AS10	Italian	Ampac Seed								113												–
Graze-N-Gro	Westerwold diploid	Seed Research of OR	114				67															91(2)
Green Farm	Westerwold diploid	Smith Seed Services														85						–
Gulf	Westerwold diploid	Public					67	26	87	78		76	72		27	69	60	87	87	56	80	70(12)
Hellen	Westerwold tetraploid	Smith Seed Services																			95	–
Hercules	Westerwold tetraploid	Barenbrug USA												91	68							–
HS-1	Italian diploid	KB SeedSolutions								72												–
Jackson	Westerwold diploid	The Wax Co.		66	100	62	103	59	101	99	106	106	91	77	69	100	99	97	105	95	95	94(16)
Jumbo	Westerwold tetraploid	Barenbrug USA	112																88	83		94(3)
KB Royal	Italian diploid	KB SeedSolutions								83												–
Koga	Westerwold tetraploid	Smith Seed Services																	94	96	101	97(3)
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(17)
Master	Westerwold tetraploid	Smith Seed Services																		82		–
Maximo	Intermediate tetraploid	Pickseed USA, Inc.										101										–
Maximus	Westerwold tetraploid	Barenbrug USA																	63	84		74(2)
Melquatro	Italian tetraploid	Hood River Seed															135		72			104(2)

continued

Table 15. continued

Variety	Type	Proprietor	Lexington[1]																		Mean[4] (#trials)
			03[2,3]	04	05	06	07	08	09	10	10	11	12	12	13	14	15	16	17	18	19	
Meroa	Westerwold diploid	Smith Seed Services														93	102				108	101(3)
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										–
Rapido	Westerwold diploid	Smith Seed Services																			77	–
Spark	tetraploid	DLF Pickseed																				–
Stockaid	diploid	–				82																–
Striker	Westerwold tetraploid	Seed Research of OR					90															–
TAMTBO	Westerwold tetraploid	Tex. Ag Exp Sta.						47		101		108	95			79				91		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)

[1] 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.
[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 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 1 year, so the final report would be "2016 Annual and Perennial Ryegrass and Festulolium Report" archived in the UK Forage website at <forages.ca.uky.edu>.
[4] Mean only presented when respective variety was included in two or more trials.
[5] Type was not provided by the company.

Table 16. Summary of Kentucky perennial ryegrass yield trials 2000-2020 (yield shown as a percentage of the mean of the commercial varieties in the trial).

			Lexington																	Princeton		Bowling Green		Mean[3,4] (#trials)
			01[1,2]	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	00	02	00	03	
Variety	Type	Proprietor	2yr[5]	2yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	2yr	3yr	3yr	2yr	2yr	3yr	2yr	2yr	
Aires	diploid	Ampac Seed	95																		93			94(2)
Albion	tetraploid	Grasslands Oregon													105	103								104(2)
Amazon	tetraploid	AgriBioTech			99																107			103(2)
Anaconda	tetraploid	Caudill Seed																		95		103		99(2)
Aubisque	tetraploid	Seed Research of OR		144																			99	122(2)
Bandit	tetraploid	Grassland West																		106		114		110(2)
Barvitra	diploid	Barenbrug USA														104								–
Bastion C-2	tetraploid	Seed Research of OR			91																			–
Bestfor	tetraploid	Improved Forages																		113	107	120		113(3)
Best for Plus	hybrid tetraploid	Improved Forages		116	108	118																	136	120(4)
BG-34	diploid	Barenbrug USA				83	85				86		87	84	85	81		83						84(8)
Bison	hybrid tetraploid	International Seeds																					140	–
Boost	tetraploid	Allied Seed						130	125	120	143	110	103	102										119(7)
Boxer	tetraploid	AgriBioTech																		106				–
Calibra	tetraploid	DLF Pickseed							96	109	81	99	103	96	87	100	98	98	87		112			96(12)
CAS MP64	diploid	Cascade International	97																					–
Citadel	tetraploid	Ag Canada																		94	113	103		103(3)
Crave	tetraploid	Ampac Seed											95											–
Derby	- -[7]	Public																				74		–
Elena DS	tetraploid	Allied Seed											110				110							110(2)
Eurostar	tetraploid	Seed Research of OR						112																–
Everlast	diploid	Caudill Seed												104										–
Feeder	diploid	Seed Research of OR						76																–
Grand Daddy	tetraploid	Smith Seed	118				101	109		76	92	84	86		107						111			98(9)
Green Gold	tetraploid	Grasslands Oregon					96																	–
Herbal	–	ProSeeds Marketing							77															–
Impressario	tetraploid	DLF Pickseed								107			92											100(2)
Kentaur	tetraploid	DLF Pickseed										106		117										112(2)
Lactal	tetraploid	Brett Young								102														–
Lasso	diploid	DLF Pickseed	98																					–
LHT-102	tetraploid	Ampac Seed											114											–
Linn (certified)	diploid	Public	98	98	102		98	85	84	101	92	93	80	95	83	89	83	74	103	87	88	77		90(19)
Manhatten	diploid	–																			85			–
Mara	diploid	Barenbrug USA																				85		–
Matrix	diploid	Cropmark seeds		77																			64	–
Maverick Gold	hybrid tetraploid	Ampac Seed	97																		71			84(2)
Melpetra	tetraploid	Hood River Seed															83							–
Orantas	diploid	DLF Pickseed								82														–
Ortet	tetraploid	Oregro Seeds							114															–
PayDay	tetraploid	Mountain View Seeds											101	103	99		87	108	97					99(6)
Polly II	tetraploid	FS Growmark																		110		125		118(2)
Polly Plus	hybrid tetraploid	Allied Seed		64																			60	62(2)
Power	tetraploid	Ampac Seed						110	103	102	100	109	104	95	101	107								104(9)
Polim	tetraploid	DLF Pickseed									106													–

continued

Table 16. (continued

Variety	Type	Proprietor	Lexington																	Princeton		Bowling Green		Mean[3,4] (#trials)
			01[1,2]	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	00	02	00	03	
			2yr[5]	2yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	2yr	3yr	3yr	2yr	2yr	3yr	2yr	2yr	
Quartermaster	tetraploid	Radix Research				122																		–
Quartet	tetraploid	Ampac Seed	97			56		46													113			78(4)
RAD-CPS212	hybrid tetraploid	Radix Research				134																		–
RAD-MI125	hybrid tetraploid	Mountain View Seeds					120																	–
Remington	tetraploid	Barenbrug USA													95	117	109	108	100					106(5)
Remington PLUS NEA2[6]	tetraploid	Barenbrug USA													119	99			103					107(3)
Sierra	diploid	Lewis Seed Co.				89																		–
TetraGain	tetraploid	Pure Seed											111											–
TetraMag	tetraploid	Mountain View Seeds											110		136		127	124	123					124(5)
TetraSweet	tetraploid	Mountain View Seeds															104	105	86					98(3)
Tonga	tetraploid	Kings AgriSeeds				96				103														100(3)
Verseka	tetraploid	Allied Seed											75											–
Victorian	diploid	Caudill Seed												104	83									94(2)
Yatsyn	diploid	Barenbrug USA																		89				–

[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 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 3 years, so the final report would be "2015 Annual and Perennial Ryegrass and Festulolium Report" archived in the UK Forage website at <forages.ca.uky.edu>.
[3] Mean only presented when respective variety was included in two or more trials.
[4] In perennial ryegrass, low yielding varieties usually result from winterkill or summer mortality.
[5] Number of years of data
[6] Remington PLUS NEA2 contains a non-toxic (novel) endophyte.
[7] Type was not provided by the company.

Table 17. Summary of Kentucky festulolium yield trials 2001-2020 (yield shown as a percentage of the mean of the commercial varieties in the trial).[1]

			Lexington												
			2001[3,4]	2005	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Mean[5]
Variety	Type[2]	Proprietor	2yr[6]	3yr	3yr	3yr	3yr	3yr	2yr	3yr	2yr	3yr	3yr	3yr	(#trials)
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	93(11)
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	100(8)
Gain	MF x IR	Allied Seed					103	77	52	75					77(4)
Hostyn	MF xIR	DLF Pickseed							107	110	106		108		108(4)
Hykor	(TF x IR) x TF	DLF Pickseed					133	141	153	131	119	121	112		130(7)
InaMerlin	MF x IR	Hood River Seed											88	77	83(2)
Kenfest	MFx AR	KY Agr. Exp Station												97	–
Lofa	(TF x Int) x Int	DLF Pickseed					105	107	110	128	112	91	109	108	109(8)
Mahulena	(TF x IR) x TF	DLF Pickseed							131	109	107		111	114	114(5)
Meadow Green	- -[7]	Pure Seed							37	34					36(2)
Perseus	MF x IR	DLF Pickseed					132	114	126	123	110	109	105	112	116(8)
Perun	MF x IR	DLF Pickseed					127	114	107	131	110	102	99	110	113(8)
Rebab	(TFxIR) xTF	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	106(12)
Sweet Tart	MF x IR	ProSeeds Marketing			88		82	63	62						74(4)

[1] The festuloliums were in fescue trials from 2001-2005 and in perennial ryegrass trials from 2008-2009.
[2] MF = meadow fescue, TF = tall fescue, IR = Italian ryegrass, PR = perennial ryegrass, Int = intermediate ryegrass.
[3] Year trial was established.
[4] 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 3 years, so the final report would be "2015 Annual and Perennial Ryegrass and Festulolium Report" archived in the UK Forage website at <forages.ca.uky.edu>.
[5] Mean only presented when respective variety was included in two or more trials.
[6] Number of years of data
[7] Type was not provided by the company.

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