

# 2014 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 2013/2014 showed those varieties that are not adapted to Kentucky.

Annual ryegrasses are increasing in use across Kentucky as more winter-hardy varieties are released and promoted. Annual ryegrass is productive for three to four months and is used primarily for late fall and early to late spring pasture. Winter growth occurs only during mild winters. 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. Italian ryegrass is native to Southern Europe and is not a true annual. In Kentucky most varieties behave as biennials or short-lived perennials, depending on environmental conditions. 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).

Table 1. Temperature and rainfall at Lexington, Kentucky in 2011, 2012, 2013, and 2014.

	2011				2012				2013				2014 <sup>2</sup>			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP <sup>1</sup>	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	29	-2	2.10	-0.76	38	+7	4.80	+1.94	38	+7	4.50	+1.64	25	-6	2.28	-.58
FEB	39	+4	6.34	+3.13	40	+5	5.39	+2.18	36	+1	1.78	-1.43	30	-5	5.47	+2.26
MAR	47	+3	4.76	+0.36	56	+12	5.64	+1.24	39	-5	5.47	+1.07	39	-5	3.08	-1.32
APR	58	+3	12.36	+8.48	56	+1	3.26	-0.62	55	0	4.46	+0.58	58	+3	5.27	-1.89
MAY	64	0	6.72	+2.25	69	+5	4.02	-0.45	65	+1	5.23	+0.76	66	+2	5.72	+1.25
JUN	74	+2	2.61	-1.05	73	+1	2.42	-1.24	72	0	7.32	+3.66	75	+3	2.93	-0.73
JUL	80	+4	6.29	1.29	81	+5	2.50	-2.50	72	-4	9.33	+4.33	74	-2	3.18	-1.82
AUG	75	0	2.89	-1.04	75	0	1.68	-2.25	72	-3	3.68	-0.25	76	+1	6.53	+2.60
SEP	66	-2	5.52	+2.32	67	-1	6.40	+3.20	67	-1	2.21	-0.99	69	+1	3.63	+4.3
OCT	55	-2	4.10	+1.53	55	-2	2.00	-0.57	55	-2	7.02	+4.45	57	0	5.55	+2.98
NOV	50	+5	9.53	+6.14	43	-2	1.81	-0.65	41	-4	3.06	-0.33				
DEC	41	+5	5.58	+1.60	42	+6	9.57	+4.94	36	0	4.19	+0.21				
Total			68.80	+24.25			49.49	+4.94			58.25	+13.70			44.14	+6.96

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

<sup>2</sup> 2014 data is for the ten months through October.

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 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 would be similar to those of perennial ryegrass.

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.

This report provides current yield data on annual and perennial ryegrass varieties in trials in Kentucky as well as guidelines for selecting varieties. Tables 17, 18, and 19 show summaries of all annual and perennial ryegrass and festulolium varieties tested in Kentucky for the last 15 years. The UK Forage Extension Web site at [www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage) 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 pasture (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.

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

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

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

**Table 3. Dry matter yields, seedling vigor, maturity and stand persistence of annual ryegrass varieties sown September 6, 2010, at Lexington, Kentucky (see Table 17 for designation of Italian or Westerwolds type commercial varieties).**

Variety	Seedling Vigor <sup>1</sup> Oct 14, 2010	Maturity <sup>2</sup>				Percent Stand					Yield (tons/acre)						
		2011				2010	2011				2011						
		Apr 21	May 19	Jun 7	Jun 28	Oct 14	Jan 5	Mar 16	Jul 13	Aug 23	Jan 5	Apr 21	May 19	Jun 7	Jun 28	Jul 22	Total
<b>Commercial Varieties—Available for Farm Use</b>																	
Barmultra II	3.0	33.3	41.8	53.5	62	99	100	100	100	83	0.16	1.99	1.36	1.01	0.38	0.13	5.03*
TetraPrime	1.6	31.8	41.8	52.0	62	99	100	100	100	100	0.19	1.54	1.32	0.79	0.33	0.12	4.28
GR-AS10	4.0	32.5	39.0	52.0	62	100	100	100	100	58	0.20	1.76	1.12	0.80	0.25	0.11	4.25
Attain	3.6	33.0	49.8	59.0	62	100	100	100	99	0	0.36	1.95	1.07	0.63	0.17	0.00	4.18
Feast II	4.8	32.0	39.0	52.0	62	100	100	98	99	91	0.20	1.49	1.12	0.86	0.31	0.14	4.11
Fox	4.3	32.8	43.8	53.5	62	100	100	99	99	71	0.18	1.66	0.99	0.81	0.31	0.12	4.07
Winterhawk	3.4	33.3	49.8	57.5	62	100	100	100	100	0	0.28	1.91	0.96	0.56	0.22	0.01	3.93
TAMTBO	3.8	33.0	47.0	58.0	62	100	100	100	100	0	0.22	1.88	0.90	0.65	0.16	0.01	3.82
Marshall	4.3	33.0	51.3	56.5	62	100	100	100	100	0	0.39	1.64	0.99	0.58	0.17	0.00	3.77
Bruiser	4.3	33.5	48.8	60.5	62	100	100	100	100	3	0.40	1.85	0.87	0.49	0.14	0.00	3.76
Jackson	3.3	33.3	46.5	58.0	62	100	100	100	100	0	0.42	1.91	0.80	0.49	0.11	0.01	3.74
Big Boss	3.8	33.8	55.0	62.0	62	99	100	99	99	0	0.29	1.61	0.98	0.68	0.12	0.00	3.68
Ed	2.5	33.8	50.3	61.0	62	99	100	100	100	0	0.22	1.92	0.87	0.50	0.12	0.00	3.62
Fria	3.1	33.0	46.0	59.0	62	100	100	100	99	5	0.31	1.85	0.84	0.46	0.12	0.00	3.58
Brangus	4.0	32.3	55.5	60.5	62	100	100	99	99	0	0.29	1.42	1.02	0.57	0.24	0.01	3.56
Big Daddy	3.5	33.0	56.0	61.0	62	100	100	98	98	0	0.23	1.32	0.99	0.56	0.14	0.02	3.25
Verdure	4.3	32.5	56.0	62.0	62	100	100	99	99	1	0.32	1.31	0.93	0.54	0.12	0.01	3.23
KB Royal	4.3	32.8	54.0	59.0	62	100	100	100	100	1	0.35	1.31	0.86	0.47	0.12	0.01	3.12
Gulf	4.1	32.8	55.5	61.0	62	100	100	99	100	0	0.31	1.34	0.83	0.34	0.10	0.00	2.93
HS-1	4.6	32.0	56.0	60.0	62	100	100	97	96	0	0.25	1.13	0.86	0.41	0.07	0.00	2.72
<b>Experimental Varieties</b>																	
BAR LMF9881	3.0	33.5	41.8	54.0	62	100	100	100	100	48	0.20	2.17	1.20	0.92	0.31	0.12	4.91*
BAR LMF9876	2.6	33.0	43.8	56.0	62	98	100	100	100	13	0.16	2.05	1.09	0.75	0.26	0.08	4.39
BAR LMF9740	3.4	33.5	43.5	56.0	62	100	100	98	98	6	0.20	1.75	1.13	0.81	0.25	0.02	4.16
B-7.1366	3.5	33.0	42.0	57.0	62	100	100	99	100	0	0.25	2.03	0.91	0.68	0.15	0.02	4.04
PPG-LMT 102	2.0	33.8	49.3	56.0	62	98	100	100	100	0	0.17	1.70	0.89	0.58	0.17	0.01	3.51
Mean	3.6	33.0	48.1	57.5	62	100	100	99	99	19	0.26	1.70	1.00	0.64	0.19	0.04	3.83
CV,%	22.1	1.8	8.8	3.3	0	1	0	1	1	49	42.91	14.16	11.56	14.01	26.30	60.61	9.01
LSD,0.05	1.1	0.8	6.0	2.7	0	1	0	2	2	13	0.16	0.34	0.16	0.13	0.07	0.03	0.49

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

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

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

## Description of the Tests

Data from eleven studies are reported. Annual ryegrass tests were established in the fall of 2010, 2011, 2012 and 2013 at Lexington. Perennial ryegrass tests and festulolium tests were established in 2011, 2012 and 2013 at Lexington. The soil at Lexington is a well-drained silt loam (Maury) and is well suited for ryegrass production.

Seedings were made at the rate of 25 pounds per acre into a prepared seedbed with a disk drill. Plots were 5 feet by 20 feet in a randomized complete block design with four replications with a harvested plot area of 5 feet by 15 feet. For the perennial tests nitrogen was top-dressed

at 60 pounds per acre of actual nitrogen in March, May, and August. For the annual tests nitrogen was top-dressed at 60 pounds per acre in March and 60 pounds after the first spring harvest. The tests were harvested using a sickle-type forage plot harvester. The first cutting was harvested at each location when all ryegrass 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 13. Yields are given by cutting date for 2014 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.

**Table 4. Dry matter yields, seedling vigor, plant height, maturity and stand persistence of annual ryegrass varieties sown September 14, 2011, at Lexington, Kentucky** (see table 17 for designation of Italian or Westerwolds type commercial varieties).

Variety	Seedling Vigor <sup>1</sup> Oct 11, 2011	Percent Stand			Height (inches)			Maturity <sup>2</sup>			Yield (tons/acre)				Total
		2011	2012	2012	2011	2012	2012	2011	2012	2012	2011	2012	2012	2012	
		Oct 11	Mar 21	Jun 4	Dec 2	Apr 5	May 10	Apr 5	May 10	Jun 4	Dec 2	Apr 6	May 10	Jun 4	
<b>Commercial Varieties—Available for Farm Use</b>															
Winterhawk	5.0	100	100	100	10	23	15	34	52	58	1.06	1.61	0.62	0.44	3.72*
TAMTBO	2.8	100	100	100	10	20	18	34	54	59	0.92	1.45	0.68	0.41	3.46*
Jackson	4.0	100	100	100	10	23	15	34	53	61	0.94	1.53	0.54	0.38	3.39*
MX 108	3.5	100	100	100	9	19	16	33	48	56	0.75	1.44	0.72	0.44	3.35*
Bruiser	4.5	100	100	100	10	24	16	34	54	59	0.98	1.47	0.54	0.33	3.32*
Maximo	3.5	100	100	100	9	19	15	33	45	57	0.63	1.52	0.66	0.42	3.23
Marshall	4.0	100	100	100	10	24	18	34	50	59	0.76	1.48	0.62	0.32	3.19
Primecut	3.0	100	100	100	10	22	14	34	53	60	0.78	1.42	0.50	0.29	2.99
TillageMax-Bristol <sup>3</sup>	3.3	100	100	100	9	20	14	33	51	58	0.67	1.26	0.61	0.34	2.87
TillageMax-INDY <sup>3</sup>	3.3	100	100	100	10	22	15	33	50	60	0.63	1.37	0.48	0.38	2.85
DH3	4.3	100	100	100	10	20	18	34	56	59	0.77	1.17	0.55	0.35	2.85
AE110	2.6	100	100	100	9	21	17	33	48	58	0.56	1.38	0.61	0.29	2.84
Fria	3.3	100	100	100	10	25	15	34	54	60	0.64	1.43	0.43	0.29	2.79
Big Daddy	3.5	100	100	100	9	19	18	33	56	61	0.68	1.10	0.55	0.29	2.62
TillageRootMax	3.8	100	100	100	10	19	14	33	49	58	0.74	1.01	0.54	0.32	2.61
Feast II	2.0	100	100	100	8	15	13	33	46	59	0.44	1.10	0.55	0.48	2.57
Gulf	3.8	100	100	100	10	22	16	34	56	59	0.63	1.17	0.41	0.22	2.43
<b>Experimental Varieties</b>															
07-2 AR	3.5	100	100	100	10	22	15	33	46	61	0.79	1.76	0.72	0.49	3.76*
PS-AR-09-1	3.0	100	100	100	9	20	16	33	45	61	0.74	1.39	0.70	0.48	3.32*
PS-Lm-09-2	3.5	100	100	100	11	21	15	33	48	59	0.77	1.46	0.60	0.45	3.27*
XLFLOLHY	4.3	100	100	100	10	18	17	34	52	58	0.91	1.27	0.69	0.37	3.23
XLFDARG	2.0	100	100	100	6	20	12	33	51	60	0.28	1.47	0.52	0.43	2.70
Mean	3.5	0	0	0	9.4	20.6	15.2	33.3	50.6	59.0	0.73	1.38	0.58	0.37	3.06
CV,%	18.3	0	0	0	9.0	7.6	11.6	2.2	4.7	3.3	21.47	14.25	18.11	26.67	11.51
LSD,0.05	0.9	0	0	0	1.2	2.2	2.5	1.1	3.4	2.8	0.22	0.28	0.15	0.14	0.50

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

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

<sup>3</sup> These are mixtures that included crimson clover and/or tillage radish.

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

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 14, 15, and 16 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 14, 15, and 16, 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 13).

Tables 17, 18, and 19 are summaries of yield data from 1999 to 2014 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 can-



**Table 5. Dry matter yields, seedling vigor, plant height, maturity and stand persistence of annual ryegrass varieties sown August 31, 2012, at Lexington, Kentucky** (see table 17 for designation of Italian or Westerwolds type commercial varieties).

Variety	Seedling Vigor <sup>1</sup> Oct 11, 2012	Maturity <sup>2</sup>				Percent Stand				Height (inches)				Yield (tons/acre)					Total		
		2013				2012				2013				2013							
		Apr 22	May 21	Jun 11	Jun 25	Oct 11	Mar 20	Jul 22	Aug 21	Dec 14	Apr 22	May 21	Jun 11	Jun 25	Dec 14	Apr 23	May 21	Jun 11		Jun 25	Jul 23
<b>Commercial Varieties—Available for Farm Use</b>																					
MX108(Max)	4.6	32.0	47.3	56.0	56.5	100	100	100	100	8	14	19	18	13	0.95	1.82	1.25	0.60	0.22	0.45	5.30*
TetraPrime	3.5	31.8	46.8	57.0	57.0	100	100	100	100	6	13	18	15	13	0.51	1.78	1.34	0.49	0.23	0.37	4.72*
LHT-102	4.0	31.5	49.3	53.0	56.0	100	100	100	100	6	12	19	10	11	0.44	1.77	1.55	0.39	0.22	0.31	4.67
Marshall	4.6	32.8	50.8	59.5	62.0	100	100	20	4	9	16	21	14	7	1.28	1.90	0.99	0.44	0.05	0.00	4.66
AE110	3.4	32.5	50.8	56.5	61.0	100	94	89	56	8	15	21	16	12	0.85	1.59	1.28	0.51	0.11	0.31	4.64
Centurion	4.0	33.3	46.3	60.0	62.0	100	100	30	8	9	17	17	17	9	0.99	2.12	0.86	0.46	0.09	0.00	4.53
TAMTBO	4.1	32.8	55.5	57.5	62.0	100	93	25	7	7	14	22	13	7	0.97	1.69	1.36	0.38	0.05	0.00	4.44
Feast II	4.9	31.3	53.5	55.0	56.0	100	70	93	92	8	9	24	13	13	0.96	0.98	1.41	0.49	0.20	0.31	4.35
Winterhawk	4.8	32.5	49.3	62.0	62.0	100	100	24	10	9	17	16	16	7	1.09	1.82	0.94	0.37	0.06	0.00	4.29
Jackson	4.1	32.8	52.0	62.0	62.0	100	100	13	4	10	16	20	14	8	1.20	1.69	0.98	0.36	0.02	0.00	4.24
TillageMaxBristol <sup>3</sup>	2.3	32.3	54.0	57.5	62.0	89	87	18	4	7	14	21	12	9	0.98	1.60	1.20	0.38	0.08	0.00	4.24
TillageMaxINDY <sup>3</sup>	2.1	32.3	51.3	59.5	62.0	91	90	14	3	6	15	21	14	10	0.76	1.74	1.20	0.41	0.07	0.00	4.19
TillageRootMax	2.3	33.0	48.8	60.0	62.0	98	100	13	1	7	17	19	15	9	0.65	1.97	1.07	0.42	0.07	0.00	4.18
Fria	4.9	33.3	50.8	62.0	62.0	100	100	20	1	9	16	17	15	8	1.09	1.66	0.92	0.41	0.08	0.00	4.16
Bruiser	5.0	32.5	51.3	61.0	62.0	100	100	23	5	9	15	17	14	8	1.24	1.51	0.93	0.29	0.05	0.00	4.02
Gulf	4.8	31.3	62.0	59.0	62.0	100	63	6	1	8	9	28	9	7	1.06	0.76	1.26	0.19	0.07	0.00	3.34
<b>Experimental Varieties</b>																					
PS-Lm-09-2	4.6	33.3	49.3	57.0	56.5	100	100	100	97	8	17	18	18	11	0.82	2.00	1.12	0.64	0.15	0.52	5.25*
Lh 4x-1PS	3.8	32.3	53.5	57.0	59.0	100	100	94	91	8	14	20	17	13	0.74	1.83	1.34	0.53	0.18	0.37	4.98*
Amp	3.1	33.0	56.0	60.0	62.0	99	98	30	11	7	17	21	15	8	0.79	1.80	1.29	0.47	0.08	0.00	4.43
IS-LWT 12	4.0	32.5	57.0	59.5	62.0	100	85	31	18	8	14	24	14	8	1.05	1.44	1.22	0.41	0.05	0.00	4.17
IS-LWT 14	3.6	32.0	55.5	58.5	62.0	100	99	36	16	8	14	21	15	8	0.86	1.54	1.24	0.48	0.06	0.00	4.17
IS-LWT 13	3.8	32.8	56.0	57.0	62.0	93	84	35	14	7	13	23	15	8	0.78	1.50	1.30	0.47	0.07	0.00	4.13
Mean	3.9	32.4	52.1	58.5	60.5	99	94	46	34	8	14	20	14	9	0.91	1.66	1.18	0.44	0.10	0.12	4.41
CV,%	15.2	2.1	5.6	3.5	1.4	4	12	20	23	13	10	10	13	13	22.83	12.34	12.54	22.47	28.01	44.11	9.99
LSD,0.05	0.9	0.9	4.1	2.9	1.2	5	16	13	11	1	2	3	3	2	0.29	0.29	0.21	0.14	0.04	0.07	0.62

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

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

<sup>3</sup> These are mixtures that included crimson clover and/or tillage radish.

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

not be made using the summary tables 17, 18, and 19, 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 17, 18, and 19 to determine to which yearly report to refer.

## 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 Web site, [www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage).

- 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)

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**Table 6. Dry matter yields, seedling vigor, plant height, maturity, and stand persistence of annual ryegrass varieties sown September 11, 2012, at Lexington, Kentucky** (see table 17 for designation of Italian or Westerwolds type commercial varieties).

Variety	Seedling Vigor <sup>1</sup> Oct 12, 2012	Maturity <sup>2</sup>				Percent Stand			Plant Height (inches)				Yield (tons/acre)					
		2013				2012			2013				2013					
		Apr 29	May 25	Jun 11	Jun 28	Oct 12	Mar 20	Jul 18	Apr 29	May 25	Jun 11	Jun 28	Apr 29	May 25	Jun 11	Jun 28	Jul 29	Total
<b>Commercial Varieties—Available for Farm Use</b>																		
Barmultra II	3.5	32.8	55.5	55.0	54.5	100	100	100	14	16	12	12	1.61	1.17	0.22	0.21	0.17	3.38*
Marshall	4.6	34.8	48.0	56.0	58.5	100	100	6	17	15	11	13	1.92	1.07	0.15	0.15	0.00	3.29*
Nelson	2.9	33.0	53.0	56.0	58.0	100	100	19	15	17	11	13	1.59	1.17	0.13	0.17	0.00	3.06*
Hercules	3.4	32.3	59.5	56.0	56.5	100	71	75	13	23	13	16	1.26	1.26	0.19	0.21	0.08	3.00
Big Boss	2.8	32.5	58.5	56.0	58.5	100	94	6	15	19	10	12	1.46	1.15	0.15	0.06	0.00	2.83
Jackson	4.0	34.3	61.5	56.5	57.5	100	67	11	14	24	11	12	1.20	1.08	0.12	0.12	0.00	2.52
Feast II	2.8	31.0	58.0	54.0	57.0	100	35	73	9	23	10	15	0.81	1.20	0.10	0.17	0.07	2.35
<b>Experimental Varieties</b>																		
ME4	3.3	33.5	49.8	56.0	57.0	100	100	13	19	16	10	12	1.90	1.02	0.15	0.11	0.00	3.19*
M2CVS	4.4	33.0	49.3	58.0	58.5	100	100	14	16	15	11	13	1.72	0.99	0.14	0.12	0.00	2.97
ME-94	4.4	34.5	52.0	56.0	58.0	100	100	21	17	16	10	14	1.68	1.02	0.09	0.14	0.00	2.93
Mean	3.6	33.2	54.5	56.0	57.4	100	87	34	15	18	11	13	1.51	1.11	0.15	0.15	0.03	2.95
CV,%	22.1	5.1	4.5	1.8	1.6	0	11	25	8	13	11	10	7.91	10.00	31.42	39.80	70.89	7.86
LSD,0.05	1.2	2.5	3.5	1.4	1.3	0	14	12	2	4	2	2	0.17	0.16	0.07	0.08	0.03	0.34

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

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

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

**Table 7. Dry matter yields, seedling vigor winter injury, plant height, maturity, and plant persistence of annual ryegrass varieties sown September 5, 2013, at Lexington, Kentucky** (see table 17 for designation of Italian or Westerwolds type commercial varieties).

Variety	Seedling Vigor <sup>1</sup> Oct 14, 2013	Percent Stand		Winter Injury <sup>2</sup>	Plant Height (in)	Maturity <sup>3</sup>			Yield (tons/acre)					
		2013	2014			2014			2014					
		Oct 14	Apr 2	Jan 27	May 1	May 1	May 22	Jun 10	May 2	May 23	Jun 10	Jun 27	Jul 23	Total
<b>Commercial Varieties—Available for Farm Use</b>														
Fria	4.3	96	97	1.5	19	37	50	60	2.01	0.89	0.49	0.09	0.04	3.51*
Ed	4.1	97	96	2.8	19	41	51	59	1.77	0.93	0.55	0.11	0.11	3.47*
Bruiser	4.8	97	96	2.5	19	42	53	58	1.80	0.88	0.55	0.12	0.08	3.42*
Marshall	3.8	93	95	1.3	22	36	48	59	1.94	0.82	0.47	0.10	0.08	3.41*
Barmultra II	3.4	89	70	3.5	15	33	52	56	1.20	1.05	0.72	0.18	0.21	3.36*
Assist	3.5	93	93	3.0	18	39	49	60	1.57	0.79	0.50	0.07	0.14	3.06*
Amp	3.4	89	46	3.5	17	43	54	59	1.09	0.75	0.54	0.11	0.09	2.58
Hercules	4.3	92	44	5.8	14	34	52	59	0.88	0.71	0.52	0.17	0.21	2.49
Dyna-Gain	3.8	93	83	3.5	19	39	51	59	1.13	0.66	0.46	0.10	0.11	2.46
Jackson	4.0	95	78	5.3	16	49	54	61	1.10	0.68	0.43	0.10	0.10	2.40
Nelson	3.3	90	51	4.8	15	34	53	60	0.91	0.64	0.51	0.10	0.08	2.23
Feast II	3.3	88	12	8.3	10	32	54	59	0.40	0.42	0.53	0.23	0.24	1.82
Attain	3.6	92	31	4.5	14	33	53	61	0.71	0.58	0.36	0.09	0.06	1.80
Verdure	4.0	92	23	7.5	12	32	53	60	0.51	0.46	0.38	0.06	0.07	1.48
Big Boss	3.3	90	13	7.3	12	34	56	60	0.43	0.39	0.38	0.07	0.04	1.31
Gulf	4.0	93	14	7.3	11	38	56	60	0.33	0.28	0.25	0.04	0.03	0.93
Dixie Gold	2.8	80	2	8.0	11	33	55	60	0.18	0.17	0.23	0.05	0.03	0.68
<b>Experimental Varieties</b>														
M2CVS	3.4	93	97	1.5	20	39	50	59	1.99	0.81	0.46	0.14	0.09	3.49*
ME4	3.3	88	89	1.3	23	37	48	58	1.98	0.83	0.52	0.04	0.09	3.47*
ME-94	3.9	92	95	2.0	20	42	50	58	1.75	0.86	0.49	0.10	0.08	3.28*
LMT-15M3	3.4	80	75	3.3	16	34	51	57	1.30	0.92	0.65	0.14	0.17	3.18*
B-13.0171	2.8	84	21	5.0	15	34	50	61	0.78	0.54	0.60	0.12	0.12	2.16
FL4XMep	2.8	80	20	4.8	14	46	55	62	0.64	0.55	0.38	0.10	0.08	1.75
FL4XMarmi	2.6	70	27	5.3	15	44	56	61	0.50	0.34	0.32	0.11	0.00	1.26
FL4XMaron	2.8	84	9	4.8	12	47	56	62	0.38	0.23	0.31	0.07	0.01	1.00
Mean	3.5	89	55	4.3	16	38	52	59	1.09	0.65	0.46	0.10	0.09	2.40
CV,%	15.9	11	26	25.8	10	13	5	3	23.00	24.17	24.22	49.33	72.39	20.09
LSD,0.05	0.8	14	21	1.6	2	7	4	3	0.35	0.24	0.16	0.07	0.10	0.68

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

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

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

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

**Table 8. Dry matter yields, seedling vigor, maturity, and stand persistence of perennial ryegrass varieties sown September 14, 2011, at Lexington, Kentucky** (see table 18 for designation of diploid or tetraploid type commercial varieties).

Variety	Seedling Vigor <sub>1</sub> Oct 11, 2011	Maturity <sup>2</sup>				Percent Stand						Yield (tons/acre)						3-year Total		
		2012		2013		2012		2013		2014		2012		2013		2014				
		May 4	May 24	May 16	Jun 13	Oct 11	Mar 21	Oct 23	Mar 20	Oct 21	Apr 11	Oct 24	Total	Total	May 16	Jun 13	Aug 7		Oct 24	Total
<b>Commercial Varieties—Available for Farm Use</b>																				
Boost	4.8	54.5	56.8	49.0	60.0	100	100	93	88	92	45	48	2.98	2.27	0.49	0.21	0.07	0.38	1.16	6.51*
Power	3.3	53.0	56.5	46.0	58.5	100	100	96	91	94	45	48	2.65	2.18	0.42	0.21	0.05	0.57	1.30	6.48*
Kentaur	3.5	48.0	50.5	35.8	57.0	100	100	95	84	93	49	50	2.88	2.40	0.31	0.26	0.04	0.40	1.01	6.29*
Calibra	3.8	48.8	54.5	37.0	58.0	100	100	97	95	97	73	65	2.49	1.96	0.58	0.20	0.12	0.52	1.42	5.87*
Linn (certified)	3.8	59.0	59.5	56.0	—	100	100	100	85	86	43	25	2.12	1.84	0.90	0.02	0.04	0.28	1.33	5.53*
Grand Daddy	2.8	52.0	57.0	50.0	58.0	100	100	95	94	94	45	34	2.15	1.85	0.40	0.11	0.10	0.38	0.99	4.98*
<b>Experimental Varieties</b>																				
XLFTETPRG	4.3	55.0	56.5	49.3	60.0	100	100	94	86	91	43	34	3.12	2.29	0.40	0.14	0.04	0.42	1.00	6.40*
Mean	3.7	52.9	55.9	44.8	58.6	100	100	96	89	92	49	43	2.63	2.11	0.45	0.17	0.07	0.42	1.14	6.03
CV,%	11.9	3.0	4.3	10.7	1.8	0	0	2	9	5	41	44	14.71	13.87	64.94	55.98	52.85	44.97	40.77	15.71
LSD,0.05	0.7	2.4	3.6	8.8	1.5	0	0	3	12	7	29	28	0.57	0.44	0.53	0.14	0.06	0.28	0.88	1.79

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

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

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

**Table 9. Dry matter yields, seedling vigor, maturity, and stand persistence of perennial ryegrass and festulolium (FL) varieties sown September 7, 2012, at Lexington, Kentucky** (see table 18 for designation of diploid or tetraploid type commercial varieties).

Variety	Seedling Vigor <sub>1</sub> Oct 15, 2012	Maturity <sup>2</sup>			Percent Stand					Yield (tons/acre)					2-year Total	
		2013		2014	2012		2013		2014	2013		2014				
		May 20	May 13	Jun 13	Oct 15	Mar 20	Oct 22	Apr 9	Oct 27	Total	May 13	Jun 13	Aug 7	Oct 27		Total
<b>Commercial Varieties—Available for Farm Use</b>																
Perseus (FL)	4.3	54.5	41.0	62.0	100	100	98	29	45	6.21	0.62	1.06	0.31	0.64	2.63	8.84*
LHT-102	4.8	54.0	37.8	62.0	100	100	100	33	69	5.89	0.36	1.03	0.19	0.54	2.12	8.02*
TetraGain	3.0	56.0	48.0	62.0	97	98	98	69	88	5.16	0.82	0.97	0.26	0.46	2.50	7.66*
TetraMag	4.6	52.5	37.8	62.0	100	100	100	21	55	5.69	0.31	0.92	0.13	0.45	1.80	7.50
Hostyn (FL)	3.0	58.5	47.0	61.5	99	100	100	23	48	5.72	0.38	0.71	0.25	0.42	1.77	7.49
Elena DS	3.3	54.5	35.8	62.0	98	98	98	80	84	5.24	0.59	1.02	0.16	0.42	2.19	7.43
Boost	3.0	56.0	44.3	62.0	91	99	95	91	93	4.87	0.81	0.73	0.12	0.46	2.13	7.00
Calibra	4.0	54.0	34.5	61.5	100	100	100	96	93	4.53	0.88	0.81	0.15	0.60	2.44	6.96
PayDay	2.9	53.5	37.8	61.0	100	100	100	90	95	4.72	0.69	0.88	0.23	0.41	2.22	6.94
Crave	3.3	53.0	39.5	60.5	100	100	100	78	90	4.70	0.51	0.84	0.15	0.52	2.03	6.73
Power	3.8	54.5	42.3	62.0	100	100	100	84	63	4.57	0.62	0.80	0.20	0.33	1.96	6.53
Grand Daddy	3.3	56.5	50.3	61.5	99	99	100	81	79	4.33	0.58	0.57	0.16	0.40	1.70	6.03
Verseka	3.6	55.0	35.8	61.5	100	100	100	72	63	4.35	0.44	0.66	0.20	0.36	1.66	6.01
Impressario	4.1	55.5	50.0	61.5	100	100	100	33	64	4.51	0.26	0.59	0.15	0.48	1.48	5.99
BG34	4.4	50.3	32.0	59.0	100	100	100	65	65	4.00	0.55	0.69	0.19	0.43	1.86	5.86
Linn (certified)	3.3	58.5	55.5	61.0	100	100	100	80	55	3.62	0.97	0.45	0.16	0.40	1.98	5.60
<b>Experimental Varieties</b>																
IS-FLPT 5	3.4	53.0	32.0	61.0	100	100	100	79	76	4.71	0.55	0.86	0.20	0.63	2.24	6.95
IS-FLPT 6	3.0	52.5	33.3	61.5	100	100	100	89	81	4.43	0.56	0.84	0.23	0.45	2.08	6.51
PPG-FPRD 104	3.9	57.0	48.3	60.5	100	100	100	71	69	4.25	0.68	0.84	0.18	0.45	2.15	6.40
IS-FLPD 6	3.6	55.0	42.8	60.0	100	100	99	78	63	3.66	0.49	0.60	0.16	0.27	1.53	5.19
Mean	3.6	54.7	41.0	61.2	99	100	99	67	72	4.76	0.58	0.79	0.19	0.46	3.02	6.78
CV,%	19.9	3.2	12.4	1.6	3	1	2	25	36	11.48	30.36	28.54	49.56	39.19	25.07	13.68
LSD,0.05	1.0	2.4	7.3	1.4	5	1	3	24	36	0.77	0.25	0.32	0.13	0.25	0.72	1.31

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

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

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

**Table 10. Dry matter yields, seedling vigor, maturity and stand persistence of perennial ryegrass varieties sown September 5, 2013 at Lexington, Kentucky (see table 18 for designation of diploid or tetraploid type commercial varieties).**

Variety	Seedling Vigor <sup>1</sup> Oct 14, 2013	Maturity <sup>2</sup>		Percent Stand			Yield (tons/acre)				
		2014		2013	2014		2014				
		May 7	Jun 12	Oct 14	Apr 2	Oct 27	May 7	Jun 12	Aug 6	Oct 29	Total
<b>Commercial Varieties—Available for Farm Use</b>											
Kentaur	3.8	32.8	62.0	97	99	99	1.47	1.71	0.26	0.35	3.80*
Boost	2.3	46.3	61.5	88	88	93	1.69	1.28	0.26	0.26	3.49*
PayDay	3.0	34.5	62.0	98	98	100	1.39	1.39	0.30	0.32	3.41*
Power	3.8	35.8	61.5	98	99	100	1.51	1.29	0.26	0.30	3.36*
Grand Daddy	3.3	41.0	62.0	98	98	94	1.46	1.13	0.21	0.36	3.16
BG34	3.8	32.3	53.8	99	100	100	1.39	1.18	0.28	0.27	3.11
Calibra	3.5	38.0	62.0	98	98	98	1.24	1.27	0.29	0.25	3.05
Victorian	4.4	56.0	29.0	99	100	100	1.81	0.65	0.21	0.35	3.02
Everlast	4.8	56.0	52.8	100	93	98	1.58	0.73	0.22	0.34	2.87
Linn (certified)	3.9	52.0	29.0	99	99	98	1.69	0.55	0.11	0.18	2.53
<b>Experimental Varieties</b>											
RAD-MFP141	2.9	32.8	61.5	97	97	99	1.58	1.41	0.32	0.32	3.63*
RAD-MFP145	2.9	33.8	53.8	97	97	98	1.45	1.40	0.28	0.29	3.43*
Mean	3.5	40.9	54.2	97	97	98	1.52	1.17	0.25	0.30	3.24
CV,%	12.6	9.9	15.5	3	3	2	12.42	8.52	41.95	31.83	10.76
LSD,0.05	0.6	5.8	12.1	4	4	3	0.27	0.14	0.15	0.14	0.50

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

<sup>2</sup> 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 festulium varieties sown September 14, 2011, at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 11, 2011	Maturity <sup>2</sup>						Percent Stand						Height (in)	Yield (tons/acre)						3-year Total			
		2012		2013	2014		2011	2012		2013	2014		2012	2012		2013		2014						
		Apr 10	Apr 30	May 20	May 24	May 16	Jun 17	Oct 11	Mar 21	Oct 19	Mar 28	Oct 22	Apr 11	Oct 24	Apr 10	Total	Total	May 18	Jun 17	Aug 7		Oct 24	Total	
<b>Commercial Varieties—Available for Farm Use</b>																								
Hykor	1.8	31.5	55.5	29.0	60.0	59.5	29.0	100	100	100	100	100	100	100	100	11	2.31	5.20	1.25	0.39	0.21	1.41	3.26	10.77*
Felina	1.3	30.8	54.5	29.0	60.0	57.5	29.0	100	100	100	100	100	100	80	9	1.74	4.77	0.95	0.31	0.14	1.10	2.50	9.00	
Perun	3.0	32.5	48.5	46.8	56.0	52.0	60.5	100	100	97	74	79	21	34	14	3.47	3.48	0.37	0.61	0.22	0.60	1.80	8.75	
Perseus	3.3	32.8	45.0	49.5	55.0	46.3	60.5	100	100	100	87	91	20	25	15	3.75	3.80	0.40	0.32	0.16	0.29	1.17	8.73	
Spring Green	3.0	32.5	56.0	52.0	56.0	52.5	62.0	100	100	100	88	94	65	54	17	3.36	3.32	0.86	0.28	0.11	0.62	1.87	8.55	
Lofa	3.0	32.8	49.3	49.3	55.5	49.8	61.5	100	100	100	91	91	19	35	15	3.44	3.56	0.48	0.29	0.10	0.32	1.19	8.18	
Duo	4.3	48.8	—	62.0	56.0	51.5	61.5	100	100	98	91	91	53	48	26	2.90	3.50	0.76	0.27	0.25	0.47	1.74	8.14	
Fojtan	1.0	30.8	53.0	29.0	59.5	56.5	29.0	100	100	100	100	100	100	48	9	1.88	4.03	0.67	0.25	0.22	0.66	1.80	7.72	
Barfest	2.6	32.0	43.5	44.0	56.0	50.3	60.0	100	100	100	94	97	84	71	12	2.85	3.21	0.68	0.23	0.05	0.68	1.64	7.70	
Gain	4.6	50.0	—	62.0	58.5	49.0	61.5	100	100	56	23	20	4	4	25	2.60	2.81	0.14	0.16	0.11	0.04	0.46	5.87	
Sweet Tart	3.0	31.8	50.3	38.8	56.5	52.0	60.0	100	100	100	9	74	25	28	14	2.22	2.11	0.15	0.06	0.05	0.22	0.47	4.81	
Bonus	4.5	50.0	—	62.0	60.0	—	—	100	100	10	2	1	0	1	25	2.48	1.02	0.00	0.00	0.00	0.00	0.00	3.50	
<b>Experimental Varieties</b>																								
KYFA1016	2.6	32.3	39.0	51.5	56.0	52.5	60.0	100	100	100	96	97	84	83	12	2.77	2.96	0.86	0.24	0.15	0.77	2.02	7.75	
KYFA1015	2.3	32.3	39.0	51.5	56.0	49.3	61.0	100	100	100	96	97	85	61	12	2.71	2.99	0.67	0.22	0.13	0.49	1.51	7.21	
KYFA9819	2.0	32.0	40.5	52.0	56.0	53.0	61.3	100	100	100	96	95	63	33	12	2.42	2.60	0.28	0.11	0.05	0.32	0.76	5.79	
XLFFL	4.3	48.8	—	62.0	59.5	—	—	100	100	4	1	1	0	0	25	2.55	1.79	0.00	0.00	0.00	0.00	0.00	4.35	
Mean	2.9	36.3	47.8	48.1	57.2	52.3	53.8	100	100	85	72	77	51	44	16	2.72	3.20	0.53	0.23	0.12	0.50	1.39	7.30	
CV,%	15.3	2.9	5.5	9.1	1.1	5.6	1.8	0	0	6	7	6	23	50	10	11.73	19.01	45.15	745.93	83.79	50.75	33.82	13.41	
LSD,0.05	0.6	1.5	3.8	6.3	1.0	4.5	1.4	0	0	8	7	7	17	31	2	0.45	0.87	0.34	0.25	0.15	0.36	0.67	1.39	

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

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

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



**Table 12. Dry matter yields, seedling vigor, maturity, and stand persistence of festulolium varieties sown September 7, 2012, at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 15, 2012	Maturity <sup>2</sup>			Percent Stand					Yield (tons/acre)						2-year Total
		2013		2014	2012	2013		2014		2013	2014					
		May 20	May 13	Jun 12	Oct 15	Mar 20	Oct 22	Apr 9	Oct 27	Total	May 13	Jun 12	Aug 7	Oct 27	Total	
<b>Commercial Varieties—Available for Farm Use</b>																
Hykor	2.5	60.0	57.0	29.0	98	98	100	100	100	7.31	1.35	0.87	0.25	1.35	3.82	11.13*
Perseus	4.0	55.0	40.0	59.0	99	100	96	29	58	7.01	0.58	1.27	0.17	0.87	3.18	10.20*
Felina	1.3	60.0	56.5	29.0	95	96	99	99	100	6.61	1.16	0.72	0.23	1.18	3.28	9.90
Mahulena	1.4	60.0	58.5	29.0	92	93	95	99	99	5.96	1.53	0.68	0.31	0.99	3.51	9.47
Spring Green	4.1	57.5	47.3	58.5	100	100	100	83	93	6.03	0.99	1.16	0.19	0.81	3.14	9.18
Fojtan	2.0	57.5	55.5	29.0	97	97	100	100	100	5.80	1.15	0.68	0.20	1.27	3.30	9.10
Lofa	4.5	54.5	45.0	59.5	100	100	86	31	63	6.41	0.69	1.08	0.10	0.59	2.45	8.87
Perun	3.3	55.5	41.3	59.3	100	100	98	20	53	6.64	0.50	0.81	0.13	0.64	2.09	8.73
Hostyn	3.0	59.0	50.3	60.0	99	100	99	38	41	6.79	0.50	0.68	0.11	0.62	1.91	8.70
Barfest	3.8	55.5	43.5	58.0	100	100	100	76	82	5.57	0.89	0.97	0.11	0.89	2.86	8.44
Duo	3.9	60.0	51.0	58.5	100	100	100	80	81	5.62	1.01	0.89	0.11	0.61	2.61	8.23
Sweet Tart	4.6	56.5	51.0	58.7	100	85	93	16	13	4.44	0.26	0.52	0.10	0.33	1.20	5.64
Gain	4.9	61.5	37.3	60.0	100	78	18	6	14	3.94	0.10	0.21	0.02	0.15	0.48	4.42
Meadow Green	4.8	56.0	—	—	100	66	0	0	0	3.53	0.00	0.00	0.00	0.00	0.00	3.53
Bonus	5.0	60.0	—	—	100	38	2	1	1	2.86	0.00	0.00	0.00	0.02	0.02	2.88
<b>Experimental Varieties</b>																
Amp1427	2.4	56.0	46.3	51.8	96	99	100	88	91	6.14	1.18	0.95	0.09	1.09	3.31	9.45
KYFA1016	3.1	55.5	42.3	58.0	100	100	100	97	97	6.38	1.18	0.90	0.19	0.53	2.80	9.18
KYFA1015	3.0	55.5	43.0	58.5	100	100	100	83	92	5.86	0.84	0.93	0.13	0.97	2.86	8.72
KYFA9819	3.0	55.5	44.3	59.0	98	99	99	78	80	5.69	1.01	1.03	0.13	0.50	2.66	8.35
XLFFL	4.9	59.5	—	—	100	89	0	0	0	3.51	0.00	0.00	0.00	0.00	0.00	3.51
Mean	3.5	57.5	47.9	51.0	99	92	79	56	63	5.61	0.75	0.71	0.13	0.67	2.26	7.85
CV,%	13.6	2.3	12.2	7.9	2	10	8	27	25	9.57	32.98	32.59	61.53	39.41	23.50	10.92
LSD,0.05	0.7	1.9	8.7	6.0	2	12	9	22	22	0.76	0.35	0.33	0.11	0.37	0.76	1.22

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

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

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

**Table 13. Dry matter yields, seedling vigor, maturity, and stand persistence of festulolium varieties sown September 5, 2013, at Lexington, Kentucky.**

Variety	Seedling Vigor <sup>1</sup> Oct 14, 2013	Maturity <sup>2</sup>		Percent Stand				Yield (tons/acre)				
		2014		2013	2014		2013 <sup>3</sup>	2014				
		May 8	Jun 12	Oct 14	Apr 2	Oct 28	Dec 18	May 8	Jun 12	Aug 6	Oct 29	Total
<b>Commercial Varieties—Available for Farm Use</b>												
Perun	4.0	41.0	62.0	99	99	98	—	2.42	1.94	0.38	0.63	5.36*
Perseus	3.9	42.3	62.0	100	99	99	—	2.09	2.03	0.29	0.61	5.02*
Lofa	4.1	41.0	62.0	99	99	99	—	2.20	1.98	0.30	0.51	4.99*
Hostyn	3.0	47.3	62.0	96	94	95	—	1.95	1.77	0.39	0.62	4.73
Barfest	3.3	43.0	62.0	99	98	99	—	2.11	1.70	0.26	0.45	4.52
Spring Green	3.5	42.3	62.0	100	100	100	—	1.97	1.56	0.29	0.51	4.34
Hykor	2.9	54.5	29.0	100	93	99	—	1.23	1.25	0.42	1.10	4.00
Duo	3.5	46.8	62.0	100	100	100	—	1.94	1.38	0.24	0.32	3.88
Gain	4.8	53.5	61.0	100	76	80	0.38	1.29	1.43	0.25	0.40	3.73
Felina	2.4	54.0	29.0	97	89	98	—	1.12	1.16	0.45	0.85	3.58
Mahulena	1.8	56.0	29.0	98	84	95	—	1.12	1.05	0.32	0.72	3.21
Rebab	2.3	50.3	43.5	97	92	97	—	0.97	0.97	0.32	0.74	3.01
Fojtan	2.0	48.5	50.8	98	85	96	—	0.93	1.01	0.27	0.79	3.00
Meadow Green	5.0	47.5	61.5	100	18	4	0.48	0.60	1.02	0.06	0.02	2.18
Bonus	4.8	51.5	62.0	100	6	4	0.54	0.46	0.79	0.09	0.06	1.94
<b>Experimental Varieties</b>												
KYFA9819	2.6	40.3	62.0	100	97	97	—	1.78	1.57	0.23	0.47	4.06
Amp1427	2.3	34.5	62.0	99	95	97	—	1.70	1.76	0.18	0.28	3.92
XLFFL	4.3	52.5	61.5	100	71	13	0.29	1.49	1.37	0.03	0.03	3.22
Mean	3.3	47.0	54.7	99	83	82	0	1.52	1.43	0.26	0.51	3.82
CV,%	17.4	8.9	9.5	2	9	2	43	12.59	12.12	27.86	29.68	11.32
LSD,0.05	0.8	6.0	7.3	2	11	3	0	0.27	0.25	0.10	0.21	0.61

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

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

<sup>3</sup> These four varieties had sufficient fall growth to justify a fall harvest.

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

**Table 14. Performance of annual ryegrass varieties sown in 2013 at Lexington.<sup>1</sup>**

Variety	Type	Proprietor/ KY Distributor	2013 <sup>2</sup>
			2014 <sup>3</sup>
<b>Commercial Varieties—Available for Farm Use</b>			
Amp	Westerwold tetraploid	Columbia Seeds	x <sup>4</sup>
Assist	Westerwold diploid	SaddleButte	*
Attain	Westerwold tetraploid	Smith Seed Services	x
Barmultra II	Italian tetraploid	Barenbrug	*
Big Boss	Westerwold tetraploid	Smith Seed Services	x
Bruiser	Westerwold diploid	Ampac Seed	*
Dixie Gold	Westerwold tetraploid	Caudill Seed	x
Dyna-Gain	Westerwold diploid	Columbia Seeds	x
Ed	Westerwold diploid	Smith Seed Services	*
Feast II	Italian tetraploid	Ampac Seed	x
Fria	Westerwold diploid	Allied Seed	*
Gulf	Westerwold diploid	Public	x
Hercules	Westerwold diploid	Barenbrug	x
Jackson	Westerwold diploid	The Wax Company	x
Marshall	Westerwold diploid	The Wax Company	*
Nelson	Westerwold tetraploid	The Wax Company	x
Verdure	Westerwold tetraploid	Smith Seed Services	x
<b>Experimental Varieties</b>			
B-13.0171	—	Blue Moon Farms	x
FL4XMarmi	Westerwold diploid	Univ. of Florida	x
FL4XMaron	Westerwold diploid	Univ. of Florida	x
FL4XMep	Westerwold diploid	Univ. of Florida	x
LMT-15M3	—	DLF International	*
ME4	Westerwold diploid	The Wax Company	*
ME-94	Westerwold diploid	The Wax Company	*
M2CVS	Westerwold diploid	The Wax Company	*

<sup>1</sup> See Table 17 for summary of yield data on named varieties from 2000-2014.

<sup>2</sup> Establishment year.

<sup>3</sup> Harvest year.

<sup>4</sup> "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. Performance of perennial ryegrass across years at Lexington.**

Variety	Type	Proprietor/ KY Distributor	2011 <sup>1</sup>			2012		2013
			2012 <sup>2</sup>	2013	2014	2013	2014	2014
<b>Commercial Varieties—Available for Farm Use</b>								
BG34	diploid	Barenbrug USA				x <sup>3</sup>	x	x
Boost	tetraploid	Allied Seed	*	*	*	x	*	*
Calibra	tetraploid	DLF International	x	*	*	x	*	x
Crave	tetraploid	Ampac Seed Company				x	*	
Elena DS	tetraploid	Allied Seed				x	*	
Everlast	diploid	Caudill Seed						x
Grand Daddy	tetraploid	Smith Seed Services	x	x	*	x	x	x
Impressario	tetraploid	DLF International				x	x	
Kentaur	tetraploid	DLF International	*	*	*			*
LHT-102	tetraploid	Ampac Seed Company				*	*	
Linn	diploid	Public	x	x	*	x	*	x
PayDay	tetraploid	Mountain View Seeds				x	*	*
Power	tetraploid	Ampac Seed Company	*	*	*	x	*	*
TetraGain	tetraploid	Pure Seed				x	*	
TetraMag	tetraploid	Mountain View Seeds				*	x	
Verseka	tetraploid	Allied Seed				x	x	
Victorian	diploid	Caudill Seed						x
<b>Experimental Varieties</b>								
IS-FLPD6	diploid	DLF International				x	x	
IS-FLPT5	tetraploid	DLF International				x	*	
IS-FLPT6	tetraploid	DLF International				x	*	
PPG-FPRD 104	diploid	Mountain View Seeds				x	*	
RAD-MFP141	tetraploid	Radix Research						*
RAD-MFP145	tetraploid	Radix Research						*
XLFTETPRG	tetraploid	ProSeeds Marketing	*	*	*			

<sup>1</sup> Establishment year.

<sup>2</sup> Harvest year.

<sup>3</sup> "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 16. Performance of festulolium varieties at Lexington.**

Variety	Type <sup>2</sup>	Proprietor/ KY Distributor	2011 <sup>1</sup>			2012		2013
			2012 <sup>3</sup>	2013	2014	2013	2014	2014
<b>Commercial Varieties—Available for Farm Use</b>								
Barfest	MF x PR	Barenbrug USA	x <sup>4</sup>	x	x	x	x	x
Duo	MF x PR	Ampac Seed	x	x	x	x	x	x
Felina	(TF x IR) x TF	DLF International	x	*	x	*	*	x
Gain	MF x IR	Allied Seed	x	x	x	x	x	x
Fojtan	(TF x IR) x TF	DLF International	x	x	x	x	*	x
Hostyn	MF x IR	DLF International				*	x	x
Hykor	(TF x IR) x TF	DLF International	x	*	*	*	*	x
Lofa	(TF x Int) x Int	DLF International	*	x	x	x	x	*
Mahulena	(TF x IR) x TF	DLF International				x	*	x
Meadow Green	—	Pure Seed				x	x	x
Perseus	MF x IR	DLF International	*	x	x	*	*	*
Perun	MF x IR	DLF International	*	x	x	*	x	*
Rebab	(TF x IR) x TF	DLF International						
Spring Green	MF x PR	Turf Seed	*	x	x	x	*	x
Bonus	MF x IR	Allied Seed	x	x	x	x	x	x
Sweet Tart	MF x IR	ProSeeds Marketing	x	x	x	x	x	
<b>Experimental Varieties</b>								
Amp1427	—	Ampac Seed				x	*	x
KYFA1015	MF x IR	KY Agric. Exp. Station	x	x	x	x	x	
KYFA1016	MF x IR	KY Agric. Exp. Station	x	x	x	x	x	
KYFA9819EF	MF x IR	KY Agric. Exp. Station	x	x	x	x	x	x
XLF FL	—	ProSeeds Marketing	x	x	x	x	x	x

<sup>1</sup> Establishment year.

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

<sup>3</sup> Harvest year.

<sup>4</sup> "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 18. Summary of Kentucky perennial ryegrass yield trials 1999-2014** (yield shown as a percentage of the mean of the commercial varieties in the trial).

Variety	Type	Proprietor	Lexington												Princeton		Bowling Green		Mean <sup>3,4</sup> (#trials)	
			99 <sup>1,2</sup>	01	03	04	05	06	07	08	09	10	11	12	00	02	00	03		
			2yr <sup>5</sup>	2yr	2yr	3yr	3yr	2yr	3yr	3yr	3yr	2yr	3yr	2yr	2yr	3yr	2yr	2yr		
Aires	diploid	Ampac Seed		95													93			94(2)
Amazon	tetraploid	AgriBioTech	108			99											107			104(3)
Anaconda	tetraploid	Caudill Seed	113													95		103		104(3)
Aubisque	tetraploid	Seed Research of OR			144														99	122(2)
Bandit	tetraploid	Grassland West														106		114		110(2)
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							85(4)
Bison	hybrid tetraploid	International Seeds																	140	-
Boost	tetraploid	Allied Seed							130	125	120	143	110	104						122(6)
Boxer	tetraploid	AgriBioTech	121														106			114(2)
Calibra	tetraploid	DLF International								96	109	81	99	103		112				100(6)
CAS MP64	diploid	Cascade International		97																-
Citadel	tetraploid	Ag Canada	101													94	113	103		103(4)
Crave	tetraploid	Ampac Seed												100						-
Derby	-	Public																74		-
Elena DS	tetraploid	Allied Seed												110						-
Eurostar	tetraploid	Seed Research of OR							112											-
Feeder	diploid	Seed Research of OR							76											-
Grand Daddy	tetraploid	Smith Seed		118				101	109		76	92	84	90		111				98(8)
Green Gold	tetraploid	Grasslands Oregon						96												-
Herbal	-	ProSeeds Marketing									77									-
Impressario	tetraploid	DLF International										107			89					98(2)
Kentaur	tetraploid	DLF International											106							-
Lactal	tetraploid	Brett Young									102									-
Lasso	diploid	DLF International		98																-
LHT-102	tetraploid	Ampac Seed												119						-
Linn	diploid	Public	87	98	98	102		98	85	84	101	92	93	83	87	88	77			91(14)
Manhattan	diploid	-														85				-
Mara	diploid	Barenbrug USA															85			-
Matrix	diploid	Cropmark seeds			77														64	-
Maverick Gold	hybrid tetraploid	Ampac Seed		97												71				84(2)
Orantas	diploid	DLF International									82									-
Ortet	tetraploid	Oregro Seeds								114										-
PayDay	tetraploid	Mountain View Seeds												103						-
Polly II	tetraploid	FFR/Sou. St.	104												110		125			113(3)
Polly Plus	hybrid tetraploid	Allied Seed			64														60	62(2)
Power	tetraploid	Ampac Seed							110	103	102	100	109	97						104(6)
Polim	tetraploid	DLF International										106								-
Quartermaster	tetraploid	Radix Research					122													-
Quartet	tetraploid	Ampac Seed		97			56		46							113				78(4)
RAD-CPS212	hybrid tetraploid	Radix Research					134													-
RAD-MI125	hybrid tetraploid	Mountain View Seeds						120												-
Sampson	diploid	International Seeds	87																	-
Sierra	diploid	Lewis Seed Co.					89													-
TetraGain	tetraploid	Pure Seed												114						-
TetraMag	tetraploid	Mountain View Seeds												111						-
Tonga	tetraploid	Kings AgriSeeds					96				103									100(2)
Verseka	tetraploid	Allied Seed												89						-
Yatsyn	diploid	Barenbrug USA	80												89					85(2)

<sup>1</sup> Year trial was established.

<sup>2</sup> Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in forage yield between varieties. To find actual yields, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 1999 was harvested two years, so the final report would be "2001 Annual and Perennial Ryegrass Report" archived in the KY Forage website at <[www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage)>.

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

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

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

**Table 19. Summary of Kentucky festulolium yield trials 1999-2014** (yield shown as a percentage of the mean of the commercial varieties in the trial).<sup>1</sup>

Variety	Type <sup>2</sup>	Proprietor	Lexington										Princeton	Quicksand		Mean <sup>5</sup> (#trials)		
			1999 <sup>3,4</sup>	2001	2003	2005	2007	2008	2009	2010	2011	2012	2000	2001	2003			
			2yr <sup>6</sup>	3yr	2yr	3yr	3yr	3yr	3yr	3yr	3yr	2yr	2yr	2yr	2yr			
Agula	MF x IR	Allied Seed										94						-
Barfest	MF x PR	Barenbrug USA										105	101	107				104(3)
Bonus	MF x IR	Allied Seed										93	46	36				58(3)
Duo	MF x PR	Ampac Seed	104			84		103	99	95	106	104						99(7)
Felina	(TF x IR) x TF	DLF International		101								132	118	125				125(3)
Fojtan	(TF x IR) x TF	DLF International										112	101	115				109(3)
Gain	MF x IR	Allied Seed										103	77	56				79(3)
Hostyn	MF x IR	DLF International												110				-
Hykor	(TF x IR) x TF	DLF International			98							133	141	141			98	128(4)
Lofa	(TF x Int) x Int	DLF International										105	107	112				108(3)
Mahulena	(TF x IR) x TF	DLF International												120				-
Meadow Green	-	Pure Seed												45				-
Perseus	MF x IR	DLF International										132	114	129				125(3)
Perun	MF x IR	DLF International										127	114	111				117(3)
Spring Green	MF x PR	Turf-Seed		88		105	100	114	101	113	112	116				97		105(9)
Sweet Tart	MF x IR	ProSeeds Marketing							88		82	63	71					76(4)
Vorage	-	Improved Forages												99				-

<sup>1</sup> The festuloliums were in fescue trials from 1999-2005.

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

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

<sup>4</sup> Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in forage yield between varieties. To find actual yields, look in the yearly report for the final year of each specific trial. For example, the Lexington trial planted in 1999 was harvested two years, so the final report would be "2001 Tall Fescue Report" archived in the KY Forage website at <[www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage)>.

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

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



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