



2019 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

Table 1. Temperature and rainfall at Lexington, Kentucky, in 2016, 2017, 2018, and 2019

	2016				2017				2018				2019 ²			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP ¹	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	32	+1	0.80	-2.06	40	+9	6.81	+3.95	31	0	2.01	-0.85	33	+2	4.11	+1.25
FEB	38	+3	6.09	+2.88	47	+12	4.46	+1.25	45	+10	9.77	+6.56	42	+7	7.64	+4.43
MAR	52	+8	4.07	-0.33	48	+4	3.34	-1.06	42	-2	5.16	+0.76	43	-1	3.44	-0.91
APR	57	+2	3.97	+0.09	62	+7	4.17	+0.29	50	-5	5.52	+1.64	54	+4	4.76	+0.88
MAY	64	0	9.17	+4.70	66	+2	7.74	+3.27	73	+9	8.39	+3.92	69	+5	4.49	+0.02
JUN	76	+4	5.09	+1.43	73	+1	7.68	+4.02	76	+4	6.42	+2.76	73	+1	6.13	+2.47
JUL	79	+3	7.43	+2.43	76	0	4.49	-0.51	77	+1	6.15	+1.15	79	+3	3.30	-1.70
AUG	79	+4	4.37	+0.44	74	-1	6.66	+2.73	77	+2	6.45	+2.52	77	+2	2.42	-1.51
SEP	74	+6	2.18	-1.02	69	+1	4.72	+1.52	74	+6	12.88	+9.68	77	+9	0.18	-3.02
OCT	64	+7	0.37	-2.20	60	+3	6.06	+3.49	59	+2	6.54	+3.97	61	+4	8.15	+5.58
NOV	51	+6	1.94	-1.45	47	+2	3.09	-0.30	42	-3	5.64	+2.25				
DEC	37	+1	9.4	+5.42	35	-1	2.66	-1.32	40	+4	7.35	+3.37				
Total			54.88	+10.33			61.88	+17.33			82.28	+37.73			44.67	+7.49

¹ DEP is departure from the long-term average.

² 2019 data is for ten months through October.

but some of the newer varieties are more 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 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. The endophyte level will be stated on a green tag on every bag of seed. 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 nine studies are reported. Annual ryegrass tests were established in the fall of 2015, 2016, 2017, and 2018

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.

at Lexington. Perennial ryegrass tests (2016, 2017, and 2018) and festulolium tests (2016 and 2017) 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

Table 3. Dry matter yields, seedling vigor, winter injury, plant height, maturity, and stand persistence of annual ryegrass varieties sown September 3, 2015, at Lexington, Kentucky (see Table 12 for designation of Italian or Westerwolds type and diploid or tetraploid type varieties)

Variety	Seedling Vigor ¹ Oct 15,2015	Winter Injury ² Jan 29	Plant Height (in) Apr 18	Maturity ³			Percent Stand				Yield (tons/acre)						
				2016			2015	2016			2015		2016				
				Apr 18	May 13	Jun 9	Oct 15	Mar 18	Jul 5	Aug 5	Nov 23	Dec 17	Apr 18	May 13	Jun 9	Jul 5	Total
Commercial Varieties-Available for Farm Use																	
Melquatro	4.4	2.3	14	31.8	52.0	56.0	100	100	100	100	0.75	0.45	1.93	2.07	1.32	0.33	6.85*
Barmultra II	3.5	2.3	15	32.5	51.0	55.0	100	100	100	100	0.95	0.57	2.10	1.45	0.93	0.37	6.36*
Nelson	4.8	5.5	13	31.8	56.0	56.0	100	56	45	1	1.10	0.91	0.78	1.42	0.99	0.16	5.35
TetraPrime	1.9	0.9	14	32.0	50.0	51.0	99	100	100	100	0.26	0.42	1.64	1.90	0.59	0.46	5.27
Meroa	4.1	3.5	14	32.0	53.5	59.0	100	99	94	94	0.74	0.57	1.41	1.46	0.81	0.20	5.20
Oryx	4.1	4.3	13	31.3	51.0	56.5	100	100	99	96	0.79	0.52	1.40	1.35	0.74	0.28	5.08
Marshall	3.8	1.1	18	32.0	52.5	55.0	99	99	44	0	0.95	0.54	1.57	1.36	0.59	0.08	5.08
Jackson	3.6	4.3	15	32.0	53.5	55.5	100	97	14	0	0.91	0.68	1.40	1.38	0.61	0.04	5.02
Kowinearly	2.0	2.8	16	32.0	56.0	57.0	100	99	43	0	0.48	0.73	1.59	1.26	0.73	0.09	4.88
Bruiser	4.1	4.0	16	32.0	55.5	57.0	100	97	78	4	0.69	0.71	1.26	1.41	0.68	0.07	4.81
Kospeed	3.3	4.5	15	32.5	54.5	57.5	100	87	15	1	0.92	0.61	1.36	1.24	0.49	0.07	4.68
Feast II	4.1	9.0	6	29.0	54.0	58.0	100	13	48	35	0.55	0.80	0.33	1.36	1.11	0.29	4.45
Fria	3.3	5.3	15	31.8	55.5	55.5	100	90	19	0	0.65	0.72	0.92	1.30	0.70	0.04	4.33
Gulf	4.6	9.0	5	29.5	56.5	60.0	100	6	1	1	0.62	0.77	0.23	0.86	0.54	0.01	3.03
Experimental Varieties																	
BAR LM 15425	1.8	1.8	17	32.3	52.0	57.5	99	100	98	94	0.38	0.61	2.08	1.66	1.06	0.35	6.14*
BAR LM 15426	1.5	1.5	17	32.5	52.0	55.5	95	95	96	68	0.45	0.61	1.73	1.79	0.87	0.30	5.75
BAR LM 15427	1.6	0.9	17	32.3	52.5	57.0	100	100	100	94	0.43	0.62	1.82	1.66	0.83	0.38	5.75
BAR LM 15371	2.1	2.5	15	32.0	53.0	55.0	99	100	100	99	0.47	0.43	1.78	1.50	0.91	0.34	5.44
ME4	3.6	2.5	19	32.5	53.0	56.0	100	100	60	0	0.90	0.52	1.72	1.39	0.53	0.13	5.19
M2CVS	3.5	0.8	19	32.5	51.0	56.5	99	100	61	1	0.77	0.57	1.56	1.30	0.85	0.13	5.18
ME94	5.0	3.8	16	32.3	54.5	55.5	100	100	39	1	0.83	0.69	1.52	1.16	0.73	0.06	4.99
PPG-TAR113	1.3	1.8	11	31.3	54.0	57.0	100	100	90	38	0.07	0.09	0.88	1.42	0.70	0.31	3.48
Mean	3.3	3.4	14	32.0	53.0	56.0	99	88	66	42	0.67	0.60	1.41	1.44	0.79	0.20	5.11
CV,%	15.9	37.2	12	2.0	3.0	2.0	2	9	24	21	36.33	27.67	25.23	18.22	35.21	43.96	14.14
LSD,0.05	0.7	1.8	2	1.0	2.0	2.0	3	11	22	12	0.34	0.23	0.50	0.37	0.39	0.13	1.02

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.

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 11. Yields are given by cutting date for 2019 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 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 1999 to 2019 of com-

Table 4. 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		Percent Stand		Yield (tons/acre)			
			2017		2016	2017	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*
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*
SARG-FL	4.0	21	40.5	54.0	99	99	1.91	1.14	0.23	3.28*
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.

mercial 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 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 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)

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Table 5. 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 Injury ¹ Jan 29	Plant Height (in) May 1	Maturity ²		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
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.

Table 6. 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			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
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
Baqueano	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
BARHAO	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 7. Dry matter yields, seedling vigor, maturity, and stand persistence of perennial ryegrass varieties sown September 7, 2016, at Lexington, Kentucky (see Table 13 for designation of diploid or tetraploid varieties)

Variety	Seedling Vigor ¹ Oct 5, 2016	Maturity ²						Percent Stand						Yield (tons/acre)							
		2017		2018		2019		2016		2017		2018		2019		2017		2018		2019	
		May 15	Jun 26	May 22	May 22	May 14	Jun 6	Oct 5	Mar 14	Oct 31	Mar 20	Oct 19	Mar 22	Oct 25	May 14	Jun 6	May 14	Jun 6	May 14	Jun 6	Total
Commercial Varieties-Available for Farm Use																					
TetraMag	4.4	52.5	58.0	53.5	45.0	62.0	100	100	97	59	89	89	38	0.92	0.54	1.46	9.30*				
Elena	4.0	54.0	57.0	53.0	49.0	61.5	100	100	98	84	71	67	16	0.76	0.43	1.19	8.00*				
Remington	4.3	46.8	29.0	44.8	45.0	59.0	100	100	100	98	90	94	50	0.67	0.58	1.25	7.92*				
TetraSweet	4.8	51.5	29.0	51.8	51.0	62.0	100	100	99	93	89	89	41	0.86	0.44	1.30	7.56				
Calibra	4.0	50.5	29.0	53.0	48.8	62.0	100	100	99	89	69	70	15	0.75	0.54	1.29	7.14				
PayDay	4.3	52.5	29.0	53.0	50.0	62.0	100	100	99	85	86	88	22	0.59	0.43	1.02	6.38				
Linn	4.4	58.0	29.0	62.0	57.5	60.7	100	100	100	96	48	46	5	0.83	0.18	1.01	6.06				
Melpetra	3.1	46.3	29.0	39.0	45.0	57.5	100	100	99	35	38	38	10	0.46	0.42	0.88	6.03				
Experimental Varieties																					
BARLP15261	4.0	46.3	29.0	40.5	45.0	50.5	100	100	100	98	98	99	54	0.52	0.57	1.09	7.97*				
BARLP16237	3.8	45.0	29.0	39.0	45.0	57.0	100	100	100	97	98	98	58	0.46	0.37	0.83	6.97				
BARLP16238	4.0	55.5	29.0	56.0	51.3	62.0	100	100	100	71	40	41	17	0.48	0.33	0.83	6.33				
BARLP15COW	4.1	55.0	29.0	55.5	51.0	62.0	100	100	100	71	38	37	16	0.33	0.40	0.79	6.01				
Mean	4.1	51.1	33.8	50.1	48.7	59.8	100	100	99	81	71	71	28	0.64	0.43	1.08	7.14				
CV%	14.9	3.5	1.0	5.1	3.5	8.4	0	0	1	13	32	35	75	33.87	28.70	29.06	15.09				
LSD _{0.05}	0.9	2.6	0.5	3.7	2.5	7.3	0	0	2	15	33	36	30	0.31	0.18	0.45	1.55				

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 8, 2017, at Lexington, Kentucky (see Table 13 for designation of diploid or tetraploid varieties)

Variety	Seedling Vigor ¹ Oct 12, 2017	Maturity ²				Percent Stand					Yield (tons/acre)				2-year Total
		2018		2019		2017	2018		2019		2018	2019			
		May 9	Jun 15	May 14	Jun 10	Oct 12	Mar 14	Oct 19	Mar 22	Oct 25	Total	May 14	Jun 10	Total	
Commercial Varieties-Available for Farm Use															
TetraMag	4.4	45.0	60.0	45.0	62.0	100	100	100	99	86	4.75	0.78	0.70	1.49	6.24*
PayDay	3.6	35.3	60.0	48.8	62.0	100	100	100	100	76	4.02	0.81	0.62	1.43	5.45*
Remington	3.5	32.3	60.0	45.0	62.0	100	100	100	100	94	4.28	0.63	0.51	1.14	5.41*
TetraSweet	4.0	40.3	60.0	50.0	62.0	100	100	100	100	79	3.49	0.96	0.66	1.62	5.12
Calibra	3.8	41.8	59.5	47.5	62.0	100	100	100	100	77	3.58	0.83	0.57	1.40	4.98
BG34	4.0	32.0	58.0	46.3	62.0	100	100	99	96	29	3.28	0.66	0.44	1.10	4.38
Linn	4.1	47.5	60.0	58.0	60.0	100	100	83	83	43	2.72	0.94	0.32	1.26	3.98
Experimental Varieties															
BARLP17237	3.4	35.3	60.0	45.0	60.0	100	100	100	100	91	4.05	0.85	0.50	1.35	5.40*
BARLP17253	3.8	32.0	58.5	45.0	62.0	100	100	100	98	58	3.33	0.72	0.45	1.17	4.50
BARLP16238	4.5	36.5	59.5	53.5	62.0	100	100	99	90	51	3.21	0.75	0.51	1.26	4.47
Mean	3.9	37.8	59.6	48.4	61.6	100	100	98	96	68	3.67	0.79	0.53	1.32	4.99
CCV,%	11.6	13.1	1.4	2.8	0.0	0	0	3	4	25	15.36	20.43	28.25	17.65	11.59
LSD,0.05	0.7	7.2	1.2	2.0	0.0	0	0	5	6	25	0.82	0.24	0.22	0.34	0.84

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 9. 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 Sep 28, 2018	Maturity ²		Percent Stand			Yield (tons/acre)		
		2019		2018	2019		2019		
		May 13	Jun 10	Sep 28	Mar 22	Oct 18	May 13	Jun 10	Total
Commercial Varieties-Available for Farm Use									
TetraMag	5.0	47.5	61.5	100	100	99	1.87	0.89	2.76*
Linn	5.0	58.0	60.0	100	100	86	2.01	0.38	2.40
Remington	4.4	45.0	62.0	100	100	100	1.60	0.68	2.28
PayDay	4.8	52.0	62.0	100	100	100	1.58	0.50	2.08
Calibra	5.0	48.8	62.0	100	100	100	1.41	0.61	2.02
TetraSweet	4.9	50.5	62.0	100	100	100	1.45	0.42	1.87
Experimental Varieties									
BARLPF253	4.3	49.3	60.0	100	100	100	1.44	0.35	1.79
Mean	4.7	49.5	61.4	100	100	98	1.62	0.56	2.18
CV,%	8.3	3.5	0.6	0	0	5	12.88	27.07	10.57
LSD,0.05	0.6	2.4	0.5	0	0	7	0.30	0.22	0.33

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 10. Dry matter yields, seedling vigor, maturity, and stand persistence of festulolium varieties sown September 7, 2016, at Lexington, Kentucky (see Table 14 for ryegrass and fescue genetic background of these varieties)

Variety	Seedling Vigor ¹		Maturity ²						Percent Stand						Yield (tons/acre)						3-year Total						
	Oct 5, 2016		2017		2018		2019		2016		2017		2018		2019		2018		2019			2019					
	May 11	Jun 20	May 22	Jun 10	May 14	Jun 10	Oct 5	Oct 19	Mar 14	Oct 31	Mar 15	Oct 19	Mar 22	Oct 25	May 14	Jun 10	May 14	Jun 10	May 14	Jun 10		May 14	Jun 10				
Commercial Varieties-Available for Farm Use																											
Hykor	2.3	59.0	29.0	29.0	62.0	58.5	29.0	29.0	100	100	100	100	100	100	100	100	100	100	100	100	3.18	5.56	3.18	1.26	0.49	1.76	10.50*
Mahulena	2.6	60.0	29.0	29.0	62.0	60.0	29.0	29.0	100	100	100	100	100	100	100	100	100	100	100	100	3.37	5.45	3.37	1.00	0.56	1.55	10.38*
Lofa	4.5	50.5	62.0	49.8	55.0	61.5	60.0	61.5	100	99	80	94	91	21	5.78	2.71	1.02	0.68	1.70	10.20*							
Hostyn	2.5	54.0	62.0	55.0	56.5	60.0	60.0	60.0	100	98	53	65	60	21	6.33	2.39	0.90	0.53	1.44	10.15*							
Perseus	4.8	48.8	62.0	47.5	52.5	47.5	62.0	62.0	100	99	79	93	90	31	6.00	2.53	0.74	0.60	1.34	9.87*							
Fojtan	1.9	56.5	29.0	57.0	59.5	57.0	29.0	29.0	100	100	100	100	100	100	5.16	2.35	1.31	0.52	1.83	9.34*							
Perun	4.1	50.5	62.0	52.0	54.5	52.0	62.0	62.0	100	97	71	91	89	33	5.51	2.27	0.89	0.60	1.49	9.27*							
Barfest	3.1	48.8	57.0	50.5	52.0	50.5	62.0	62.0	100	100	89	100	100	53	4.92	2.21	0.98	0.52	1.50	8.63							
Spring Green	4.0	55.0	62.0	53.5	53.5	50.0	61.5	61.5	100	99	97	99	99	63	4.75	2.36	0.99	0.52	1.51	8.62							
InaMerlin	4.0	52.5	61.0	54.0	57.0	54.0	61.0	61.0	100	99	6	35	38	4	4.92	1.62	1.13	0.52	1.65	8.19							
Duo	3.8	57.5	62.0	51.0	53.0	51.0	62.0	62.0	99	100	95	98	98	53	4.23	2.17	1.04	0.36	1.40	7.79							
Experimental Varieties																											
KYFL1301	4.3	47.5	61.0	53.5	53.5	47.5	61.5	61.5	100	100	86	99	99	38	5.53	2.96	1.30	0.57	1.87	10.36*							
ORBSTFEST	3.1	48.8	58.5	54.0	54.0	50.3	61.5	61.5	100	99	93	92	90	23	4.55	2.45	1.23	0.51	1.74	8.75							
ORRUFEST	3.3	50.5	59.5	51.0	51.0	46.3	61.5	61.5	100	99	70	94	94	29	4.99	2.20	0.95	0.55	1.50	8.69							
KYFL1013	3.5	47.5	56.0	52.5	52.5	46.3	62.0	62.0	100	100	96	100	99	48	4.55	2.09	1.00	0.41	1.40	8.05							
PPGFEST-102	3.0	55.0	62.0	51.0	51.0	49.8	62.0	62.0	100	99	89	97	97	36	4.42	2.01	0.69	0.44	1.13	7.56							
Mean	3.4	52.6	54.6	55.0	55.0	51.6	55.5	55.5	100	99	81	91	90	47	5.17	2.43	1.03	0.52	1.55	9.15							
CV%	20.6	3.3	2.3	2.9	2.9	4.3	1.1	1.1	0	1	10	8	9	31	12.41	16.73	25.90	32.49	23.46	10.92							
LSD,0.05	1.0	2.5	1.8	2.2	2.2	3.2	0.9	0.9	0	1	12	11	11	21	0.91	0.58	0.38	0.24	0.52	1.42							

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, 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						Percent Stand						Yield (tons/acre)								
			2018			2019			2017			2018			2019			2018			2019		
			May 9	Jun 15	May 14	Jun 10	Oct 12	Oct 25	Mar 14	Oct 19	Mar 22	Oct 25	Mar 14	Oct 19	Mar 22	Oct 25	May 14	Jun 10	May 14	Jun 10	May 14	Jun 10	Total
Commercial Varieties-Available for Farm Use																							
Perun	3.0	21.0	40.5	58.5	55.0	61.0	100	100	100	51	36	35	4.46	1.15	0.48	1.62	6.08*						
Perseus	3.0	19.0	40.5	58.5	50.3	61.5	100	100	58	46	48	4.15	1.32	0.59	1.91	6.05*							
Lofa	3.0	20.5	39.0	58.0	52.5	61.5	100	100	61	60	55	4.14	1.30	0.42	1.72	5.86*							
Kenfest	2.8	18.8	37.3	56.5	51.5	62.0	100	100	87	87	48	3.88	1.17	0.31	1.47	5.35							
Mahulena	2.0	24.5	56.0	29.0	60.0	29.0	100	100	100	100	100	3.83	1.31	0.20	1.52	5.34							
InaMerlin	3.8	22.5	41.8	60.0	56.0	61.3	100	100	31	23	4	4.12	0.84	0.22	1.06	5.18							
Fojtan	2.0	16.0	48.8	29.0	58.0	29.0	100	100	100	100	100	3.67	1.15	0.25	1.40	5.07							
Spring Green	3.0	16.0	42.0	58.5	52.0	62.0	100	100	97	96	74	3.38	1.10	0.40	1.50	4.88							
Duo	4.3	19.0	47.0	60.0	51.0	62.0	100	94	95	87	54	3.06	0.97	0.31	1.27	4.33							
Experimental Varieties																							
KYFL 1301	3.3	19.3	39.0	58.0	50.3	62.0	100	100	93	96	81	4.91	1.58	0.50	2.08	6.99*							
Mean	3.0	19.7	43.2	52.6	53.7	55.0	100	99	77	73	60	3.96	1.19	0.37	1.56	5.51							
CV%	14.1	14.3	9.4	1.9	3.8	1.0	0	3	31	33	34	17.85	28.42	34.18	26.69	19.03							
LSD,0.05	0.6	4.1	5.9	1.5	3.0	0.8	0	4	35	35	29	1.03	0.49	0.18	0.60	1.42							

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		
Baqueuano	Westerwold tetraploid	Smith Seed Services
Double Diamond	Westerwold tetraploid	Oregro Seeds
Feast II	Italian tetraploid	Ampac Seed
Gulf	Westerwold diploid	Public
Jackson	Westerwold diploid	The Wax Company
Jumbo	Westerwold tetraploid	Barenbrug USA
Koga	Italian tetraploid	Smith Seed
Marshall	Westerwold diploid	The Wax Company
Master	Westerwold tetraploid	Smith Seed Services
Maximus	Westerwold tetraploid	Barenbrug
Nelson	Westerwold tetraploid	The Wax Company
TAMTBO	Westerwold tetraploid	Oregro Seeds
TetraPrime	Italian tetraploid	Mountain View Seeds
Trinova	Westerwold tetraploid	Smith Seed Services
Winterhawk	Westerwold diploid	Oregro Seeds
Experimental Varieties		
BARHAO	Italian diploid	Barenbrug USA
BARLM17425	Westerwold tetraploid	Barenbrug USA
BARLM17477	Westerwold tetraploid	Barenbrug USA
BARLM17514	Westerwold tetraploid	Barenbrug USA
BARLM17534	Westerwold tetraploid	Barenbrug USA
BARLM17538	Westerwold tetraploid	Barenbrug USA
KYLM1601	Westerwold diploid	KY Agri. Exp Station
KYLM1701	Westerwold tetraploid	KY Agri. Exp Station
KYLM1703	Westerwold tetraploid	KY Agri. Exp Station
K014-WEAR	Westerwold diploid	Oregro Seeds
K014-WEMA	Westerwold diploid	Oregro Seeds
K014-WLS	Westerwold diploid	Oregro Seeds
K014-WM	Westerwold diploid	Oregro Seeds
M2CVS	Westerwold diploid	The Wax Company
ME4	Westerwold diploid	The Wax Company
ME-94	Westerwold diploid	The Wax Company
PPG-LWT105	Westerwold tetraploid	Mountain View Seeds
WMWL		The Wax 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		
BG34	diploid	Barenbrug USA
Calibra	tetraploid	DLF Pickseed
Elena	tetraploid	Allied Seed
Linn (certified)	diploid	Public
Melpetra	tetraploid	Hood River Seed
PayDay	tetraploid	Mountain View Seeds
Remington	tetraploid	Barenbrug USA
TetraMag	tetraploid	Mountain View Seeds
TetraSweet	tetraploid	Mountain View Seeds
Experimental Varieties		
BARLP15COW	diploid	Barenbrug USA
BARLP15261	tetraploid	Barenbrug USA
BARLP16237	tetraploid	Barenbrug USA
BARLP16238	diploid	Barenbrug USA
BARLP17237	tetraploid	Barenbrug USA
BARLP17253	diploid	Barenbrug USA
BARLPF253		Barenbrug USA

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

Variety	Type ¹	Proprietor/KY Distributor
Commercial Varieties-Available for Farm Use		
Barfest	MF x PR	Barenbrug USA
Duo	MF x PR	Ampac Seed
Fojtan	(TF x IR) x TF	DLF Pickseed
Hostyn	MF x IR	DLF Pickseed
Hykor	(TF x IR) x TF	DLF Pickseed
InaMerlin	MF x IR	Hood River Seed
Kenfest	MF x AR	KY Agric. Exp. Station
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
Experimental Varieties		
KYFL1013	MF x IR	KY Agric. Exp. Station
KYFL1301	MF x AR	KY Agric. Exp. Station
ORBSTFEST	-	Oregro Seeds
ORRUFEST	-	Oregro Seeds
PPG-FEST-102	PR x MF	Mountain View Seeds

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

Table 15. Summary of Kentucky annual ryegrass yield trials 2003-2019 (yield shown as a percentage of the yield value of Marshall)

Variety	Type	Proprietor	Lexington ¹																	Mean ⁴ (#trials)		
			032:3	04	05	06	07	08	09	10	10	11	12	12	13	14	15	16	17		18	
Abundant	tetraploid	Ampac Seed			12																	
Acrobat	-	Proseeds Marketing					144															
AET10	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						90(2)
Baquano	Westerwold tetraploid	Smith Seed Services																		77		-
Barmultra II	Italian tetraploid	Barenbrug USA							133			103	95			125	108					117(4)
Big Bang	-	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						95(9)
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				39	35	113	109	81	93	71	47	56	88	80	87	65				80(11)
Flying A	Westerwold diploid	Oregro Seeds					59															-
Fox	Italian diploid	DLF Pickseed							109													-
Fria	Westerwold diploid	Allied Seed							95	87	89		104	81	85	98						89(6)
GR-AS10	Italian	Ampac Seed							113													-
Graze-N-Gro	Westerwold diploid	Seed Research of OR					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				70(11)
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	106	106	91	77	69	100	99	97	105	95	94	94(15)
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		95(2)
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(16)
Master	Westerwold tetraploid	Smith Seed Services																		82		-
Maximo	Intermediate tetraploid	Pickseed USA, Inc.									101											-
Maximus	Westerwold tetraploid	Barenbrug USA																	63	84		74(2)
Meiquatro	Italian tetraploid	Hood River Seed												135	72							104(2)
Meroa	Westerwold diploid	Smith Seed Services											93	102								98(2)
MX 108	Westerwold tetraploid	Pickseed USA, Inc.								95	114											105(2)
Nelson	Westerwold tetraploid	The Wax Co.								86		93	65	77	105	97	105	97	73	91		89(7)

continued

Table 15. (continued)

Variety	Type	Proprietor	Lexington ¹										Mean ⁴ (#trials)			
Oryx	Italian diploid	Hood River Seed													100	
Primecut	Westerwold brand	Oregro Seeds														
Spark	tetraploid	DLF Pickseed														
Stockaid	diploid	–														
Striker	Westerwold tetraploid	Seed Research of OR														
TAMTBO	Westerwold tetraploid	Tex. Ag Exp Sta.														91
Tam 90	Italian diploid	Tex. Ag Exp Sta.														64(2)
TetraPrime	Italian tetraploid	Mountain View Seeds														90
TetraPro	Italian tetraploid	Tex. Ag Exp Sta.														90
TillageRootMax	Westerwold diploid	Cover Crop Solutions														86(2)
T-Rex	Westerwold tetraploid	SaddleButte														
Trinova	Westerwold tetraploid	Smith Seed Services														78
Ugne	Italian tetraploid	Hood River Seed														102
Verdure	Westerwold tetraploid	Smith Seed Services														42
Winterhawk	Westerwold diploid	Oregro Seeds														58
																119
																113
																96
																107(6)

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.

Table 16. Summary of Kentucky perennial ryegrass yield trials 2000-2019 (yield shown as a percentage of the commercial varieties in the trial)

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	00		02	00	03
			2yr ⁵	2yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	3yr	2yr	3yr	2yr		3yr	2yr	3yr
Aires	diploid	Ampac Seed	95																93				94(2)
Albion	tetraploid	Grasslands Oregon											105	103									104(2)
Amazon	tetraploid	AgriBioTech			99																		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	86						85(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	87	100	98	98			112			98(11)
CASMP64	diploid	Cascade International	97																				-
Citadel	tetraploid	Ag Canada																94	113	103			103(3)
Crave	tetraploid	Ampac Seed									95												-
Derby	-	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									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													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	80	95	83	89	83	78	87	88	77				90(18)
Manhattan	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																					99(5)
Polly II	tetraploid	FS Growmark									101	103	99			87	107						118(2)
Polly Plus	hybrid tetraploid	Allied Seed																110				60	62(2)
Power	tetraploid	Ampac Seed																					104(9)
Polim	tetraploid	DLF Pickseed									106												-
Quartermaster	tetraploid	Radix Research																					-

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	00	01	02	00	01	02	00	01	02		
			2yr ⁵	2yr	3yr	3yr	2yr	3yr	3yr	2yr	3yr	3yr	2yr	3yr	2yr	3yr	2yr	3yr	2yr	3yr	2yr	3yr	2yr	3yr	2yr	3yr	2yr		
Quartet	tetraploid	Ampac Seed	97		56		46																						
RAD-CP5212	hybrid tetraploid	Radix Research			134																								
RAD-M1125	hybrid tetraploid	Mountain View Seeds				120																							
Remington	tetraploid	Barenbrug USA											95	117	109	106													
Remington PLUS NEA2 ⁶	tetraploid	Barenbrug USA											119	99															
Sierra	diploid	Lewis Seed Co.			89																								
TetraGain	tetraploid	Pure Seed									111																		
TetraMag	tetraploid	Mountain View Seeds									110		136			127	127												
TetraSweet	tetraploid	Mountain View Seeds													104	101													
Tonga	tetraploid	Kings AgriSeeds			96				103																				
Verseka	tetraploid	Allied Seed									75																		
Victorian	diploid	Caudill Seed										104	83																
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.

Table 17. Summary of Kentucky festulolium yield trials 2001-2019 (yield shown as a percentage of the mean of the commercial varieties in the trial)¹

Variety	Type ²	Proprietor	Lexington												Mean ⁵ (#trials)		
			2001 ^{3,4}	2005	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017			
			2yr ⁶	3yr	3yr	3yr	3yr	3yr	2yr	3yr	2yr	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	81			94(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	95			99(8)
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				130(7)
InaMerlin	MF x IR	Hood River Seed												88			-
Kenfest	MF x AR	KY Agr. Exp Station													100		-
Lofa	(TF x Int) x Int	DLF Pickseed					105	107	110	128	112	91	109	110	110		109(8)
Mahulena	(TF x IR) x TF	DLF Pickseed							131	109	107			111	100		112(5)
Meadow Green	-	Pure Seed							37	34							36(2)
Perseus	MF x IR	DLF Pickseed					132	114	126	123	110	109	105	113			117(8)
Perun	MF x IR	DLF Pickseed					127	114	107	131	110	102	99	114			112(8)
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	91			105(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



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