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2018 Annual and Perennial Ryegrass and Festulolium Report

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Introduction

Annual ryegrass (*Lolium multiflorum*) and perennial ryegrass (*Lolium perenne*) are high-quality, productive, cool-season grasses used in Kentucky. Both have exceptionally high seedling vigor and are highly palatable to livestock. In Kentucky, winter survival can be an issue for many annual ryegrass varieties, so before planting, review winter survival results in this publication. The severe winter of 2014-2015 showed those varieties that are not adapted to Kentucky (see winter injury and percent stand columns in Table 3).

Annual ryegrasses are increasing in use across Kentucky as more winter-hardy varieties are released and promoted. Annual ryegrass is productive for three to five months and is used primarily for late fall and early to late spring pasture. Winter growth occurs only during mild winters in Kentucky. This crop has garnered increased interest for high-quality baleage. 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. 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*, Hausska) 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 2015, 2016, 2017 and 2018.

	2015				2016				2017				2018[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	2.17	-0.69	32	+1	0.80	-2.06	40	+9	6.81	+3.95	31	0	2.01	-0.85
FEB	26	-9	3.08	-0.13	38	+3	6.09	+2.88	47	+12	4.46	+1.25	45	+10	9.77	+6.56
MAR	45	+1	7.34	+2.94	52	+8	4.07	-0.33	48	+4	3.34	-1.06	42	-2.	5.16	+0.76
APR	57	+2	13.19	+9.31	57	+2	3.97	+0.09	62	+7	4.17	+0.29	50	-5	5.52	+1.64
MAY	69	+5	3.02	-1.45	64	0	9.17	+4.70	66	+2	7.74	+3.27	73	+9	8.39	+3.92
JUN	75	+3	8.20	+4.54	76	+4	5.09	+1.43	73	+1	7.68	+4.02	76	+4	6.42	+2.76
JUL	77	+1	10.22	+5.22	79	+3	7.43	+2.43	76	0	4.49	-0.51	77	+1	6.15	+1.15
AUG	74	-1	3.49	-0.44	79	+4	4.37	+0.44	74	-1	6.66	+2.73	77	+2	6.45	+2.52
SEP	72	+4	3.49	+0.29	74	+6	2.18	-1.02	69	+1	4.72	+1.52	74	+6	12.88	+9.68
OCT	59	+2	2.78	+0.21	64	+7	0.37	-2.20	60	+3	6.06	+3.49	59	+2	6.54	+3.97
NOV	51	+6	3.72	+0.33	51	+6	1.94	-1.45	47	+2	3.09	-0.30				
DEC	49	+13	8.42	+4.44	37	+1	9.4	+5.42	35	-1	2.66	-1.32				
Total			69.12	+24.57			54.88	+10.33			61.88	+17.33			69.29	+32.11

[1] DEP is departure from the long-term average.
[2] 2018 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 2014, 2015, 2016, and 2017 at Lexington. Perennial ryegrass tests (2016 and 2017) and festulolium tests (2015, 2016, and 2017) were established in 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 har-

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 seedlingsor 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.

Table 3. Dry matter yields, seedling vigor, and stand persistence of annual ryegrass varieties sown September 5, 2014, at Lexington, Kentucky (see Table 15 for designation of Italian or Westerwolds type commercial varieties).

Variety	Seedling Vigor[1] Oct 9, 2014	Percent Stand 2014 Oct 9	Percent Stand 2015 Apr 3	Winter Injury[2] Jan 19,2015	Maturity[3] 2015 Apr 23	Maturity[3] 2015 May 19	Plant Height(in) Apr 23	Yield (tons/acre) 2014 Dec 15	Yield (tons/acre) 2015 Apr 24	Yield (tons/acre) 2015 May 19	Yield (tons/acre) 2015 Jun 15	Yield (tons/acre) Total
Commercial Varieties-Available for Farm Use												
Centurion	4.1	99	95	0.5	32.3	50.5	18	0.53	1.51	1.22	0.48	3.74*
Winterhawk	4.1	99	92	1.5	35.8	54.5	18	0.74	1.29	1.05	0.31	3.39*
Bruiser	4.4	99	80	2.5	32.5	55.5	17	0.74	0.98	0.90	0.36	2.98
Ed	3.3	94	70	2.0	31.5	55.5	13	0.45	0.88	1.13	0.39	2.85
Marshall	4.0	98	81	0.5	32.5	54.0	17	0.51	1.14	0.91	0.28	2.84
Jackson	3.8	98	88	1.0	32.5	55.5	16	0.57	1.18	0.81	0.29	2.84
TetraPrime	3.0	98	98	0.5	31.0	46.3	12	0.34	1.17	0.99	0.22	2.72
Kowinearly	3.1	97	91	1.8	41.3	59.0	17	0.30	1.14	0.95	0.31	2.70
Meroa	3.0	78	64	2.8	36.3	55.0	13	0.28	0.96	0.93	0.48	2.65
Green Farm	4.0	100	66	2.8	46.0	59.5	21	0.52	0.87	0.71	0.29	2.40
Fria	4.0	99	58	3.3	32.0	57.0	13	0.44	0.58	0.96	0.32	2.30
Kospeed	4.4	99	63	1.8	41.0	59.0	16	0.58	0.72	0.78	0.19	2.26
TAMTBO	2.9	78	43	1.8	31.5	57.5	13	0.30	0.63	1.04	0.26	2.23
Tam 90	3.8	100	26	5.0	30.0	58.0	10	0.64	0.34	0.92	0.32	2.22
Nelson	2.1	65	48	1.8	31.0	56.5	12	0.34	0.70	0.90	0.26	2.20
Big Boss	2.5	68	6	5.8	30.3	58.0	11	0.48	0.21	0.86	0.52	2.07
Attain	2.1	63	16	2.3	30.5	58.0	11	0.38	0.32	0.92	0.32	1.95
Gulf	4.0	100	26	6.3	30.8	59.0	10	0.53	0.31	0.76	0.34	1.95
Big Bang	3.4	86	25	4.3	30.0	55.5	9	0.28	0.30	0.92	0.41	1.91
Bill	3.6	88	11	5.0	30.3	59.0	9	0.43	0.26	0.76	0.29	1.75
Verdure	3.4	87	4	6.0	29.5	59.5	9	0.51	0.18	0.72	0.26	1.66
Feast II	3.0	88	13	7.3	35.0	54.0	9	0.35	0.24	0.73	0.26	1.58
Experimental Varieties												
ME94	3.9	92	88	0.5	36.8	54.0	18	0.60	1.33	1.09	0.54	3.57*
ME4	2.9	96	94	0.0	32.3	53.0	19	0.43	1.40	0.91	0.41	3.14*
M2CVS	3.9	99	92	0.5	31.5	54.0	14	0.50	1.31	0.95	0.35	3.12*
GO-ITT12	3.0	94	89	1.8	32.5	55.0	15	0.28	0.93	1.28	0.29	2.79
GO-FLN2	3.3	97	49	3.3	30.5	57.0	10	0.50	0.49	1.08	0.32	2.40
GO-IT213	2.3	78	11	5.3	30.8	59.5	13	0.27	0.23	0.74	0.36	1.60
Mean	3.4	90	57	2.8	33.0	56.0	14	0.46	0.77	0.93	0.34	2.49
CV,%	20.9	9	36	33.2	14.0	3.0	18	30.34	32.57	24.47	47.53	17.71
LSD,0.05	1.0	12	21	1.3	7.0	2.0	4	0.20	0.35	0.32	0.23	0.62

[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.

vested 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 2018 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 summarize information about distributors and yield performance for all annual and perennial ryegrass and festulolium varieties currently 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. In Tables 12, 13, and 14, an open block indicates that the variety was not in that particular test (labeled at the top of the column); an "x" in the block means that the variety was in the test but yielded significantly less than the top-yielding variety. A single asterisk (*) means that the variety was not significantly different from the top variety, based on the 0.05 LSD. It is best to choose a variety that has performed well over several years and locations. 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 2018 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 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.

Table 4. 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 15 for designation of Italian or Westerwolds type commercial varieties).

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

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.

Table 5. Dry matter yields, seedling vigor, plant height, maturity, and stand persistence of annual ryegrass varieties sown September 7, 2016, at Lexington, Kentucky (see Table 15 for designation of Italian or Westerwolds type commercial 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*
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.

Table 6. Dry matter yields, winter injury, plant height, maturity, and stand persistence of annual ryegrass varieties sown September 8, 2017, at Lexington, Kentucky (see Table 15 for designation of Italian or Westerwolds type commercial varieties).

Variety	Percent Stand 2017	Percent Stand 2018		Winter Injury[1]	Plant Height (in)	Maturity[2] 2018		Yield (tons/acre) 2018			
	Oct 31	Mar 14	May 4	Jan 29	May 1	May 1	May 22	May 1	May 22	Jun 14	Total
Commercial Varieties-Available for Farm Use											
Centurion	96	89	91	3.3	20.0	32.0	54.5	1.72	1.06	0.22	3.00*
Winterhawk	93	79	84	5.5	17.0	31.8	57.0	1.64	1.10	0.15	2.89*
Bruiser	99	94	95	4.8	19.0	32.0	57.5	1.57	1.20	0.12	2.89*
Jackson	97	94	93	4.5	16.5	31.5	57.0	1.33	1.16	0.21	2.70*
Marshall	95	87	91	2.5	17.3	31.8	56.5	1.49	0.97	0.10	2.56*
TetraPrime	88	39	86	6.8	11.8	31.0	55.5	1.05	1.18	0.32	2.54*
Koga	69	38	50	7.0	14.8	31.5	56.5	0.64	1.52	0.25	2.41*
Jumbo	95	14	33	7.5	13.0	31.0	62.0	0.87	1.17	0.20	2.24
Gulf	95	39	61	7.5	14.5	31.3	61.5	1.14	0.90	0.18	2.23
Feast II	95	14	51	8.8	12.0	31.3	59.0	0.51	1.37	0.34	2.22
Nelson	88	16	36	7.3	13.3	31.3	62.0	0.63	1.04	0.20	1.87
Melquatro	75	29	36	8.0	11.5	31.3	61.0	0.37	1.17	0.31	1.85
Maximus	93	9	23	8.3	11.0	31.0	61.5	0.55	0.84	0.22	1.61
Experimental Varieties											
M2CVS	93	86	86	3.8	19.0	31.8	55.0	1.69	1.15	0.16	3.01*
BARLM17538	94	51	63	7.3	13.8	31.3	58.5	1.11	1.33	0.33	2.77*
WMWL	96	75	83	4.8	17.0	32.0	58.0	1.48	1.10	0.12	2.70*
ME94	91	81	83	5.5	16.3	31.8	60.0	1.26	1.26	0.14	2.67*
ME4	90	78	83	3.8	19.0	32.0	56.5	1.50	0.97	0.18	2.65*
BARLM17425	87	28	41	7.3	10.8	31.3	61.0	0.67	1.31	0.38	2.35*
PPG-LWT-105	91	18	35	7.8	13.5	31.3	62.0	0.76	1.13	0.26	2.15
BARHAAO	88	16	26	7.8	13.8	31.3	62.0	0.77	0.92	0.12	1.81
BARLM17477	73	11	24	7.3	11.0	31.0	61.5	0.63	0.98	0.21	1.81
BARLM17514	89	5	14	8.0	9.5	31.0	60.5	0.46	1.06	0.30	1.81
BARLM17534	70	11	14	8.3	8.5	31.0	62.0	0.21	0.77	0.13	1.11
Mean	89	46	58	6.4	14.3	31.9	59.1	1.00	1.11	0.21	2.32
CV,%	10	36	23	16.1	18.6	1.4	3.3	46.55	20.06	55.19	23.40
LSD,0.05	13	23	18	1.4	3.7	0.6	2.8	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 7. Dry matter yields, seedling vigor, maturity, and stand persistence of perennial ryegrass varieties sown September 7, 2016, at Lexington, Kentucky (see Table 16 for designation of diploid or tetraploid commercial varieties).

Variety	Seedling Vigor[1]	Maturity[2]			Percent Stand					Yield (tons/acre)					
		2017		2018	2016	2017		2018		2017	2018			2-year
	Oct 5, 2016	May 15	Jun 26	May 22	Oct 5	Mar 14	Oct 31	Mar 20	Oct 19	Total	May 22	Aug 17	Oct 22	Total	Total
Commercial Varieties-Available for Farm Use															
TetraMag	4.4	52.5	58.0	53.5	100	100	97	59	89	5.77	1.26	0.46	0.34	2.07	7.84*
Elena	4.0	54.0	57.0	53.0	100	100	98	84	71	5.14	1.04	0.33	0.30	1.67	6.81*
Remington	4.3	46.8	29.0	44.8	100	100	100	98	90	4.83	1.17	0.35	0.32	1.84	6.67*
TetraSweet	4.8	51.5	29.0	51.8	100	100	99	93	89	4.16	1.28	0.44	0.38	2.10	6.26
Calibra	4.0	50.5	29.0	53.0	100	100	99	89	69	4.31	0.94	0.29	0.31	1.54	5.85
PayDay	4.3	52.5	29.0	53.0	100	100	99	85	86	3.87	0.97	0.27	0.26	1.49	5.36
Melpetra	3.1	46.3	29.0	39.0	100	100	99	35	38	3.93	0.62	0.31	0.29	1.21	5.15
Linn	4.4	58.0	29.0	62.0	100	100	100	96	48	3.26	1.32	0.27	0.20	1.79	5.05
Experimental Varieties															
BARLP15261	4.0	46.3	29.0	40.5	100	100	100	98	98	4.96	0.91	0.60	0.41	1.92	6.88*
BARLP16237	3.8	45.0	29.0	39.0	100	100	100	97	98	4.44	0.76	0.53	0.41	1.70	6.14
BARLP16238	4.0	55.5	29.0	56.0	100	100	100	71	40	4.02	0.88	0.32	0.28	1.48	5.50
BARLP15COW	4.1	55.0	29.0	55.5	100	100	100	71	33	3.89	0.86	0.29	0.18	1.33	5.22
Mean	4.1	51.1	33.8	50.1	100	100	99	81	71	4.38	1.00	0.37	0.31	1.68	6.06
CV,%	14.9	3.5	1.0	5.1	0	0	1	13	32	17.55	24.37	39.57	52.66	23.95	16.70
LSD,0.05	0.9	2.6	0.5	3.7	0	0	2	15	33	1.11	0.35	0.21	0.23	0.58	1.46

[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.
*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 16 for designation of diploid or tetraploid commercial varieties).

Variety	Seedling Vigor[1]	Maturity[2]		Percent Stand			Yield (tons/acre)				
		2018		2017	2018		2018				
	Oct 12, 2017	May 9	Jun 15	Oct 12	Mar 14	Oct 19	May 9	Jun 15	Aug 17	Oct 24	Total
Commercial Varieties-Available for Farm Use											
TetraMag	4.4	45.0	60.0	100	100	100	2.12	1.50	0.62	0.50	4.75*
Remington	3.5	32.3	60.0	100	100	100	1.72	1.27	0.62	0.66	4.28*
PayDay	3.6	35.3	60.0	100	100	100	1.88	1.10	0.57	0.47	4.02*
Calibra	3.8	41.8	59.5	100	100	100	1.69	1.09	0.39	0.40	3.58
TetraSweet	4.0	40.3	60.0	100	100	100	1.76	0.96	0.45	0.33	3.49
BG34	4.0	32.0	58.0	100	100	99	1.81	0.79	0.46	0.22	3.28
Linn	4.1	47.5	60.0	100	100	83	1.85	0.41	0.33	0.13	2.72
Experimental Varieties											
BARLP17237	3.4	35.3	60.0	100	100	100	1.70	1.43	0.43	0.49	4.05*
BARLP17253	3.8	32.0	58.5	100	100	100	1.64	0.79	0.54	0.35	3.33
BARLP16238	4.5	36.5	59.5	100	100	99	1.53	0.85	0.54	0.29	3.21
Mean	3.9	37.8	59.6	100	100	98	1.77	1.02	0.50	0.39	3.67
CV,%	11.6	13.1	1.4	0	0	3	19.26	19.16	28.78	39.31	15.36
LSD,0.05	0.7	7.2	1.2	0	0	5	0.49	0.28	0.21	0.22	0.82

[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.

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, 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 9. Dry matter yields, seedling vigor, winter injury, maturity, and stand persistence of festulolium varieties sown September 3, 2015, at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 15, 2015	Winter Injury[2] Jan 29, 2016	Maturity[3] 2016 May 11	Maturity[3] 2016 Jun 20	Maturity[3] 2017 May 15	Maturity[3] 2017 Jun 22	Maturity[3] 2018 May 21	Percent Stand 2015 Oct 15	Percent Stand 2016 Mar 18	Percent Stand 2016 Oct 17	Percent Stand 2017 Mar 24	Percent Stand 2017 Oct 31	Percent Stand 2018 Mar 19	Percent Stand 2018 Oct 24	Yield (tons/acre) 2016 Total	Yield (tons/acre) 2017 Total	Yield (tons/acre) 2018 May 21	Yield (tons/acre) 2018 Aug 6	Yield (tons/acre) 2018 Oct 17	Yield (tons/acre) 2018 Total	3-year Total
Commercial Varieties-Available for Farm Use																					
Hykor	1.5	0.5	57.0	29.0	64.0	29.0	61.5	100	100	100	100	100	100	99	5.44	4.05	1.88	1.42	1.13	4.43	13.92*
Perseus	3.4	1.3	50.0	56.5	54.0	62.0	54.0	100	100	50	18	41	29	49	7.91	2.44	1.15	0.69	0.32	2.16	12.52*
SpringGreen	3.0	1.0	51.5	57.0	54.5	61.5	55.0	100	100	95	94	94	91	85	7.09	2.33	1.42	0.75	0.65	2.82	12.24*
Perun	4.1	1.6	51.0	56.5	54.7	62.0	55.0	100	100	38	9	18	15	28	7.68	1.73	1.31	0.41	0.54	2.27	11.68*
Fojtan	1.3	0.5	56.0	29.0	60.5	29.0	56.5	100	100	100	100	100	100	100	4.46	3.18	1.04	1.31	0.80	3.15	10.79*
Barfest	2.9	0.9	50.5	40.5	53.5	62.0	54.0	100	100	95	94	93	84	84	5.86	2.77	1.23	0.43	0.31	1.97	10.60*
Lofa	4.3	1.3	50.5	56.0	52.0	62.0	53.5	100	100	97	87	85	38	49	6.25	2.18	0.92	0.60	0.51	2.03	10.47
Duo	4.3	4.3	56.0	60.0	53.5	61.5	53.3	100	96	96	91	89	56	60	5.81	2.09	0.87	0.43	0.28	1.58	9.48
Experimental Varieties																					
KYFL1013	4.1	1.3	50.0	53.5	54.0	62.0	55.0	100	100	98	96	88	83	71	7.24	2.94	1.36	0.45	0.21	2.02	12.19*
PPG-FEST-102	2.4	1.0	53.5	57.0	49.0	61.5	52.0	100	100	97	89	92	76	79	5.85	2.12	1.00	0.46	0.54	1.99	9.96
Mean	3.1	1.4	52.6	49.5	55.0	55.3	55.0	100	100	86	77	80	67	70	6.36	2.58	1.21	0.70	0.53	2.44	11.39
CV,%	15.9	31.5	1.8	9.0	5.3	1.0	2.3	0	0	16	6	12	24	27	21.06	25.22	35.51	46.74	61.06	32.81	20.30
LSD,0.05	0.7	0.6	1.4	6.5	4.3	0.8	1.9	1	1	20	7	14	23	28	1.94	0.95	0.63	0.47	0.47	1.16	3.35

[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 10. Dry matter yields, seedling vigor, maturity, and stand persistence of festulolium varieties sown September 7, 2016, at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 5, 2016	Maturity[2] 2017 May 11	Maturity[2] 2017 Jun 20	Maturity[2] 2018 May 22	Percent Stand 2016 Oct 5	Percent Stand 2017 Mar 14	Percent Stand 2017 Oct 31	Percent Stand 2018 Mar 15	Percent Stand 2018 Oct 19	Yield (tons/acre) 2017 Total	Yield (tons/acre) 2018 May 22	Yield (tons/acre) 2018 Aug 16	Yield (tons/acre) 2018 Oct 22	Yield (tons/acre) 2018 Total	2-year Total
Commercial Varieties-Available for Farm Use															
Mahulena	2.6	60.0	29.0	62.0	100	100	100	100	100	5.45	1.57	1.09	0.71	3.37	8.82*
Hykor	2.3	59.0	29.0	62.0	100	100	100	100	100	5.56	1.46	1.08	0.64	3.18	8.75*
Hostyn	2.5	54.0	62.0	56.5	100	100	98	53	65	6.33	1.48	0.57	0.33	2.39	8.71*
Perseus	4.8	48.8	62.0	52.5	100	100	99	79	93	6.00	1.50	0.68	0.35	2.53	8.53*
Lofa	4.5	50.5	62.0	55.0	100	100	99	80	94	5.78	1.76	0.62	0.33	2.71	8.50*
Perun	4.1	50.5	62.0	54.5	100	100	97	71	91	5.51	1.49	0.51	0.28	2.27	7.78*
Fojtan	1.9	56.5	29.0	59.5	100	100	100	100	100	5.16	1.25	0.69	0.41	2.35	7.51
Barfest	3.1	48.8	57.0	52.0	100	100	100	89	100	4.92	1.49	0.33	0.40	2.21	7.13
SpringGreen	4.0	55.0	62.0	53.5	100	100	99	97	99	4.75	1.50	0.49	0.37	2.36	7.11
InaMerlin	4.0	52.5	61.0	57.0	100	100	99	6	35	4.92	1.14	0.23	0.25	1.62	6.54
Duo	3.8	57.5	62.0	53.0	99	100	100	95	98	4.23	1.52	0.41	0.24	2.17	6.40
Experimental Varieties															
KYFL1301	4.3	47.5	61.0	53.5	100	100	100	86	99	5.53	1.83	0.76	0.37	2.96	8.49*
ORRUFEST	3.3	50.5	59.5	51.0	100	100	99	70	94	4.99	1.30	0.58	0.32	2.20	7.19
ORBSTFEST	3.1	48.8	58.5	54.0	100	100	99	93	92	4.55	1.76	0.43	0.26	2.45	7.01
KYFL1013	3.5	47.5	56.0	52.5	100	100	100	96	100	4.55	1.45	0.40	0.23	2.09	6.64
PPGFEST-102	3.0	55.0	62.0	51.0	100	100	99	89	97	4.42	1.41	0.32	0.27	2.01	6.42
Mean	3.4	52.6	54.6	55.0	100	100	99	81	91	5.17	1.49	0.58	0.36	2.43	7.60
CV,%	20.6	3.3	2.3	2.9	1	0	1	10	8	12.41	18.04	36.01	35.52	16.73	11.15
LSD,0.05	1.0	2.5	1.8	2.2	1	0	1	12	11	0.91	0.38	0.30	0.18	0.58	1.21

[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, plant height, and stand persistence of festulolium varieties sown September 8, 2017, at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 12, 2017	Plant Height (in) May 9	Maturity[2] 2018 May 9	Maturity[2] 2018 Jun 15	Percent Stand 2017 Oct 12	Percent Stand 2018 Mar 14	Percent Stand 2018 Oct 19	Yield (tons/acre) 2018 May 9	Yield (tons/acre) 2018 Jun 15	Yield (tons/acre) 2018 Aug 16	Yield (tons/acre) 2018 Oct 24	Yield (tons/acre) 2018 Total
Commercial Varieties-Available for Farm Use												
Perun	3.0	21.0	40.5	58.5	100	100	51	2.55	1.29	0.51	0.11	4.46*
Perseus	3.0	19.0	40.5	58.5	100	100	58	2.02	1.37	0.52	0.23	4.15*
Lofa	3.0	20.5	39.0	58.0	100	100	61	2.29	1.31	0.45	0.09	4.14*
Ina Merlin	3.8	22.5	41.8	60.0	100	100	31	2.17	1.29	0.54	0.12	4.12*
Kenfest	2.8	18.8	37.3	56.5	100	100	87	2.03	1.05	0.40	0.40	3.88
Mahulena	2.0	24.5	56.0	29.0	100	100	100	1.23	0.93	1.03	0.64	3.83
Fojtan	2.0	16.0	48.8	29.0	100	100	100	0.98	0.94	0.97	0.78	3.67
SpringGreen	3.0	16.0	42.0	58.5	100	100	97	1.90	0.77	0.52	0.19	3.38
Duo	4.3	19.0	47.0	60.0	100	94	95	1.54	0.97	0.29	0.26	3.06
Experimental Varieties												
KYFL1301	3.3	19.3	39.0	58.0	100	100	93	2.52	1.39	0.56	0.44	4.91*
Mean	3.0	19.7	43.2	52.6	100	99	77	1.92	1.13	0.58	0.33	3.96
CV,%	14.1	14.3	9.4	1.9	0	3	31	17.48	23.52	39.61	37.72	17.85
LSD,0.05	0.6	4.1	5.9	1.5	0	4	35	0.49	0.39	0.33	0.18	1.03

[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. Performance of annual ryegrass varieties sown in 2017 at Lexington.[1]

Variety	Type	Proprietor/KY Distributor	2017[2] 2018[3]
Commercial Varieties-Available for Farm Use			
Bruiser	Westerwold diploid	Ampac Seed	*
Centurion	Westerwold diploid	Mountain View Seeds	*
Feast II	Italian tetraploid	Ampac Seed	x[4]
Gulf	Westerwold diploid	Public	x
Jackson	Westerwold diploid	The Wax Company	*
Jumbo	Westerwold tetraploid	Barenbrug USA	x
Koga	Westerwold tetraploid	Smith Seed	*
Marshall	Westerwold diploid	The Wax Company	*
Maximus	Westerwold tetraploid	Barenbrug	x
Melquatro	Italian tetraploid	Hood River Seed	x
Nelson	Westerwold tetraploid	The Wax Company	x
TetraPrime	Italian tetraploid	Mountain View Seeds	*
Winterhawk	Westerwold diploid	Oregro Seed	*
Experimental Varieties			
BARHAAO	Italian diploid	Barenbrug USA	x
BARLM17425	Westerwold tetraploid	Barenbrug USA	*
BARLM17477	Westerwold tetraploid	Barenbrug USA	x
BARLM17514	Westerwold tetraploid	Barenbrug USA	x
BARLM17534	Westerwold tetraploid	Barenbrug USA	x
BARLM17538	Westerwold tetraploid	Barenbrug USA	*
ME4	Westerwold diploid	The Wax Company	*
ME-94	Westerwold diploid	The Wax Company	*
M2CVS	Westerwold diploid	The Wax Company	*
PPG-LWT105	Westerwold tetraploid	Mountain View Seeds	x
WMWL		The Wax Company	*

[1] See Table 14 for summary of yield data on named varieties from 2000-2018.
[2] Establishment year.
[3] Harvest year.
[4] x in the box indicates the variety was in the test but yielded significantly less than the top yielding variety.
*Not significantly different from the highest yielding variety in the test.

Table 13. Performance of perennial ryegrass across years at Lexington.

Variety	Type	Proprietor/KY Distributor	2016[1] 2017[2]	2016[1] 2018	2017 2018
Commercial Varieties-Available for Farm Use					
BG34	diploid	Barenbrug USA			x[3]
Calibra	tetraploid	DLF Pickseed	x	*	x
Elena	tetraploid	Allied Seed	*	*	
Linn (certified)	diploid	Public	x	*	x
Melpetra	tetraploid	Hood River Seed	x	x	
PayDay	tetraploid	Mountain View Seeds	x	*	*
Remington	tetraploid	Barenbrug USA	*	*	*
TetraMag	tetraploid	Mountain View Seeds	*	*	*
TetraSweet	tetraploid	Mountain View Seeds	x	*	x
Experimental Varieties					
BARLP15COW	diploid	Barenbrug USA	x	x	
BARLP15261	tetraploid	Barenbrug USA	*	*	
BARLP16237	tetraploid	Barenbrug USA	x	*	
BARLP16238	diploid	Barenbrug USA	x	x	x
BARLP17237	tetraploid	Barenbrug USA			*
BARLP17253	diploid	Barenbrug USA			x

[1] Establishment year.
[2] Harvest year.
[3] x in the box indicates the variety was in the test but yielded significantly less than the top yielding variety. Open boxes indicate the variety was not in the test.
*Not significantly different from the highest yielding variety in the test.

Table 14. Performance of festulolium varieties across years at Lexington.

Variety	Type[2]	Proprietor/KY Distributor	2015[1] 2016[3]	2015[1] 2017	2015[1] 2018	2016 2017	2016 2018	2017 2018
Commercial Varieties-Available for Farm Use								
Barfest	MF x PR	Barenbrug USA	x[4]	x	x	x	x	
Duo	MF x PR	Ampac Seed	x	x	x	x	x	x
Fojtan	(TF x IR) x TF	DLF Pickseed	x	*	x	x	x	x
Hostyn	MF x IR	DLF Pickseed				*	x	
Hykor	(TF x IR) x TF	DLF Pickseed	x	*	*	*	*	
InaMerlin	MF x IR	Hood River Seed				x	*	*
Kenfest	MF xAR	KY Agric. Exp. Station						x
Lofa	(TF x Int) x Int	DLF Pickseed	*	x	x	*	x	*
Mahulena	(TF x IR) x TF	DLF Pickseed				*	x	x
Perseus	MF x IR	DLF Pickseed	*	x	x	*	x	*
Perun	MF x IR	DLF Pickseed	*	x	x	*	x	*
Spring Green	MF x PR	Turf Seed	*	x	x	x	x	x
Experimental Varieties								
KYFL1013	MF x IR	KY Agric. Exp. Station	*	x	x	x	x	
KYFL1301	MF x AR	KY Agric. Exp. Station				*	*	*
ORBSTFEST	–	Oregro Seeds				x	x	
ORRUFEST	–	Oregro Seeds				x	x	
PPG-FEST-102	PR x MF	Mountain View Seeds	x	x	x	x	x	

[1] Establishment year.
[2] MF=meadow fescue, TF=tall fescue, IR=Italian ryegrass, PR=perennial ryegrass, Int=intermediate ryegrass, AR=annual ryegrass
[3] Harvest year.
[4] x in the box indicates the variety was in the test but yielded significantly less than the top yielding variety. Open boxes indicate the variety was not in the test.
*Not significantly different from the highest yielding variety in the test.

Table 15. Summary of Kentucky annual ryegrass yield trials 2000-2018 (yield shown as a percentage of the yield value of Marshall).

Variety	Type	Proprietor	Lexington[1]																	Princeton		Mean[4] (#trials)
			03[2,3]	04	05	06	07	08	09	10	10	11	12	12	13	14	15	16	17	00	02	
Abundant	tetraploid	Ampac Seed				12																–
Acrobat	–	Proseeds Marketing						144														–
AE110	Westerwold tetraploid	Pickseed USA, Inc.										89	100									95(2)
Amp	Westerwold tetraploid	Columbia Seeds													75							–
Andy	Westerwold tetraploid	DLF Pickseed																		97		–
Assist	Westerwold diploid	SaddleButte													88							–
Attain	Westerwold tetraploid	Smith Seed Services								111					52	69						90(2)
Avance	Westerwold diploid	DLF Pickseed																		107		–
Barextra	Italian tetraploid	Barenbrug USA																			121	–
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								88	87	88(5)
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	121			96(9)
Common	–	Public																		83	87	85(2)
Centurion	Westerwold diploid	Mountain View Seeds											97			132		100	126			114(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							–
Domino	Italian tetraploid	DLF Pickseed																			120	–
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													88		86(3)
Feast II	Italian tetraploid	Ampac Seed						35	113	109		81	93	71	47	56	88	80	93		127	88(11)
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)
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	93	79	79	72(12)
Hercules	Westerwold tetraploid	Barenbrug USA												91	68					108		100(2)
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	113		90	94(15)
Jumbo	Westerwold tetraploid	Barenbrug USA	112																94			103(2)
KB Royal	Italian diploid	KB SeedSolutions								83												–
Koga	Westerwold tetraploid	Smith Seed Services																	101			–
Kospeed	Westerwold diploid	Smith Seed Services														80	92					86(2)
Kowinearly	Westerwold diploid	Smith Seed Services														95	96					96(2)
LHT-102	Intermediate	Ampac Seed											100									–
Marshall	Westerwold diploid	The Wax Co.	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	107	100	100	100(17)
Maximo	Intermediate tetraploid	Pickseed USA, Inc.										101										–
Maximus	Westerwold tetraploid	Barenbrug USA																	67			–
Melquatro	Italian tetraploid	Hood River Seed															135		78			107(2)
Meroa	Westerwold diploid	Smith Seed Services														93	102					98(2)
MX 108	Westerwold tetraploid	Pickseed USA, Inc.										95	114									105(2)

continued

Table 15. Summary of Kentucky annual ryegrass yield trials 2000-2018 (yield shown as a percentage of the yield value of Marshall), continued.

			Lexington[1]																	Princeton		Mean[4]
Variety	Type	Proprietor	03[2,3]	04	05	06	07	08	09	10	10	11	12	12	13	14	15	16	17	00	02	(#trials)
Nelson	Westerwold tetraploid	The Wax Co.									86			93	65	77	105	97	78			89(6)
Oryx	Italian diploid	Hood River Seed															100					–
Passerel Plus	Westerwold diploid	Pennington Seed																			103	–
Primecut	Westerwold brand	Oregro Seeds										94										–
Rio	Westerwold diploid	–																		98	99	99(2)
Spark	tetraploid	DLF Pickseed																				–
Stockaid	diploid	–				82																–
Striker	Westerwold tetraploid	Seed Research of OR					90															–
TAMTBO	Italian tetraploid	Tex. Ag Exp Sta.						47		101		108	95			79						86(5)
Tam 90	Italian diploid	Tex. Ag Exp Sta.						49								78					88	72(3)
TetraPrime	Italian tetraploid	Mountain View Seeds											101			96	104	91	106			100(5)
TetraPro	Italian tetraploid	Tex. Ag Exp Sta.						40														–
TillageRootMax	Westerwold diploid	Cover Crop Solutions										82	90									86(2)
TillageMax-Bristol[5]	Westerwold diploid	Cover Crop Solutions										90	91									91(2)
TillageMax-INDY[5]	Westerwold diploid	Cover Crop Solutions										89	90									90(2)
T-Rex	Westerwold tetraploid	SaddleButte				11																–
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			121			111(5)
Winter Star	Italian tetraploid	Ampac Seed																			99	–
Zorro	Italian tetraploid	DLF Pickseed																		132	134	133(2)

[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 KY Forage website at <forages.ca.uky.edu>.
[4] Mean only presented when respective variety was included in two or more trials.
[5] These are TillageRootMax that included crimson clover and/or tillage radish.

Table 16. Summary of Kentucky perennial ryegrass yield trials 2000-2018 (yield shown as a percentage of the mean of the commercial varieties in the trial).

			Lexington															Princeton		Bowling Green		
			01[1,2]	03	04	05	06	07	08	09	10	11	12	13	14	15	16	00	02	00	03	Mean[3,4]
Variety	Type	Proprietor	2yr[5]	2yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	2yr	2yr	2yr	3yr	2yr	2yr	(#trials)
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						84(7)
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	96		112			98(10)
CAS MP64	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				111					111(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	82	87	88	77		90(17)
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															84					–
Orantas	diploid	DLF Pickseed								82												–
Ortet	tetraploid	Oregro Seeds							114													–
PayDay	tetraploid	Mountain View Seeds											101	103	99		88					98(4)
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											–
Quartermaster	tetraploid	Radix Research				122																–
Quartet	tetraploid	Ampac Seed	97			56		46											113			78(4)

continued

Table 16. Summary of Kentucky perennial ryegrass yield trials 2000-2018 (yield shown as a percentage of the mean of the commercial varieties in the trial), continued.

			Lexington															Princeton		Bowling Green		
			01[1,2]	03	04	05	06	07	08	09	10	11	12	13	14	15	16	00	02	00	03	Mean[3,4]
Variety	Type	Proprietor	2yr[5]	2yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	2yr	2yr	2yr	3yr	2yr	2yr	(#trials)
RAD-CPS212	hybrid tetraploid	Radix Research				134																–
RAD-MI125	hybrid tetraploid	Mountain View Seeds					120															–
Remington	tetraploid	Barenbrug USA													95	117	109					107(3)
Remington PLUS NEA2	tetraploid	Barenbrug USA													119	99						109(2)
Sierra	diploid	Lewis Seed Co.				89																–
TetraGain	tetraploid	Pure Seed											111									–
TetraMag	tetraploid	Mountain View Seeds											110		136		128					125(3)
TetraSweet	tetraploid	Mountain View Seeds																				
Tonga	tetraploid	Kings AgriSeeds				96				103							102					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 KY 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

Table 17. Summary of Kentucky festulolium yield trials 2001-2018 (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	Mean[5]
Variety	Type[2]	Proprietor	2yr[6]	3yr	3yr	3yr	3yr	3yr	2yr	3yr	2yr	3yr	2yr	(#trials)
Agula	MF x IR	Allied Seed					94							–
Barfest	MF x PR	Barenbrug USA					105	101	107	119	91	92	91	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	82	95(10)
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	96	99(7)
Gain	MF x IR	Allied Seed					103	77	52	75				77(4)
Hostyn	MF xIR	DLF Pickseed							107	110	106		112	109(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											84	–
Lofa	(TF x Int) x Int	DLF Pickseed					105	107	110	128	112	91	109	109(7)
Mahulena	(TF x IR) x TF	DLF Pickseed							131	109	107		113	115(4)
Meadow Green	–	Pure Seed							37	34				36(2)
Perseus	MF x IR	DLF Pickseed					132	114	126	123	110	109	109	118(7)
Perun	MF x IR	DLF Pickseed					127	114	107	131	110	102	100	113(7)
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	91	107(11)
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 KY 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

11-2018