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2022 Tall Fescue, Bromegrass, and Meadow Fescue Report

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Introduction

Tall fescue (*Festuca arundinacea*) is a productive, well-adapted, persistent, soil-conserving, cool-season grass grown on approximately 5.5 million acres in Kentucky. This grass, used for both hay and pasture, is the forage base of most of Kentucky's livestock enterprises, particularly beef cattle.

Much tall fescue in Kentucky is infected with an internal fungus (endophyte) that produces ergot alkaloids and results in decreased weight gains in growing ruminants and lower pregnancy rates in breeding stock, especially in hot weather. Varieties are now available that are free of this fungal endophyte or contain a nontoxic endophyte. Varieties in the latter group are also referred to as "novel" or "friendly" endophyte varieties, because their endophyte improves stand survival without creating animal production problems.

Smooth bromegrass (*Bromus inermis*) is a perennial pasture and hay grass native to Europe. Smooth bromegrass has creeping underground stems or rootstocks from which the leafy stems arise. This grass is palatable to all classes of livestock, from emergence to the heading stage. Meadow bromegrass (*Bromus biebersteinii*) is a native of southeastern Europe and the adjacent Near East. It resembles smooth bromegrass but has only short rhizomes or none at all. Meadow bromegrass is densely tufted, has a similar growth habit to tall fescue, and has the advantage of greater seedling vigor than smooth bromegrass. Hybrid bromegrass is a cross between smooth and meadow bromegrasses that combines the vigorous growth of smooth bromegrass with the leafiness and good regrowth of meadow bromegrass. Alaska bromegrass (*Bromus sitchensis*), also called Sitka bromegrass, is a long-lived perennial bunchgrass that grows at moderate rates during the spring and summer season. It does not spread by rhizomes and is more suited to environments with harsh winters.

Prairie bromegrass (*Bromus wildenowii*) is a tall, cool-season, leafy, short-lived, perennial, deep-rooted bunchgrass. It was introduced from South America. Seedheads are produced throughout the growing season. To maintain productive stands for several years, it is necessary to manage at least one growth cycle each year for seed production and natural reseeding. Some prairie bromegrasses are susceptible to winterkill. Mountain bromegrass (*Bromus marginatus*) is native to North America from Alaska to northern Mexico, where it can be found in many different habitats. It is a short-lived, perennial, cool-season, sod-forming grass. Mountain bromegrass' leafy growth and deep, well-branched root system give erosion protection on sloping ground. It is similar to California bromegrass (*Bromus carinatus*), and some consider them to be synonymous. Compared to tall fescue, the bromegrasses retain quality better as they mature and grow better during dry weather. However they are generally less well adapted to Kentucky conditions.

Meadow fescue (*Festuca pratensis*) is a semibunch type cool season European grass that has great winter hardiness. It will yield slightly less than tall fescue and orchardgrass, but has better digestability and palatability for grazing applications.

This report provides Kentucky yield trial data on varieties of tall fescue and similar grass species as well as guidelines for selecting tall fescue varieties. Consult the UK Forage Extension website (https://forages.ca.uky.edu) to access all forage variety testing reports from Kentucky and surrounding states as well as a large number of other forage publications.

Important Selection Considerations

Local adaptation and seasonal yield. Select a variety that is well adapted to Kentucky, as indicated by good performance across years and locations in replicated yield trials such as those presented in this publication. Choose high-yielding persistent varieties and varieties that are productive during the desired season of use.

Tall fescues are often classified as either "Mediterranean" or "continental" types according to the area from which the parental material for the variety originated. In general, the Mediterranean types (e.g., Cajun and Fawn) are more productive in the fall and winter than the continental types (such as Kentucky 31). Compared to continental types, Mediterranean types mature earlier in spring and become dormant and nonproductive during the summer in Kentucky. They are also more susceptible to leaf diseases such as helminthsporium and rhizoctonia. Therefore, Mediterranean varieties are less preferred for use in Kentucky than continental types. Because Mediterranean varieties mature earlier in the spring, first-cutting yields are generally higher when the two types are harvested at the same time. However, the continental types produce more in the summer.

Endophyte level. Seed with infection levels of less than 5 percent is regarded as endophyte-free. A statement to that effect will be displayed prominently on a green tag attached to the seed bag. If no tag is present, assume the seed is infected with the toxic endophyte. Several varieties, both with and without the endophyte, are adapted for use in Kentucky. With the new "novel endophyte" tall fescues, the seed tag should specify the infection level. Seed of novel tall fescues should be handled carefully to preserve this infection, which means keeping seed cool and planting as soon as possible. Novel endophyte varieties need a high infection level to improve stand survival. Look for Alliance for Grassland Renewal seed quality assurance printed on each bag of novel fescue seed.

Seed quality. Buy premium-quality seed that is high in germination and purity levels and free from weed seed. Buy certified seed of improved varieties. An improved variety is one that has performed well in independent trials. Please check label for the test date (which must be within the previous nine months), the level of germination, and the amount of other crop and weed seed.

Order seed well in advance of planting time to ensure that it will be available when needed.

Description of the Tests

Data from 12 studies are reported. Tall fescue varieties were sown at Lexington (2019, 2020, and 2021), Princeton (2019 and 2021) and Quicksand (2021). Bromegrass varieites were sown in Lexington in 2019, 2020, and 2021. Meadow fescue varieties were sown in Lexington in 2019, 2020, and 2021. The soils at Lexington (Maury), Princeton (Crider) and Quicksand (Nolin) are well-drained silt loams and are well suited for tall fescue and bromegrass production.

Seedings were made at the rate of 25 pounds per acre for tall fescue and meadow fescue and 20 pounds per acre for bromegrass 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. Nitrogen was topdressed at 60 pounds per acre of actual nitrogen in March, after the first cutting, and again in late summer, for a total of 180 pounds per acre over the season. The tests were harvested using a sickle-type forage plot harvester to simulate a spring cut hay/summer grazing/fall stockpile management system. The first cutting was harvested when all tall fescue and bromegrass varieties were at the boot stage or later. 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 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, Quicksand, and Princeton are presented in tables 1 through 3. Ratings for maturity (see Table 4 for maturity scale), stand, and dry matter yields (tons/A) are reported in tables 5 through 16. Yields are given by cutting date for 2022 and as total annual production for all years of the trial. 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 are listed separately at the bottom of the tables.

Statistical analyses were performed on all data to determine if the apparent differences are truly due to varietal differences or just to chance. To determine if two varieties are truly different, compare the difference between them and the LSD (least significant difference) 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, and increased variability within a study results in higher CVs and larger LSDs.

Tables 17, 18, and 19 show information about proprietors/distributors for all varieties studied in this report. Varieties are listed in alphabetical order by species, with the experimental varieties at the bottom. Remember that experimental varieties are not available for farm use; commercial varieties can be purchased from agricultural distributors. Remember to consider the relative spring maturity and the distribution of yield across the

Table 1. Temperature and rainfall at Lexington, Kentucky, in 2020, 2021, and 2022.

	2020				2021				2022[2]			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP[1]	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	40	+9	3.72	+0.86	34	+3	4.51	+1.65	29	-2	4.93	+2.07
FEB	38	+3	5.14	+1.93	31	-4	4.60	+1.39	38	+3	7.69	+4.48
MAR	51	+7	3.79	-0.61	50	+6	5.12	+0.72	49	+5	4.27	-0.13
APR	52	-3	4.92	+1.04	54	-1	2.72	-1.16	55	0	3.71	-0.17
MAY	62	-2	5.69	+1.22	62	-2	4.34	-0.13	69	+5	3.84	-0.63
JUN	72	0	2.56	-1.10	73	+1	6.26	+2.60	76	+4	2.10	-1.56
JUL	79	+3	3.23	-1.77	75	-1	5.90	+0.90	80	+4	6.46	+1.46
AUG	75	0	3.41	-0.52	76	+1	6.16	+2.23	77	+2	4.27	+0.34
SEP	68	0	4.43	+0.83	69	+1	3.03	-0.17	70	+2	1.50	-1.70
OCT	57	0	4.98	+2.41	62	+5	4.64	+2.10	57	0	0.96	-1.61
NOV	49	+4	2.18	-1.21	43	-2	2.13	-1.26				
DEC	36	0	2.27	-1.71	47	+11	4.41	+0.43				
Total			45.92	+1.37			53.85	+9.30			39.73	+2.55

[1]DEP is departure from the long-term average.
[2]2022 data is for ten months through October.

Table 2. Temperature and rainfall at Princeton, Kentucky, in 2020, 2021, and 2022.

	2020				2021				2022[2]			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP[1]	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	40	+6	4.27	+0.47	38	+4	5.02	+1.22	32	-2	5.04	+1.24
FEB	40	+2	6.80	+2.37	32	-6	3.64	-0.79	39	+1	7.44	+3.01
MAR	52	+5	6.63	+1.69	52	+5	5.35	+0.41	51	+4	4.85	-0.09
APR	54	-5	3.08	-1.72	56	-3	4.73	-0.07	56	-2	6.41	+1.61
MAY	64	-3	5.48	+0.52	64	-3	4.52	-0.64	67	+1	2.54	-2.42
JUN	74	-1	5.13	+1.28	75	0	6.89	+3.04	75	0	2.46	-1.39
JUL	79	+1	6.31	+2.02	77	-1	7.03	+2.74	80	+2	4.75	+0.46
AUG	75	-2	3.77	-0.24	77	0	3.08	-0.93	76	-1	5.85	+1.84
SEP	69	-2	4.93	+1.60	70	-1	2.59	-0.74	69	-2	0.32	-3.01
OCT	57	-2	7.45	+4.40	64	+5	2.34	-0.71	57	-2	1.19	-1.86
NOV	51	+4	2.36	-2.27	44	-3	1.86	-2.77				
DEC	39	0	2.84	-2.20	50	+11	4.67	-0.37				
Total			59.05	+7.92			51.52	+0.39			40.85	-0.61

[1]DEP is departure from the long-term average.
[2]2022 data is for the ten months through October.

Table 3. Temperature and rainfall at Quicksand, Kentucky, in 2020, 2021, and 2022.

	2020				2021				2022[2]			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP[1]	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	42	+11	3.32	+0.03	36	+5	3.39	+0.10	32	+1	7.18	+3.89
FEB	41	+8	7.11	+3.51	35	+2	6.91	+3.31	40	+7	5.5	+1.90
MAR	52	+11	7.96	+3.62	50	+9	5.78	+1.44	49	+8	2.04	-2.30
APR	53	0	4.93	+0.83	54	+1	2.79	-1.31	55	+2	3.44	-0.66
MAY	62	0	5.75	+1.27	62	0	2.00	-2.48	67	+5	7.67	+3.19
JUN	71	+1	4.54	+0.72	72	+2	4.23	+0.41	72	+2	2.81	-1.01
JUL	78	+4	4.26	-0.99	75	+1	7.04	+1.79	77	+3	15.02	+10.17
AUG	75	+2	6.56	+2.55	76	+3	8.38	+4.37	74	+1	2.16	-1.85
SEP	69	+3	4.40	+0.88	69	+3	1.72	-1.80	67	+1	3.29	-0.23
OCT	59	+5	3.55	+0.64	62	+8	2.66	-0.25	56	+2	0.85	-2.06
NOV	49	+7	2.81	-1.07	43	1	1.52	-2.36				
DEC	38	+5	4.82	+0.68	47	14	2.42	-1.72				
Total			60.01	+12.67			48.84	+1.50			50.36	+11.04

[1]DEP is departure from the long-term average.
[2]2022 data is for the ten months through October.

Table 4. Descriptive scheme for the stages of development in perennial forage grasses.

Code	Description	Remarks
	Leaf development	
11	First leaf unfolded	Applicable to regrowth of established (plants) and to primary growth of seedlings.
12	2 leaves unfolded	Further subdivision by means of leaf development index (see text).
13	3 leaves unfolded	
•	• • • • •	
19	9 or more leaves unfolded	
	Sheath elongation	
20	No elongated sheath	Denotes first phase of new spring growth after overwintering. This character is used instead of tillering which is difficult to record in established stands.
21	1 elongated sheath	
22	2 elongated sheaths	
23	3 elongated sheaths	
•	• • • • •	
29	9 or more elongated sheaths	
	Tillering (alternative to sheath elongation)	
21	Main shoot only	Applicable to primary growth of seedlings or to single tiller transplants.
22	Main shoot and 1 tiller	
23	Main shoot and 2 tillers	
24	Main shoot and 3 tillers	
•	• • • • •	
29	Main shoot and 9 or more tillers	
	Stem elongation	
31	First node palpable	More precisely an accumulation of nodes. Fertile and sterile tillers distinguishable.
32	Second node palpable	
33	Third node palpable	
34	Fourth node palpable	
35	Fifth node palpable	
37	Flag leaf just visible	
39	Flag leaf ligule/collar just visible	
	Booting	
45	Boot swollen	
	Inflorescence emergence	
50	Upper 1 to 2 cm of inflorescence visible	
52	1/4 of inflorescence emerged	
54	1/2 of inflorescence emerged	
56	3/4 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.

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

growing season when evaluating productivity of tall fescue and bromegrass varieties.

How to Interpret the Summary Tables

Summaries of yield data from 2004 to 2022 for tall fescue and from 2006 to 2022 for bromegrass commercial varieties are presented in Tables 20 and 21, respectively. The value for each variety in these tables is listed as a percentage of the mean of the commercial varieties entered in each specific trial. Varieties with percentages over 100 yielded better than average and varieties with percentages less than 100 yielded lower than average. Direct statistical comparisons of varieties cannot be made using the Table 20 and 21 summaries, but these comparisons can help to identify varieties for further consideration. Varieties that have performed better than average over many years and at several locations have very stable performance, while others may have performed very well in wet years or on particular soil types. These details may influence variety choice, and more information from past years can be found in the appropriate annual reports. See the footnotes in Tables 20 and 21 to determine the yearly report that should be referenced.

Summary

Selecting a good variety of tall fescue and bromegrass 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.

For more information, consult the following University of Kentucky Cooperative Extension publications related to tall fescue management. These resources are available from your county Extension office and may be accessed in the "Publications" section of the UK Forage website (https://forages.ca.uky.edu).

- Lime and Fertilizer Recommendations (AGR-1)
- Grain and Forage Crop Guide for Kentucky (AGR-18)
- Tall Fescue (AGR-59)
- Establishing Forage Crops (AGR-64)
- Tall Fescue in Kentucky (AGR-108)
- Forage Identification and Use Guide (AGR-175)
- Rotational Grazing (ID-143)

About the Authors

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Table 5. Dry matter yields, seedling vigor, maturity, and stand persistence of tall fescue varieties sown August 30, 2019, at Lexington, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2] Oct 23, 2019	Maturity[3]			Percent Stand							Yield (tons/acre)						
			2020	2021	2022	2019	2020		2021		2022		2020	2021	2022				3-yr Total
			May 4	May 11	May 11	Oct 23	Mar 17	Oct 27	Mar 24	Oct 22	Mar 22	Oct 18	Total	Total	May 12	Jun 29	Oct 20	Total	
Commercial Varieties-Available for Farm Use																			
Lacefield MaxQII	novel	4.0	51.5	56.0	56.5	100	100	100	100	100	100	100	3.63	4.55	1.37	0.52	0.98	2.88	11.06*
Texoma MaxQII	novel	3.3	48.5	55.5	56.0	100	99	99	99	99	99	99	3.34	4.53	1.61	0.47	0.99	3.07	10.94*
SS0705TFSL	free	3.8	50.3	55.0	55.5	100	100	100	100	100	100	100	3.80	4.45	1.24	0.49	0.88	2.61	10.86*
Bronson	free	3.9	53.0	56.0	56.5	100	100	100	100	99	99	99	3.58	4.28	1.46	0.48	1.05	3.00	10.86*
Greendale Protek	novel	4.4	46.3	50.3	49.8	100	100	100	100	100	100	100	3.48	4.57	1.20	0.41	0.85	2.46	10.51*
Tower	free	4.4	45.0	47.3	46.3	100	100	100	100	100	99	99	3.47	4.55	0.96	0.52	0.91	2.38	10.40*
Greendale	free	3.9	46.3	48.5	48.8	100	100	100	100	100	100	100	3.47	4.49	1.05	0.58	0.77	2.40	10.37*
Martin 2 Protek	novel	4.3	52.5	55.5	55.5	100	100	100	100	98	98	98	3.56	4.25	1.21	0.45	0.86	2.52	10.34*
Jesup MaxQII	novel	3.0	48.5	55.0	56.0	100	100	100	100	100	100	100	2.97	4.54	1.17	0.51	0.95	2.63	10.13*
BarOptima PLUS E34	novel	3.8	46.3	50.3	51.5	100	100	100	100	100	100	100	3.33	4.42	0.95	0.43	0.91	2.30	10.05*
Tower Protek	novel	4.0	45.0	45.0	46.3	100	100	100	100	100	100	100	3.24	4.60	1.03	0.45	0.69	2.18	10.02*
Kentucky 32	free	2.1	53.0	56.0	55.5	96	96	94	94	94	95	95	2.72	4.68	1.28	0.43	0.88	2.59	9.99*
Ranchero	free	4.1	53.0	55.5	56.0	100	100	100	100	100	100	99	3.46	4.10	1.13	0.48	0.79	2.40	9.96*
BARFASTF-43	free	3.8	46.3	48.5	47.5	100	100	100	100	100	100	100	3.21	4.31	0.98	0.52	0.77	2.28	9.80*
Estancia Arkshield	novel	3.1	49.8	54.5	56.0	100	100	100	100	100	100	100	3.02	4.28	1.14	0.43	0.91	2.49	9.78*
Cajun II	free	3.5	51.5	56.0	56.0	100	100	100	100	100	100	100	3.10	4.14	1.23	0.53	0.76	2.51	9.75*
DLFPS-FTF 100 Protek	novel	4.1	51.5	54.5	56.0	100	100	100	100	100	100	100	3.24	3.94	1.12	0.47	0.89	2.48	9.67
Armory	free	2.6	49.3	54.5	55.5	100	100	100	100	100	100	100	2.94	4.33	1.11	0.42	0.87	2.40	9.67
Triumphant Protek	novel	3.4	52.0	55.5	56.0	100	100	100	100	100	100	100	3.07	4.07	1.05	0.48	0.81	2.33	9.47
Triumphant	free	3.9	52.0	57.0	56.0	100	100	100	100	100	100	100	3.13	3.95	1.18	0.39	0.72	2.30	9.39
Velvet	free	3.6	46.8	52.5	53.0	100	100	100	100	99	98	98	2.52	4.24	0.93	0.52	0.78	2.23	8.99
Kokanee	free	3.8	45.0	38.3	45.0	100	100	100	100	98	96	74	2.91	3.34	0.73	0.44	0.61	1.79	8.03
KY31+	toxic	4.3	49.8	55.0	53.0	100	100	100	100	96	91	86	3.52	2.20	0.43	0.06	0.76	1.25	6.97
Experimental Varieties																			
DLFPS-TF89	free	3.6	52.0	56.0	56.0	100	100	100	100	99	99	99	3.16	4.41	1.29	0.47	1.02	2.77	10.34*
KYFA9611	free	3.9	45.0	45.0	47.5	100	100	100	100	100	100	88	3.97	3.85	1.07	0.49	0.82	2.37	10.20*
PPG-FTF116	free	3.9	52.5	56.5	56.0	100	100	100	100	100	100	100	3.26	4.56	1.14	0.48	0.69	2.31	10.12*
PPG-FTF111	free	3.8	49.0	57.0	56.0	100	100	100	100	100	100	100	3.09	4.28	1.26	0.46	0.77	2.49	9.86*
KY31-	free	4.3	50.5	53.5	55.5	100	100	100	100	100	100	100	3.36	4.04	1.03	0.42	0.99	2.45	9.85*
SETFN97	free	2.9	51.0	54.5	56.0	100	100	100	100	100	100	98	2.82	4.42	1.21	0.49	0.76	2.46	9.71
GA95101T	free	3.8	46.3	55.0	55.0	100	100	100	100	100	100	100	2.32	4.13	1.08	0.52	0.82	2.42	8.87
GA29	free	2.3	49.0	56.0	56.0	95	88	95	98	98	98	98	2.25	4.14	1.21	0.42	0.80	2.44	8.83
BARFA9125	free	2.0	45.0	45.0	55.5	100	98	98	93	93	86	84	3.04	3.23	0.34	0.45	1.07	1.86	8.14
Mean		3.6	49.2	52.9	53.7	100	99	100	99	99	99	97	3.19	4.18	1.10	0.46	0.85	2.41	9.78
CV,%		19.8	4.7	4.3	2.8	2	4	2	2	2	3	7	15.67	12.00	18.43	20.73	19.15	11.98	9.68
LSD,0.05		1.0	3.3	3.2	2.2	3	5	3	3	3	4	10	0.70	0.71	0.29	0.13	0.23	0.41	1.33

[1]Free-varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel-varieties that contain an endophyte that aids persistence but is not toxic to cattle.
[2]Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[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 4 for complete scale.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 6. Dry matter yields, seedling vigor, maturity, and stand persistence of tall fescue varieties sown August 28, 2020, at Lexington, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2] Sep 24, 2020	Maturity[3]		Percent Stand					Yield (tons/acre)					
			2021	2022	2020	2021		2022		2021	2022				2-yr Total
			May 7	May 9	Sep 24	Mar 24	Oct 22	Mar 22	Oct 19	Total	May 9	Jun 27	Oct 19	Total	
Commercial Varieties-Available for Farm Use															
Jesup MaxQ	novel	4.1	53.5	55.0	100	100	100	100	100	5.93	1.60	0.58	1.05	3.22	9.15*
Ranchero	free	3.6	53.5	54.5	100	100	100	100	100	5.95	1.48	0.43	0.95	2.86	8.81*
Texoma MaxQII	novel	3.5	53.5	55.5	100	100	100	100	100	5.66	1.43	0.53	1.07	3.03	8.69*
SS0705TFSL	free	4.4	50.8	53.5	100	100	100	100	100	5.72	1.36	0.57	0.97	2.91	8.63*
Cajun II	free	4.1	55.5	54.5	100	100	100	100	100	5.57	1.43	0.51	1.01	2.95	8.52*
Palatine	free	3.9	53.5	52.5	100	100	100	100	100	5.44	1.38	0.58	1.05	3.01	8.45*
Fillmore(FTF70)	free	4.1	49.8	51.5	100	100	100	100	100	5.59	1.30	0.55	0.96	2.81	8.40*
BarOptima PLUS E34	novel	3.8	47.5	48.0	100	100	100	100	100	5.67	1.13	0.48	1.10	2.72	8.39*
Lacefield MaxQII	novel	3.4	52.5	55.0	100	100	100	100	100	5.41	1.33	0.48	1.05	2.86	8.27*
Estancia Arkshield	novel	3.6	54.0	54.0	100	100	100	100	100	5.37	1.33	0.50	0.97	2.79	8.16*
Greendale Protek	novel	4.1	48.0	46.3	100	100	100	100	100	5.56	1.19	0.50	0.90	2.60	8.15*
Martin 2 Protek	novel	3.6	55.5	54.0	100	100	100	100	100	5.44	1.30	0.43	0.94	2.68	8.11*
Armory	free	3.4	51.3	53.0	100	100	100	100	100	5.46	1.30	0.40	0.92	2.62	8.08*
Triumphant Protek	novel	3.8	53.0	54.0	100	100	100	100	100	5.56	1.28	0.47	0.77	2.51	8.08*
STF43	free	3.4	45.0	46.3	100	100	100	100	100	5.17	1.19	0.52	0.90	2.61	7.78
KY31+	toxic	3.6	52.0	53.0	100	100	100	100	100	5.04	0.95	0.52	0.97	2.44	7.48
Tower Protek	novel	3.6	45.0	45.0	100	100	100	100	100	5.03	1.04	0.52	0.75	2.31	7.34
Experimental Varieties															
KY31-	free	4.3	50.8	52.5	100	100	100	100	100	6.29	1.60	0.59	1.24	3.43	9.72*
B-18.1788	free	3.1	57.5	56.0	100	100	100	100	100	5.89	1.34	0.53	0.94	2.81	8.70*
B-18.1790	free	3.5	56.0	56.0	100	100	100	100	100	5.93	1.22	0.53	0.92	2.67	8.60*
FTF120	free	4.3	53.5	54.5	100	100	100	100	100	5.71	1.38	0.54	0.87	2.79	8.50*
FTF100 Protek	novel	4.1	53.5	54.5	100	100	100	100	100	5.49	1.39	0.50	0.97	2.87	8.36*
BARBTR7NEA23	novel	3.0	49.8	53.5	100	100	100	100	100	5.41	1.45	0.43	1.05	2.93	8.34*
FTF117	free	3.5	54.5	55.0	100	100	100	100	100	5.42	1.35	0.52	1.02	2.89	8.31*
KYFA9611	free	4.0	45.0	46.3	100	100	100	100	100	5.60	1.04	0.53	1.03	2.60	8.19*
SETFN97	free	3.4	51.8	53.5	100	100	100	100	100	5.51	1.27	0.49	0.87	2.63	8.14*
BARBTR7NEA21	novel	2.6	48.0	53.0	99	100	100	100	100	5.30	1.35	0.44	0.92	2.71	8.01*
B-18.1789	free	3.9	57.5	56.0	100	100	100	100	100	5.14	1.32	0.55	0.89	2.76	7.89
GALA16029	free	3.3	52.3	54.0	100	100	100	100	100	4.98	1.26	0.40	0.98	2.64	7.62
RAD-ERFH82	free	3.4	46.3	52.0	100	100	100	100	100	4.86	1.33	0.49	0.91	2.72	7.58
BAR9301BTR1	novel	3.4	46.8	47.5	100	100	100	100	100	4.96	1.03	0.49	0.81	2.33	7.29
BARFAF137	free	2.9	46.3	46.3	100	100	100	100	100	5.02	1.05	0.47	0.71	2.24	7.26
BARFA6BTR179	novel	3.4	45.0	45.0	100	100	100	100	100	4.66	1.00	0.42	0.77	2.20	6.86
BARFAF135	free	3.0	46.8	45.0	100	100	100	100	100	4.40	0.95	0.42	0.83	2.19	6.58
Mean		3.6	51.0	51.9	100	100	100	100	100	5.42	1.27	0.50	0.94	2.71	8.13
CV,%		14.7	4.5	3.1	0	0	0	0	0	16.45	18.82	20.80	20.91	16.57	15.54
LSD,0.05		0.7	3.2	2.2	0	0	0	0	0	1.25	0.34	0.15	0.28	0.63	1.27

[1]Free-varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel-varieties that contain an endophyte that aids persistence but is not toxic to cattle..

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

[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 4 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 tall fescue varieties sown September 10, 2021, at Lexington, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2] Oct 4, 2021	Maturity[3] 2021 Oct 4	Percent Stand			Yield (tons/acre)				
				2021	2022		2022				
				Oct 4	Mar 22	Oct 19	May 5	Jun 23	Aug 18	Oct 19	Total
Commercial Varieties-Available for Farm Use											
SS0705TFSL	free	4.3	53.0	99	99	99	2.16	1.09	0.70	0.65	4.60*
Greendale	free	4.3	50.5	100	100	100	2.04	1.21	0.73	0.56	4.53*
Texoma MaxQII	novel	3.6	54.5	99	99	99	2.25	1.02	0.73	0.49	4.49*
KY31+	toxic	4.0	52.5	99	99	99	2.37	0.97	0.67	0.46	4.47*
Dominate	free	4.0	55.5	100	98	98	2.13	0.97	0.78	0.54	4.43*
BarOptima PLUS E34	novel	4.5	51.0	100	100	100	2.22	1.09	0.60	0.47	4.39*
Triumphant	free	4.1	57.5	100	99	99	2.26	0.91	0.64	0.53	4.35*
Estancia Arkshield	novel	3.9	53.0	100	99	99	1.95	1.09	0.72	0.52	4.28*
Ranchero	free	4.1	55.0	100	100	100	2.20	0.98	0.61	0.48	4.27*
Lacefield MaxQII	novel	4.1	53.5	99	99	99	2.10	1.04	0.68	0.44	4.26*
Cajun II	free	3.9	55.0	99	99	99	2.02	1.03	0.65	0.52	4.23*
Jesup MaxQII	novel	4.0	55.0	100	100	100	2.16	0.91	0.57	0.40	4.04*
Experimental Varieties											
KYFA9611	free	2.9	50.5	99	99	99	1.83	1.20	0.84	0.53	4.39*
SETFPC-5BK	free	4.0	54.5	100	100	100	2.28	0.86	0.66	0.50	4.30*
SETFN97	free	3.8	52.5	99	99	99	2.11	1.05	0.61	0.53	4.29*
RAD-2030E	free	3.9	54.0	100	98	98	2.08	0.91	0.70	0.54	4.23*
KY31-	free	4.6	51.5	100	100	100	1.99	1.14	0.58	0.41	4.13*
FTF96	free	3.6	51.5	98	98	98	1.60	1.15	0.59	0.51	3.85
Mean		4.0	53.4	99	99	99	2.10	1.03	0.67	0.51	4.31
CV,%		11.4	1.9	1	1	1	14.26	11.92	14.13	18.46	9.98
LSD,0.05		0.6	1.4	2	2	2	0.42	0.18	0.13	0.13	0.61

[1]Free-varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel-varieties that contain an endophyte that aids persistence but is not toxic to cattle.
[2]Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[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 4 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 tall fescue varieties sown September 6, 2019, at Princeton, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2] Nov 4, 2019	Maturity[3] 2022 May 10	Percent Stand							Yield (tons/acre)					
				2019	2020		2021		2022		2020	2021	2022			3-year Total
				Nov 4	Mar 12	Nov 10	Apr 6	Oct 26	Apr 14	Nov 9	Total	Total	May 10	Jul 7	Total	
Commercial Varieties-Available for Farm Use																
Greendale Protek	novel	5.0	53.0	100	98	97	97	94	90	70	4.96	4.72	0.99	0.78	1.77	11.45*
Greendale	free	4.8	52.5	100	99	98	98	98	97	73	4.52	4.64	1.12	0.86	1.99	11.15*
Cajun II	free	5.0	56.0	100	100	100	100	99	96	46	4.40	4.54	1.11	0.83	1.93	10.93*
Ranchero	free	4.4	57.0	100	93	93	93	87	92	40	4.45	3.92	0.97	0.61	1.58	10.53*
KY31+	toxic	4.9	56.5	100	98	99	87	71	80	49	4.29	4.63	1.04	0.53	1.57	10.35*
BarOptima PLUS E34	novel	5.0	53.5	100	97	98	89	83	81	36	4.96	3.68	0.73	0.68	1.41	10.05*
Estancia Arkshield	novel	4.8	57.0	100	96	96	98	94	95	51	4.53	3.58	1.12	0.77	1.89	10.01*
Martin 2 Protek	novel	5.0	57.0	100	98	97	97	94	92	35	3.59	4.62	0.90	0.58	1.48	9.70*
Armory	free	4.3	56.5	100	65	74	62	61	65	29	3.74	3.35	1.03	0.74	1.77	9.67*
Triumphant Protek	novel	5.0	56.0	100	88	91	91	90	89	46	3.86	3.94	1.06	0.68	1.74	9.54*
Tower	free	4.5	51.0	100	84	91	91	91	86	59	4.52	3.49	0.78	0.63	1.41	9.42*
Triumphant	free	4.9	57.5	100	78	82	82	77	85	41	3.78	4.02	0.94	0.63	1.58	9.38*
Tower Protek	novel	4.9	52.0	100	91	93	93	78	75	39	4.62	3.21	0.80	0.59	1.39	9.06*
STF-43	free	5.0	54.0	100	86	88	88	78	79	38	3.76	3.05	0.96	0.56	1.52	8.34
DLFPS-FTF100 Protek	free	4.8	56.5	100	93	93	85	79	81	51	3.87	3.92	1.10	0.60	1.70	7.85
Experimental Varieties																
PPG-FTF116	free	4.9	56.5	100	91	91	93	90	86	29	4.01	4.74	0.91	0.82	1.73	10.48*
KY31-	free	5.0	57.0	100	96	96	96	89	91	51	4.16	4.01	1.09	0.63	1.72	9.90*
DLFPS-TF89	free	4.6	56.0	100	98	98	74	74	76	54	4.02	3.95	1.14	0.55	1.69	9.34*
PPG-FTF111	free	4.4	57.5	100	90	95	96	96	95	45	2.96	4.11	0.96	0.72	1.67	9.29*
SETFN97	free	4.6	56.0	100	71	84	84	59	63	30	3.80	3.71	0.79	0.56	1.35	8.81*
KYFA9611	free	4.8	54.5	100	92	81	74	68	66	26	3.51	3.39	0.68	0.66	1.34	8.42
BARFA9125	free	4.6	57.5	100	88	87	85	53	46	12	2.75	2.81	0.42	0.55	0.97	6.53
Mean		4.8	55.5	100	91	92	89	82	82	43	4.06	3.94	0.94	0.66	1.61	9.64
CV,%		7.1	2.5	0	13	10	14	20	17	56	18.81	30.30	21.23	20.70	20.44	18.40
LSD,0.05		0.5	1.9	0	19	15	18	23	20	35	1.19	1.74	0.29	0.29	0.47	2.83

1Free-varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel-varieties that contain an endophyte that aids persistence but is not toxic to cattle.
2Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
3Maturity 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 4 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 tall fescue varieties sown September 3, 2021, at Princeton, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2] Oct 26, 2021	Maturity[3]	Percent Stand			Yield (tons/acre)			
			2022	2021	2022		2022			
			May 10	Oct 26	Apr 14	Nov 9	May 10	Jul 6	Sep 1	Total
Commercial Varieties-Available for Farm Use										
Triumphant	free	5.0	58.0	100	100	99	2.93	1.96	0.99	5.89*
Greendale	free	4.6	55.0	100	100	99	2.45	1.87	1.09	5.41*
SS0705TFSL	free	4.8	57.0	100	100	100	2.44	1.94	0.97	5.35*
BarOptima PLUS E34	novel	4.5	54.5	100	100	99	2.34	1.84	0.90	5.09
Estancia Arkshield	novel	4.3	57.0	100	100	100	2.39	1.73	0.91	5.04
KY31+	toxic	4.8	57.0	100	100	100	2.40	1.73	0.90	5.03
Dominate	free	4.8	57.5	100	100	99	2.22	1.75	1.05	5.02
Armory	free	4.4	56.5	100	100	100	2.65	1.44	0.90	4.99
Lacefield MaxQII	novel	4.9	56.5	100	100	100	2.12	1.61	0.94	4.67
Experimental Varieties										
FTF96	free	3.9	55.5	100	100	100	2.44	1.77	0.91	5.12
KY31-	free	4.8	56.5	100	100	100	2.34	1.70	0.92	4.96
KYFA9611	free	4.6	52.5	100	100	100	1.58	1.95	1.21	4.75
Mean		4.6	56.1	100	100	100	2.36	1.77	0.98	5.11
CV,%		7.5	1.7	0	0	1	14.51	9.46	12.47	9.05
LSD,0.05		0.5	1.3	0	0	1	0.49	0.24	0.17	0.66

[1]Free-varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel-varieties that contain an endophyte that aids persistence but is not toxic to cattle.
[2]Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[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 4 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, and stand persistence of tall fescue varieties sown September 13, 2021, at Quicksand, Kentucky.

Variety	Endophyte Status[1]	Seedling Vigor[2] Oct 12, 2021	Percent Stand			Yield (tons/acre)			
			2021	2022		2022			
			Oct 12	Apr 11	Nov 2	May 3	Jun 10	Oct 17	Total
Commercial Varieties-Available for Farm Use									
Cajun II	free	4.9	100	100	100	1.93	1.71	1.57	5.21*
KY31+	toxic	4.9	100	100	100	2.43	1.56	1.07	5.06*
SS0705TFSL	free	5.0	100	100	100	2.03	1.33	1.51	4.87*
Lacefield MaxQII	novel	4.6	100	100	100	1.77	1.53	1.47	4.77*
Jesup MaxQII	novel	4.8	100	100	100	1.95	1.44	1.27	4.66*
Ranchero	free	5.0	100	100	100	1.92	1.36	1.34	4.62*
Texoma MaxQII	novel	4.8	100	100	100	2.01	1.41	0.95	4.38*
BarOptima PLUS E34	novel	5.0	100	100	100	1.96	1.38	0.89	4.23
Palatine	free	5.0	100	100	100	1.60	1.30	1.28	4.18
Estancia Arkshield	novel	4.9	100	100	100	1.77	1.48	0.86	4.12
Experimental Varieties									
RAD-2030E	free	4.9	100	100	100	1.58	1.82	1.33	4.73*
KY31-	free	5.0	100	100	100	1.85	1.44	0.99	4.28
Mean		4.9	100	100	100	1.90	1.48	1.20	4.59
CV,%		4.1	0	0	0	22.99	19.12	29.89	12.91.
LSSD,0.05		0.3	0	0	0	0.64	0.41	0.53	0.86

[1]Free-varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel-varieties that contain an endophyte that aids persistence but is not toxic to cattle.
[2]Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 11. Dry matter yields, seedling vigor, maturity, and stand persistence of bromegrass varieties sown August 30, 2019, at Lexington, Kentucky.

Variety	Type	Seedling Vigor[1] Nov 1, 2019	Maturity[2]				Percent Stand							Yield (tons/acre)							
			2020		2021	2022	2019	2020		2021		2022		2020	2021	2022					3-year Total
			May 7	Jun 17	May 6	May 5	Nov 1	Mar 17	Oct 27	Mar 24	Oct 22	Mar 22	Nov 2	Total	Total	May 5	Jun 16	Aug 17	Oct 17	Total	
Commercial Varieties-Available for Farm Use																					
Arsenal	meadow	5.0	56.5	60.0	57.5	57.5	99	97	96	96	88	81	74	3.66	5.01	1.18	0.99	0.74	0.58	3.48	12.16*
Admiral	meadow	4.3	55.5	60.0	57.0	56.5	98	98	98	98	80	75	65	4.02	4.29	0.88	1.08	0.64	0.55	3.16	11.47*
Artillery	smooth	5.0	50.3	29.0	45.0	50.5	100	98	98	98	95	93	85	3.75	4.41	1.10	0.82	0.66	0.52	3.11	11.27*
MacBeth	meadow	3.9	54.5	60.0	57.0	56.0	94	87	90	90	88	84	68	3.21	4.38	0.98	0.96	0.69	0.58	3.21	10.81*
Experimental Varieties																					
MB1302	meadow	4.3	56.0	60.0	56.0	55.0	99	99	97	97	88	83	65	3.48	4.20	0.85	0.94	0.57	0.60	2.96	10.64*
Mean		4.5	54.6	53.8	54.5	55.1	98	96	96	96	87	83	71	3.62	4.46	1.00	0.96	0.66	0.57	3.18	11.27
CV,%		9.2	4.1	0.0	1.4	2.7	3	7	5	5	14	12	13	13.53	10.78	23.77	15.26	21.72	13.61	13.53	9.89
LSD,0.05		0.6	3.4	0.0	1.2	2.3	5	10	8	7	18	15	15	0.76	0.74	0.37	0.23	0.22	0.12	0.66	1.72

[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 4 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 bromegrass varieties sown August 28, 2020, at Lexington, Kentucky.

Variety	Type	Seedling Vigor[1] Sep 24, 2020	Maturity[2]		Percent Stand					Yield (tons/acre)						
			2021	2022	2020	2021		2022		2021	2022					2-year Total
			Apr 30	May 16	Sep 24	Mar 24	Oct 22	Mar 22	Oct 18	Total	May 16	Jun 16	Aug 17	Oct 17	Total	
Commercial Varieties-Available for Farm Use																
Macbeth	meadow	3.5	55.5	58.0	100	100	100	100	99	5.65	1.15	0.44	0.58	0.50	2.67	8.33*
Arsenal	meadow	3.0	56.0	58.0	100	100	100	100	98	5.71	1.20	0.36	0.54	0.38	2.48	8.19*
Admiral	meadow	3.6	56.0	58.0	100	100	100	100	99	5.46	1.14	0.43	0.47	0.43	2.47	7.93*
Peak	smooth	4.1	46.3	54.5	100	100	100	100	100	4.91	1.29	0.28	0.64	0.40	2.62	7.52*
Artillery	smooth	4.0	45.0	57.0	100	100	100	100	100	4.16	1.25	0.26	0.51	0.37	2.39	6.55
Experimental Varieties																
MB1302	meadow	3.4	55.0	57.5	100	100	100	100	97	5.17	1.08	0.36	0.42	0.34	2.20	7.37*
Mean		3.6	52.3	51.2	100	100	100	100	99	5.18	1.18	0.36	0.53	0.40	2.47	7.65
CV,%		18.9	2.5	2.0	1	0	0	1	2	19.15	9.60	24.19	15.69	20.62	9.01	15.29
LSD,0.05		1.0	1.9	1.7	1	0	0	1	3	1.49	0.17	0.13	0.12	0.13	0.35	1.76

[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 4 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 bromegrass varieties sown September 10. 2021, at Lexington, Kentucky.

Variety	Type	Seedling Vigor[1] Oct 4, 2021	Maturity[2] 2022 May 5	Percent Stand			Yield (tons/acre)				
				2021	2022		2022				
				Oct 4	Mar 22	Oct 19	May 5	Jun 16	Aug 17	Oct 20	Total
Commercial Varieties-Available for Farm Use											
Arsenal	meadow	4.9	58.0	99	99	99	2.45	0.84	0.76	0.48	4.53*
Macbeth	meadow	4.6	57.0	100	99	99	2.38	0.79	0.70	0.56	4.43*
Stratus	meadow	4.5	56.5	96	96	96	2.40	0.75	0.62	0.45	4.21*
Admiral	meadow	4.6	56.0	100	99	99	2.14	0.94	0.62	0.50	4.19*
Artillery	smooth	4.9	52.0	100	98	99	1.95	0.67	0.66	0.35	3.62
Peak	smooth	4.5	53.0	97	94	96	1.48	0.79	0.74	0.32	3.33
Experimental Varieties											
MB1302	meadow	4.8	57.5	98	99	99	2.41	0.84	0.65	0.46	4.36*
MB1303	meadow	4.6	58.0	100	100	100	1.69	0.81	0.82	0.44	3.76
Mean		4.7	56.0	99	98	98	2.11	0.80	0.70	0.44	4.05
CV,%		7.0	2.0	1	1	1	15.79	10.80	11.44	29.00	9.90
LSD,0.05		0.5	1.7	2	2	2	0.49	0.13	0.12	0.19	0.59

[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 4 for complete scale.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 14. Dry matter yields, seedling vigor, maturity, and stand persistence of meadow fescue varieties sown August 30, 2019, at Lexington, Kentucky.

Variety	Seedling Vigor[1]	Maturity[2]			Percent Stand							Yield (tons/acre)						
		2020	2021	2022	2019	2020		2021		2022		2020	2021	2022				3-year
	Oct 27, 2019	May 7	May 13	May 16	Oct 27	Mar 17	Oct 26	Mar 24	Oct 22	Mar 22	Nov 2	Total	Total	May 16	Aug 17	Oct 17	Total	Total
Commercial Varieties-Available for Farm Use																		
Pradel	5.0	46.3	46.3	56.0	100	100	98	98	96	96	85	3.79	4.45	1.36	0.74	0.58	2.68	10.92*
BARFP HDR	4.3	46.3	46.3	55.0	100	100	100	99	99	97	94	3.58	3.70	1.34	0.71	0.59	2.63	9.91
Experimental Varieties																		
KYFP1301	4.8	47.5	47.5	55.5	100	100	100	99	98	97	76	3.71	3.50	1.15	0.56	0.25	1.97	9.17
Mean	4.7	46.7	46.7	55.5	100	100	99	98	98	97	85	3.69	3.88	1.28	0.67	0.47	2.43	10.00
CV,%	8.0	6.9	5.9	1.8	0	1	1	1	1	1	10	13.53	10.73	7.57	17.32	22.72	6.39	5.06
LSD,0.05	0.6	5.6	4.8	1.7	0	1	1	2	2	2	15	0.86	0.72	0.17	0.20	0.19	0.27	0.88

[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 4 for complete scale.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 15. Dry matter yields, seedling vigor, maturity, and stand persistence of meadow fescue varieties sown August 28, 2020, at Lexington, Kentucky.

Variety	Seedling Vigor[1]	Maturity[2]		Percent Stand					Yield (tons/acre)					
		2021	2022	2020	2021		2022		2021	2022				2-yr
	Sep 24, 2020	May 13	May 16	Sep 24	Mar 24	Oct 22	Mar 22	Oct 18	Total	May 16	Aug 17	Oct 18	Total	Total
Commercial Varieties-Available for Farm Use														
Raskila	4.0	45.0	49.8	100	100	100	100	91	5.27	0.83	0.24	0.28	1.35	6.62*
BARFP HDR	3.9	48.8	50.3	100	100	100	100	98	4.87	0.62	0.28	0.44	1.35	6.22*
Pradel	4.8	49.3	50.3	100	99	98	95	88	4.40	0.61	0.31	0.27	1.18	5.58
Experimental Varieties														
KYFF1301	4.3	50.0	51.0	100	100	100	100	96	4.55	0.71	0.39	0.24	1.34	5.90*
Mean	4.2	48.3	50.3	100	100	99	99	93	4.77	0.69	0.31	0.31	1.31	6.08
CV,%	11.9	4.4	5.4	0	1	1	2	5	8.32	21.44	35.23	36.89	18.05	8.94
LSD,0.05	0.8	3.4	4.4	0	2	2	3	7	0.64	0.24	0.17	0.18	0.38	0.87

[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 4 for complete scale.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 16. Dry matter yields, seedling vigor, maturity, and stand persistence of meadow fescue varieties sown September 10, 2021, at Lexington, Kentucky.

Variety	Seedling Vigor[1]	Maturity[2]	Percent Stand			Yield (tons/acre)				
		2022	2021	2022		2022				
	Oct 4, 2021	May 16	Oct 4	Mar 22	Oct 19	May 16	Jun 27	Aug 17	Oct 20	Total
Commercial Varieties-Available for Farm Use										
Raskila	4.3	55.5	96	98	98	3.86	0.56	0.51	0.54	5.47*
BARFP HDR	4.9	56.0	100	100	100	3.49	0.61	0.59	0.71	5.41*
Pradel	4.8	56.0	100	100	100	3.52	0.61	0.59	0.67	5.38*
Experimental Varieties										
KYFP1301	4.6	56.0	100	100	100	3.33	0.57	0.51	0.64	5.06*
Mean	4.6	55.9	99	99	99	3.55	0.59	0.55	0.64	5.33
CV,%	12.0	0.9	4	1	1	10.16	9.52	11.53	12.72	7.74
LSD,0.05	0.9	0.8	6	2	2	0.58	0.09	0.10	0.13	0.66

[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 4 for complete scale.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 17. Proprietors of tall fescue varieties in current trials.

Variety	Endophyte Status	Proprietor/KY distributor
Commercial Varieties-Available for Farm Use		
Armory	free	Barenbrug USA
BarOptima PLUS E34	novel	Barenbrug USA
Bronson	free	Ampac Seed
Cajun II	free	Smith Seed Services
DLFPS-FTF100 Protek	novel	DLF-Pickseed
Dominate	free	Allied Seed
Estancia Arkshield	novel	Mountain View Seeds
Fillmore(FTF70)	free	DLF-Pickseed
Greendale	free	DLF-Pickseed
Greendale Protek	novel	DLF-Pickseed
Kentucky 32	free	Oregro Seeds
Kokanee	free	Smith Seed Services
KY31+	toxic	Ky Agric. Exp. Station/Public
Jesup MaxQ	novel	Pennington Seed
Jesup MaxQII	novel	Pennington Seed
Lacefield MaxQ II	novel	Pennington Seed
Martin 2 Protek	novel	DLF-Pickseed
Palatine	free	Mountain View Seeds
Ranchero	free	Smith Seed Services
SS-0705TFSL	free	Southern States
STF43	free	Barenbrug USA
Texoma MaxQII	novel	DLF-Pickseed
Tower	free	DLF-Pickseed
Tower Protek	novel	DLF-Pickseed
Triumphant	free	DLF-Pickseed
Triumphant Protek	novel	DLF-Pickseed
Velvet	free	Oregro Seeds
Experimental Varieties[1]		
BARBTR7NEA21	novel	Barenbrug USA
BARBTR7NEA23	novel	Barenbrug USA
BARFAF135	free	Barenbrug USA
BARFAF137	free	Barenbrug USA
BARFA6BTR179	novel	Barenbrug USA
BARFA9125	free	Barenbrug USA
BAR9301BTR1	novel	Barenbrug USA
B-18.1788	free	Blue Moon Farms
B-18,1789	free	Blue Moon Farms
B-18.1790	free	Blue Moon Farms
DLFPS-TF-89	free	DLF-Pickseed
FTF96	free	DLF-Pickseed
FTF117	free	DLF-Pickseed
FTF120	free	DLF-Pickseed
GA29	free	Univ. of Georgia
GA95101T	free	Univ. of Georgia
GALA16029	free	Univ. of Georgia
KY31-	free	KY Agric. Exp. Station
KYFA9611	free	KY Agric. Exp. Station
PPG-FTF 111	free	Mountain View Seeds
PPG-FTF 116	free	Mountain View Seeds
RAD-ERFH82	free	Radix Research
RAD-2030E	free	Radix Research
SETFN97	free	Smith Seed Services
SETFPC-5BK	free	Smith Seed Services

[1]Experimental varieties are not available commercially, but provide an indication of the progress being made by forage breeding companies.

Table 18. Proprietors of bromegrass varieties in current trials.

Variety	Type	Proprietor/KY Distributor
Commercial Varieties-Available for Farm Use		
Admiral	meadow	Cisco Seeds
Arsenal	meadow	Barenbrug USA
Artillery	meadow	Barenbrug USA
MacBeth	meadow	Cisco Seeds
Peak	smooth	Allied Seed
Stratus	meadow	Allied Seed
Experimental Varieties[1]		
MB1302	meadow	Allied Seed
MB1303	meadow	Allied Seed

[1]Experimental varieties are not available commercially, but provide an indication of the progress being made by forage breeding companies.

Table 19. Proprietors of meadow fescue varieties in current trials.

Variety	Proprietor/KY Distributor
Commercial Varieties-Available for Farm Use	
BARFP HDR	Barenbrug USA
Pradel	Barenbrug USA
Raskila	Columbia Seeds
Experimental Varieties[1]	
KYFF1301	Ky Agric. Exp. Station

[1]Experimental varieties are not available commercially, but provide an indication of the progress being made by forage breeding companies.

Table 20. Summary of Kentucky tall fescue yield trials 2005-2022 (yield shown as a percentage of the mean of the commercial varieties in the trial).

Variety	Endophyte Status[1]	Proprietor	Lexington													Princeton							Quicksand				Mean[4] (#trials)
			05[2,3]	07	09	11	12	13	14	15	16	17	18	19	20	06	08	10	12	15	17	19	05	13	16	18	
			3-yr[5]	3-yr	3-yr	3-yr	3-yr	3-yr	3-yr	3-yr	3-yr	3-yr	3-yr	3-yr	2-yr	3-yr	3-yr	3-yr	3-yr	2-yr	3-yr	3-yr	4-yr	3-yr	3-yr	3-yr	
Atlas Select	free	ProSeeds Marketing															95										–
Aprilia	free	ProSeeds Marketing															93										–
Armory	free	Barenbrug USA												98	98							98					98(3)
Baguala	free	Allied Seed								92										96							94(2)
BarElite	free	Barenbrug USA		96		100												92									96(3)
BARFASTF-43	free	Barenbrug USA												99								85					92(2)
Bariane	free	Barenbrug USA	99																				95				97(2)
Barolex	free	Barenbrug USA	90																								–
BarOptima PLUS E34	novel	Barenbrug USA	122	99		107	108	102	99	113	99	90	95	102	102			99	100	96	105	102		93	118	85	102(20)
Bronson	free	Ampac Seed	88	97	105	102	99	99			100			110				101	91	103			102				100(12)
Brutus	free	Saddle Butte Ag. Inc.							90																		–
Bull	free	Improved Forages	102				100						100						99					95			99(5)
Cajun II	free	Smith Seed Services				97		105	99	99	98	107	109	99	103			101		104	91	111		90	96	104	101(16)
Cowgirl	free	Rose-AgriSeeds					94										102	100	98								99(4)
DLFPS-FTF 100 Protek	novel	DLF Pickseed												98								80					89(2)
Dominate	free	Allied Seed								90										99							95(2)
Drover	free	Barenbrug USA							105	120																	113(2)
DuraMax GOLD	novel	DLF Pickseed				102										106											104(2)
Enhance	free	Allied Seed				93																					–
Estancia ArkShield	novel	Mountain View Seeds					106				96		105	99	99				102			102			103		102(8)
Fillmore(FTF70)	free	DLF Pickseed													102												–
Flourish	free	Allied Seed					92												101								97(2)
FSG 402TF	free	Farm Science Genetics								92										103							98(2)
Goliath	free	Ampac Seed			100			104										99									101(3)
Greendale	free	DLF Pickseed												105								113					109(2)
Greendale Protek	novel	DLF Pickseed												106	99							116					107(3)
HyMark	free	Fraser Seeds				91				104							102			103							100(4)
Jesup EF	free	Pennington Seed				98	105											103	100								102(4)
Jesup MaxQ	novel	Pennington Seed	98	101	110	103	100	93	106	102	111	104	101		111		95	100	98	98	103		102	100	116	105	103(21)
Jesup MaxQII	novel	Pennington Seed												103													–
Kentucky 32	free	Oregro Seeds				93	94		101				83	101			98	94	101								96(8)
Kokanee	free	Smith Seed Services												81													–
Kora Protek	novel	DLF Pickseed									101														86		94(2)
KY31+	toxic	KY Agric Exp Sta.	108	102	102	93	95	103	100	99	103	101	107	71	91	104	93	112	101	92	105	105	110	110	110	107	101(24)
Lacefield MaxQ II	novel	Pennington Seed		109				97	104	93	92	94	106	112	100	101	106			105	100			113	102	95	102(16)
Martin2 Protek	novel	DLF Pickseed				104					96			105	98							99			106		101(6)
Nanryo	free	Jap. Grassland ForageSeed/		96																							–
Noria	free	ProSeeds Marketing		98																							–
Palatine	free	Mountain View Seeds													102												
Payload	free	Brett Young									89														111		100(2)
RAD-ERF50	free	Radix Research, Inc.															113										–
Ranchero	free	Smith Seed Services										92		101	107						96	107					101(5)
Savory	free	DLF Pickseed														91											–
Select	free	Southern States	99	99	98	90	100	97	103	97	102					102	105	99	100	99			91	99	86		98(17)
SS-0705TFSL	free	Southern States							99	99	106	111	94	110	104					103	101				101	104	103(10)
STF43	free	Barenbrug USA													98												–
Stockman	free	Seed Research of OR														97											–
Teton II	free	Mountain View Seeds				107	105		96		103								99						91		100(6)
Texoma MaxQ II	novel	Pennington Seed	95											111	105												104(3)
TF0203G	free	Seed Research of OR		87																							–
Tower	free	DLF Pickseed									101			105								96			91		98(4)
Tower Protek	novel	DLF Pickseed				98					104			102	89							92			81		94(5)
Triumphant	free	DLF Pickseed												95								95					97(3)
Triumphant Protek	novel	DLF Pickseed												96	98							97					97(3)
Tuscany II	free	Seed Research of OR					97									98			106								–
Velvet	free	Oregro Seeds												91													–
5CAN	free	Brett Young			86																						–

[1]Free-varieties that do not contain an endophyte. Toxic-KY31+ contains a toxic endophyte. Novel-varieties that contain an endophyte that aids persistence but is not toxic to cattle.
[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 the fall of 2016 was harvested 3 years, so the final report would be "2019 Tall Fescue Report" archived in the UK Forage website (https://forages.ca.uky.edu).
[4]Mean only presented when respective variety was included in two or more trials.
[5]Number of years of data.

Table 21. Summary of Kentucky bromegrass yield trials at Lexington 2006-2022 (yield shown as a percentage of the mean of the commercial varieties in the trial).

Variety	Type	Proprietor/KY Distributor	2006[1,2]	2008	2010	2012	2014	2015	2016	2017	2018	2019	2020	Mean[3] (#trials)
			4-yr[4]	3-yr	3-yr	3-yr	3-yr	3-yr	4-yr	3-yr	3-yr	3-yr	2-yr	
AC Knowles	hybrid	Agriculture Canada	85		82	102	89							89(4)
Admiral	meadow	Cisco Seeds							107	106	100	100	103	103(5)
Arid	meadow	Mountain View Seeds							94	93				94(2)
Arsenal	meadow	Barenbrug USA									106	106	106	106(3)
Artillery	smooth	Barenbrug USA									100	99	85	95(3)
Bigfoot	hybrid	Grassland Oregon	108	116	105									110(3)
Canterbury	mountain	Barenbrug USA		79										–
Carlton	smooth	Pickseed USA				82	95				85			87(3)
Doina	smooth	Barenbrug USA		114	108									111(2)
Fleet	meadow	Agriculture Canada	110			109								110(2)
Hakari	Alaska	Barenbrug USA		85	85									85(2)
MacBeth	meadow	Cisco Seeds		136	119	107	116	107	103	123	100	95	108	111(10)
Olga	smooth	Barenbrug USA		116	101									109(2()
Peak	smooth	Allied Seed		97		100		93	95	88	103		98	96(7)
Persister	prairie	DLF Pickseed		72										–
RAD-BI29	smooth	Columbia Seeds	96	86										91(2)

[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 2016 was harvested 3 years, so the final report would be "2019 Tall Fescue and Brome Report" archived in the UK Forage website (https://forages.ca.uky.edu).
[3]Mean only presented when respective variety was included in two or more trials.
[4]Number of years of data.

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