



1999 Cool-Season Grass Grazing Tolerance Variety Report

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Introduction

Cool-season grasses such as tall fescue and orchardgrass are the dominant pasture grasses in Kentucky. While variety evaluations for yield have been carried out for many years, little work has been done to establish the grazing tolerance of these varieties.

The purpose of this report is to summarize current research on the grazing tolerance of tall fescue and orchardgrass varieties when subjected to continuous, heavy grazing pressure within the grazing season. While some yield data are presented, the main focus will be on plant stand survival.

Description of the Tests

Grass variety tests for grazing tolerance were established in Lexington in the falls of 1996, 1997, and 1998. The soils at this location are well-drained silt loams and are well suited to tall fescue and orchardgrass production. Plots were 5 x 15 feet in a randomized complete block design with each variety replicated six times. In each test, 20 pounds of seed per acre were planted into a prepared seedbed using a disk drill. Plots were harvested with a sickle-type mechanized harvester in the spring for yield. Fresh weights were measured in the field and sub-samples were taken to calculate percent dry matter production. Plots were allowed to regrow to 6 to 8 inches and were then grazed down to below 4 inches quickly by cows and/or heifers and kept at that height or below for the remainder of the grazing season. Supplemental hay was fed during periods of slowest growth. Animals were removed from plots after all fall growth had been removed and when little regrowth was expected. Visual ratings of percent stand were made in the fall and spring. Grass plots were fertilized with 60 pounds of actual N per acre in the spring, and other fertilizers (lime, P, and K) were applied as needed.

The varieties included in the 1996 seeding for grazing tolerance were re-randomized and planted in a small plot yield trial operated under hay management for all cuttings (Table 3 for tall fescue, Table 7 for orchardgrass). These studies were seeded at the same time as the grazing tolerance plot (Table 2 for tall fescue, Table 6 for orchardgrass).

Results and Discussion

Weather data for Lexington for 1997, 1998, and 1999 are presented in Table 1. Dry weather was a limiting factor in the second half of 1997 and 1998. 1999 was a drought year with above-average temperatures, and forage growth was significantly reduced.

Data on percent stand and on dry matter yield are presented in Tables 2 through 9. Table 3 represents only dry matter yield data taken from tall fescue studies planted with varieties identical to those in Tables 2. Table 7 represents a similar relationship to Table 6 for orchardgrass. The intent of this "parallel" structure was to determine both grazing tolerance and yield under the same environmental conditions.

Statistical analyses were performed on all entries (including experimentals) to determine if the apparent differences are truly due to variety or just due to chance. Varieties not significantly different from the highest numerical value in a column are marked with one asterisk (*). To determine if two varieties are truly different, compare the difference between the two varieties 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 a given location. The Coefficient of Variation (CV), which is a measure of the variability of the data, is included for each column of means. Low variability is desirable, and increased variability within a study results in higher CVs and larger LSDs.

Tall fescue: Kentucky 31 tall fescue with the endophyte (KY31+) is considered to be the most grazing-tolerant variety and is the one to which others are compared. In the studies in this report, several endophyte-free or low-endophyte tall fescues have been grazed continuously and heavily to see if they can tolerate overgrazing as well as KY31+ and whether there are differences among varieties (Tables 2, 4, and 5). A yield study has been included (Table 3) that contains most of the varieties in the 1996 grazing tolerance study (Table 2) and is included for comparison purposes.

In general, almost all of the tall fescues had stand ratings not significantly different than KY31+ (Tables 2, 4, and 5). This lack of difference was surprising, as all studies were grazed harder in 1999 than in previous years, and 1999 was an extreme drought year in central Kentucky. In past years, each grazing tolerance study was harvested for hay and then allowed to regrow before being stocked with livestock. In 1999, in order to put more stress on varieties and to separate varieties more clearly, all studies were grazed for the entire season.

Endophyte levels: It is routine to check the endophyte status of tall fescues in the grazing trials either by checking the tillers from the plots themselves or from the seed. It is expected that all commercial varieties should have zero or nearly zero endophyte content. However, tillers from the 1997 seeding taken from the commercial varieties ranged from 0 to 10% infection

(Table 4). Infected KY31 had nearly 100% infection, as was expected. The source of the low levels of endophyte infection is not clear, but it could be from residual low levels contained in the original seed or from contamination from the manure of the grazing animals (seed ingested prior to coming onto the study and then deposited in the plots). Most of the commercial varieties in the 1998 seeding were zero (Table 5).

Orchardgrass: It was observed at the end of 1998 that very little separation of varieties had occurred in the grazing studies. Therefore, as with tall fescue, all orchardgrass studies were grazed harder in 1999 than in previous years to separate varieties. In past years, each grazing tolerance study was harvested for hay and then allowed to regrow before being stocked with livestock. In 1999, in order to put more stress on varieties and to separate varieties more clearly, all studies were grazed for the entire season.

Stands of orchardgrass declined with age, and more separation among varieties was seen compared to tall fescue (Tables 6, 8, and 9). A yield trial of the varieties from the 1996 grazing tolerance trial is included for comparison (Table 7). Although all commercial varieties were similar in the 1996 seeding (Table 6), Tekapo in the 1997 seeding (Table 8) and Boone, Hallmark, Tekapo, and Shiloh from the 1998 seeding (Table 9) were at the top of their respective trials. Tekapo has been consistently lower in stand in the 1996 seeding, primarily because it experienced some winterkill in the first winter and therefore started out at a lower percent stand than others in the study.

In spite of the drought of 1999, both tall fescue and orchardgrass varieties seemed to come back well, generating relatively good stand ratings. However, it is uncertain as to whether these overgrazed and abused plots will withstand winter conditions and come back equally well in the spring of 2000.

Tables 10 (fescue) and 11 (orchardgrass) summarize information about distributors and persistence across locations and

years for all varieties in these tests. Varieties are listed in alphabetical order, with experimental varieties listed at the bottom. In tables 10 and 11 shaded areas indicate that the variety was not in that particular test (labeled at the top of the column), while clear blocks mean the variety was in the test. A single asterisk (*) means that the variety was not significantly different for the top-yielding variety in that study. It is best to choose a variety that has performed well over several years.

Summary

These studies indicate that there are varieties of cool-season grasses that can tolerate overgrazing for multiple seasons and still maintain reasonable stands. Several varieties of endophyte-free tall fescue have been able to maintain equivalent stands to endophyte-infected KY31. There is no KY31+ equivalent with orchardgrass—that is, there is no variety that historically has been proven to be tolerant of overgrazing. Therefore, comparison of limited years of orchardgrass grazing tolerance data is difficult. However, it does appear that some separation is occurring among orchardgrass cultivars in the current studies.

This information should be used along with yield and other information (relative maturity in spring, for example) in selecting the best grass variety for each individual use. It is *not* recommended that tall fescue or orchardgrass be continuously overgrazed as was done in this trial. While several varieties expressed tolerance to the level of grazing pressure used in these trials, overgrazing greatly reduces yield and therefore profitability of these varieties. This information should be an indication of those varieties that will better withstand the occasional overgrazing that sometimes becomes necessary in livestock operations.

Good management for maximum life from any grass would be to allow it to become completely established before grazing and to avoid overgrazing it during times of extreme stress (such as drought).

Table 1. Temperature and rainfall at Lexington during the 1997, 1998, and 1999 growing seasons.

MON	1997				1998				1999			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	31	+0	3.70	+0.84	41	+10	3.96	+1.10	36	+5	5.64	+2.78
FEB	41	+6	3.96	+0.75	41	+6	2.54	-0.67	40	+5	2.32	-0.89
MAR	46	+2	13.82	+9.42	46	+2	3.40	-1.00	40	-4	3.27	-1.13
APR	50	-5	1.89	-1.99	54	-1	6.20	+2.32	56	+1	1.87	-2.01
MAY	58	-6	8.84	+4.37	67	+3	6.14	+1.67	65	+1	1.35	-3.12
JUN	70	-2	9.54	+5.88	73	+1	10.81	+7.15	74	+2	3.89	+0.23
JUL	76	+0	3.32	-1.68	75	-1	7.98	+2.98	80	+4	1.00	-4.00
AUG	73	-2	2.58	-1.35	76	+1	0.29	-3.64	75	0	1.31	-2.62
SEP	67	-1	2.37	-0.83	74	+6	0.61	-2.59	69	+1	1.03	-2.17
OCT	56	-1	1.92	-0.65	58	+1	2.41	-0.16	57	0	1.91	-0.66

DEP is departure from the long-term average for that location.

Table 2. Dry matter yields (tons/acre), vigor, and percent stand ratings of tall fescue and Kentucky bluegrass (BG) varieties sown 23 August 1996 at Lexington, Kentucky, in a grazing tolerance study.

Variety	Seedling Vigor ¹	Yield			Percent Stand					
		May 19 1997	May 22 1998	2-yr Total	Jan 14 1998	Apr 20 1998	Jun 6 1998	Nov 22 1998	Jul 6 1999	Oct 4 1999
Commercial Varieties—Available for Farm Use										
Kenblue (BG)	2.50	1.07	2.50	3.56	100.0 *	78.3	68.3	80.8 *	61.7 *	63.3 *
KY31+ ²	5.50	1.96	3.31 *	5.27 *	98.3 *	85.0 *	76.7 *	62.5	60.8 *	61.7 *
Festorina	5.00	1.83	3.32 *	5.16	98.3 *	86.7 *	80.0 *	74.2 *	63.3 *	60.8
Dovey	7.50 *	1.17	3.00	4.17	91.7	86.7 *	81.7 *	60.0	45.0	60.0
Barcel	4.33	1.93	3.27 *	5.21	93.3 *	85.0 *	73.3 *	59.2	44.2	56.7
Stargrazer	5.17	2.10 *	3.48 *	5.58 *	91.7	83.3 *	73.3 *	51.7	36.7	55.8
Lato (BG)	3.00	1.23	2.77	4.01	90.0	76.7	73.3 *	72.5 *	43.3	49.2
Experimental Varieties—Not Available for Farm Use										
FA89K	6.17	2.12*	3.36 *	5.48 *	96.7 *	83.3 *	70.0	55.0	53.3	71.7 *
KYFA9404	7.33 *	1.86	3.27 *	5.12	95.0 *	86.7 *	81.7 *	65.0	50.8	71.7 *
KYFA9303	5.50	1.96	3.52 *	5.48 *	96.7 *	81.7 *	80.0 *	70.8 *	72.5 *	65.8 *
TF9201	7.33 *	2.16	3.37 *	5.53 *	98.3 *	86.7 *	78.3 *	59.2	58.3	64.2 *
KYFA9302	6.17	1.51	3.14	4.65	90.0	85.0 *	76.7 *	45.0	59.2 *	63.3 *
BAR-FA-6FRD	4.67	1.68	3.03	4.71	95.0 *	86.7 *	75.0 *	65.8	57.5 *	63.3 *
BARFA4113	5.33	1.64	3.02	4.67	95.0 *	85.0 *	76.7 *	68.3 *	63.3 *	62.5 *
KYFA9304	6.17	2.26 *	3.58 *	5.84 *	100.0 *	86.7 *	78.3 *	65.8	61.7 *	62.5 *
TF9005	2.00	1.63	2.98	4.61	78.3	78.3	71.7 *	41.7	35.8	62.5 *
KYFA9301	6.00	2.20 *	3.46 *	5.66 *	100.0 *	83.3 *	78.3 *	60.8	55.8	60.8
GA156	6.00	1.64	3.41 *	5.05	93.3 *	83.3 *	66.7	50.8	45.0	60.0
BARFA2HG	3.67	1.64	3.04	4.68	90.0	78.3	75.0 *	66.7 *	50.0	59.2
KY31- ²	6.17	2.12 *	3.12	5.24 *	96.7 *	81.7 *	76.7 *	62.5	59.2 *	58.3
KYFA9403	6.00	2.36 *	3.50 *	5.86 *	96.7 *	85.0 *	76.7 *	62.5	57.5 *	55.8
KYTF2	6.00	2.38 *	3.49 *	5.87 *	100.0 *	80.0	81.7 *	63.3	62.5 *	55.8
GA153	5.83	1.50	3.38 *	4.88	85.0	86.7 *	66.7	29.2	29.2	48.3
Mean	5.36	1.82	3.23	5.06	94.4	83.5	75.5	60.6	53.3	60.6
CV, %	18.70	18.43	10.39	11.43	7.1	6.2	11.8	21.4	24.8	15.0
LSD, 0.05	1.15	0.39	0.38	0.66	7.6	5.9	10.2	14.8	15.1	10.4

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

¹ Establishment vigor rating taken on 17 October 1996, 0 to 9 scale, with 9 being most vigorous.

² "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.

Table 3. Dry matter yields (tons/acre) and maturity ratings for tall fescue and Kentucky bluegrass (BG) varieties sown on 23 August 1996 at Lexington, Kentucky, for hay management purposes.

Variety	Maturity ¹ May 5, 1999	1997 Total	1998 Total	1999 Total	3-yr Total
Commercial Varieties— Available for Farm Use					
Stargrazer	48.38	8.28 *	6.19 *	1.82	16.29 *
KY31+ ²	50.50	7.74	6.12 *	2.03 *	15.89 *
Dovey	53.25	6.99	6.73 *	1.82	15.54 *
Barcel	45.25	7.02	5.78	1.85	14.64
Festorina	46.88	7.00	5.22	1.86	14.08
Lato	55.63	5.33	4.70	1.62	11.65
Kenblue (BG)	60.25 *	3.81	4.61	1.21	9.62
Experimental Varieties— Not Available for Farm Use					
TF9201	50.13	8.81 *	6.15 *	2.00 *	16.96 *
KY31- ²	48.75	8.37 *	6.30 *	2.13 *	16.79 *
KYTF2	47.38	8.26 *	6.50 *	1.76	16.53 *
KYFA9403	49.00	8.14 *	6.53 *	1.82	16.49 *
KYFA9303	51.00	7.65	6.74 *	1.94 *	16.33 *
KYFA9304	48.25	7.77	6.15 *	1.95 *	15.88 *
TF9005	50.38	7.23	6.19 *	2.16 *	15.58 *
KYFA9404	55.50	7.13	6.25 *	1.86	15.23
GA156	50.88	7.19	6.02 *	1.95 *	15.15
KYFA9302	52.25	7.40	5.80	1.90 *	15.10
BARFA4113	46.75	7.45	5.79	1.65	14.89
KYFA9301	48.75	7.45	5.69	1.73	14.87
FA89K	49.00	7.39	5.61	1.76	14.75
BAR-FA-6FRD	48.38	7.07	5.79	1.85	14.71
BARFA2HG	48.00	6.77	5.44	1.80	14.01
GA153	52.63	5.89	5.89	1.93	13.71
Mean	50.31	7.22	5.92	1.84	14.99
CV,%	3.86	9.67	9.50	10.71	6.91
LSD, 0.05	2.74	0.99	0.79	0.28	1.46

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

¹ Maturity rating scale: 37=flag leaf visible, 45=boot swollen, 50=beginning of inflorescence emergence, 58=complete emergence of inflorescence, 62=beginning of pollen shedding.

² "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.

Table 4. Dry matter yields (tons/acre), percent stand, and endophyte infection ratings for tall fescue varieties sown 5 September 1997 at Lexington, Kentucky, in a grazing tolerance study.

Variety	Percent Endophyte Infection ¹	1998 Yield May 19	Percent Stand		
			Sep 9, 1998	Mar 30, 1999	Nov 9, 1999
Commercial Varieties— Available For Farm Use					
JesupEF	6.67	2.12	100.0 *	89.2 *	85.0 *
Festorina	3.33	2.00	100.0 *	87.5 *	83.3 *
KY31+ ²	96.67	2.42 *	100.0 *	89.2 *	76.7 *
Johnstone	1.67	1.76	100.0 *	87.5 *	70.0
Cattle-Club	5.00	1.93	98.15 *	84.2	68.3
Martin II	10.00	2.01	98.15 *	87.5 *	66.7
Southern Cross	0.00	1.62	90.74	74.2	63.3
Experimental Varieties— Not Available for Farm Use					
KYFA 9303	14.17	2.00	100.0 *	89.2 *	76.7 *
TF 8805	8.33	2.22 *	100.0 *	87.5 *	76.7 *
KYFA 9304	8.33	2.16 *	100.0 *	89.2 *	75.0 *
KY31- ²	18.33	2.32 *	100.0 *	89.2 *	75.0 *
B-1	3.33	1.64	98.2 *	88.3 *	73.3
KYTF2	21.67	2.03	100.0 *	87.5 *	71.7
KYFA 9301	0.00	1.97	100.0 *	87.5 *	70.0
KYFA 9302	1.67	2.03	100.0 *	90.0 *	70.0
WVPB-TF-500	10.83	1.86	88.9	79.2	63.3
Mean		2.01	98.40	86.70	72.8
CV, %		11.42	2.35	3.18	11.99
LSD, 0.05		0.26	2.66	3.17	10.04
* Not significantly different from the highest numerical value in the column based on the 0.05 LSD.					
¹ Means of six replications using tiller samples taken on 29 April 1999.					
² "+" indicates variety is endophyte infected; "-" indicates variety is endophyte free.					

Table 5. Dry matter yields (tons/acre), endophyte infection score, vigor score, maturity rating, and percent stand for tall fescue and perennial ryegrass (PRG) varieties sown 15 September 1998 at Lexington, Kentucky, in a grazing study.

Variety	Percent Endophyte Infection ¹	Seedling Vigor ² Nov 10, 1998	Maturity ³ May 5, 1999	Yield		2-yr Total	Percent Stand Oct 4, 1999
				Nov 16, 1998	May 7, 1999		
Commercial Varieties— Available for Farm Use							
JesupEF	3.3	7.67 *	52.50 *	0.26	2.70	2.95	84.2 *
Select	0.0	7.50	49.58	0.18	2.67	2.85	81.7 *
Johnstone	3.3	5.83	47.42	0.25	2.62	2.87	81.7 *
KenHy	0.0	6.17	46.67	0.28	2.37	2.65	79.2 *
Cattle-Club	0.0	7.33	52.58 *	0.32	2.54	2.86	78.3 *
TF33	0.0	5.33	46.08	0.16	2.38	2.55	74.2
Vulcan	6.7	4.50	38.08	0.38	1.90	2.28	73.3
Bronson	0.0	7.67 *	51.92	0.28	2.20	2.48	73.3
Fuego	0.0	5.67	41.00	0.23	2.07	2.30	73.3
KY31+ ⁴	83.3	6.67	44.92	0.34	2.41	2.75	71.7
Polly II (PRG)	0.0	8.50 *	40.67	1.17 *	3.81 *	4.98 *	61.7
Experimental Varieties— Not Available for Farm Use							
Jesup502	93.3	6.83	51.67	0.27	2.57	2.84	84.2 *
Ampacpp1	6.7	8.17 *	51.42	0.48	3.16	3.64	84.2 *
JesupEI	100.0	7.67 *	52.67 *	0.29	2.55	2.84	84.2 *
KY31- ⁴	6.7	6.33	47.50	0.39	2.55	2.94	81.7 *
KyFA9301	13.3	6.50	46.83	0.32	2.44	2.76	80.0 *
Jesup542	96.7	7.50	53.08 *	0.37	2.55	2.92	79.2 *
KYTF2	36.7	7.17	45.17	0.37	2.40	2.77	75.8 *
Georgia5-542	96.7	7.17	54.17 *	0.33	2.37	2.71	71.7
Woodburn 97	23.3	2.33	42.42	0.07	1.19	1.26	39.2
Mean		6.63	47.82	0.33	2.47	2.81	75.6
CV, %		12.54	4.60	32.85	11.90	11.37	10.21
LSD, 0.05		0.95	2.50	0.13	0.34	0.37	8.85

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

¹ Means of six replications using tiller samples taken on 21 October 1999.

² 0 to 9 scale, with 9 being most vigorous.

³ Maturity rating score: 37=flag leaf visible, 45=boot swollen, 50=beginning of inflorescence, 58=complete emergence of inflorescence, 62=beginning of pollen shedding.

⁴ "-" indicates variety is endophyte free; "+" indicates variety is endophyte infected.

Table 6. Dry matter yields (tons/acre), maturity rating, and percent stand of orchardgrass varieties sown 23 August 1996 at Lexington, Kentucky, in a grazing tolerance study.

Variety	Maturity ¹	Yield			Percent Stand			
	May 14, 1999	May 19, 1997	May 26, 1998	2-yr Total	Jan 14, 1998	Nov 22, 1998	Jul 6, 1999	Oct 4, 1999
Commercial Varieties— Available for Farm Use								
Progress	48.00	1.15	3.15	4.30	93.3 *	67.7	55.0 *	50.0 *
Hallmark	55.17 *	1.57	3.60 *	5.17	95.0 *	71.2 *	53.3 *	47.5 *
Benchmark	53.00 *	1.42	3.46 *	4.88	91.7 *	76.8 *	57.5 *	45.0
Profile	52.67 *	1.49	3.38	4.87	95.0 *	72.3 *	55.8 *	44.2
Potomac	52.83 *	1.71	3.30	5.01	96.7 *	60.2	55.0 *	44.2
Haymate	47.67	2.61 *	3.91 *	6.52 *	88.3	56.3	49.2	41.7
Tekapo	46.50	1.42	3.38	4.80	65.0	43.5	35.8	41.7
Experimental Varieties— Not Available for Farm Use								
9007238	52.83 *	1.64	3.24	4.88	90.0	67.7 *	56.7 *	58.3 *
KYOG2	51.83 *	1.28	3.76 *	5.04	96.7 *	72.2 *	61.7 *	55.8 *
OG8703	54.17 *	1.43	3.58 *	5.01	96.7 *	71.2 *	54.2 *	51.7 *
OG9201	43.83	1.66	3.55 *	5.21	95.0 *	74.2 *	65.0 *	50.0 *
Mowtolgray	49.33 *	1.79 *	3.43	5.22	93.3 *	60.3	55.8 *	48.3 *
Mowtol85II	51.67 *	1.50	3.65 *	5.15	93.3 *	71.2 *	52.5 *	42.5
Mean	50.69	1.58	3.5	5.08	90.7	63.6	51.8	46.3
CV, %	11.21	49.24	11.58	18.37	5.89	19.21	21.27	22.27
LSD, 0.05	6.55	0.90	0.47	1.08	0.62	14.08	12.72	11.88

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

¹ Maturity rating score: 37=flag leaf visible, 45=boot swollen, 50=beginning of inflorescence, 58=complete emergence of inflorescence, 62=beginning of pollen shedding.

Table 7. Dry matter yields (tons/acre) and maturity ratings of orchardgrass varieties sown 23 August 1996 at Lexington, Kentucky, for hay management purposes.

Variety	Maturity ¹	1997 Total	1998 Total	1999 Harvests		1999 Total	3-yr Total
	May 14, 1999			May 10	Jul 9		
Commercial Varieties— Available for Farm Use							
Benchmark	51.63 *	7.65 *	4.75 *	1.75 *	0.54	2.29 *	14.69 *
Potomac	50.13	6.24 *	4.46	1.57	0.49	2.06	12.77 *
Hallmark	51.38 *	5.96 *	4.51	1.47	0.55 *	2.03	12.49 *
Haymate	45.38	5.57	4.73 *	1.39	0.49	1.88	12.18
Progress	47.50	6.05	4.08	1.32	0.61 *	1.93	12.06
Profile	49.13	5.65	4.08	1.43	0.47	1.91	11.63
Tekapo	43.88	5.88 *	4.03	1.23	0.46	1.69	11.60
Experimental Varieties— Not Available for Farm Use							
OG9201	48.88	5.72 *	5.23 *	1.58	0.68 *	2.27 *	13.22 *
OG8703	50.50 *	5.97 *	4.81 *	1.72	0.60 *	2.31 *	13.09 *
KYOG2	49.75	5.45	5.15 *	1.75 *	0.56 *	2.30 *	12.91 *
Mowtol85II	48.63	5.95 *	4.71 *	1.52	0.55 *	2.07 *	12.74 *
Mowtolgray	46.63	6.54 *	4.30	1.34	0.49	1.82	12.66 *
9007238	51.75 *	5.19	4.32	1.68	0.48	2.15 *	11.66
Mean	48.83	6.07	4.56	1.55	0.54	2.06	12.72
CV, %	2.07	22.8	9.69	9.98	18.35	8.33	12.68
LSD, 0.05	1.45	1.98	0.63	0.22	0.14	0.25	2.31
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.							
¹ Maturity rating score: 37=flag leaf visible, 45=boot swollen, 50=beginning of inflorescence, 58=complete emergence of inflorescence, 62=beginning of pollen shedding.							

Table 8. Dry matter yields (tons/acre) and percent stand of orchardgrass varieties sown 8 September 1997 at Lexington, Kentucky, in a grazing tolerance study.

Variety	Yield	Percent Stand		
	May 19, 1998	Sep 30, 1998	Mar 30, 1999	Nov 9, 1999
Commercial Varieties— Available for Farm Use				
Tekapo	1.59	78.3	84.2	78.3 *
Benchmark	1.79 *	88.3 *	87.5 *	68.3
Warrior	1.88 *	81.7	85.0	66.7
Crown	1.60	85.0 *	87.5 *	65.0
Ambrosia	1.93 *	78.3	76.7	63.3
Takena	1.84 *	81.7	84.2	60.0
Haymate	1.91 *	85.0 *	85.0	58.3
Condor	2.01 *	85.0 *	83.3	53.3
Experimental Varieties— Not Available for Farm Use				
93E	1.53	88.3 *	89.2 *	73.3 *
93M	1.88 *	86.7 *	86.7 *	63.3
AV61	2.14 *	86.7 *	86.7 *	61.7
93L	1.94 *	86.7 *	85.8	58.3
Mean	1.83	84.30	85.10	64.20
CV, %	17.18	5.83	3.12	10.30
LSD, 0.05	0.37	0.57	3.08	7.64
* Not significantly different from the highest numerical value in the column, based on the 0.05LSD.				

Table 9. Dry matter yields (tons/acre), maturity, vigor, and percent stand ratings of orchard-grass varieties sown 15 September 1998 at Lexington, Kentucky, in a grazing tolerance study.				
Variety	Maturity ¹	Seedling Vigor ² Oct 30, 1998	Yield	Percent Stand
	May 5, 1999		May 7, 1999	Oct 4, 1999
Commercial Varieties— Available for Farm Use				
Boone	50.25	8.17 *	1.86	89.2 *
Hallmark 1996 ³	49.33	7.33	1.78	85.8 *
Tekapo	46.83	6.00	1.50	85.0 *
Shiloh	51.08	8.00 *	1.88	85.0 *
Hallmark 1970 ³	50.17	7.67	1.80	84.2 *
Benchmark	51.50	8.00 *	1.98	83.3
Cheyenne	53.25 *	8.83 *	2.13 *	81.7
Haymate	45.83	7.33	1.91	80.8
Crown	48.67	7.17	1.77	80.8
Wp300	49.42	8.00 *	2.07	77.5
Pizza	46.50	7.67	1.82	75.0
Experimental Varieties— Not Available for Farm Use				
OG9501	49.17	7.83	1.17	86.7 *
OG9705g	50.50	6.67	1.94	85.0 *
KYOG9303	48.67	7.67	1.80	84.2 *
KYO7G23-335	49.42	7.50	1.92	82.5
AmpacpII	47.83	7.33	2.55 *	80.0
Mean	49.28	7.57	1.87	82.92
CV, %	2.27	10.42	21.49	5.46
LSD, 0.05	1.28	0.91	0.46	5.21
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.				
¹ Maturity rating score: 37=flag leaf visible, 45=boot swollen, 50=beginning of inflorescence, 58=complete emergence of inflorescence, 62=beginning of pollen shedding.				
² 0 to 9 scale, with 9 being most vigorous.				
³ Seed for this test came from fields planted on dates indicated.				

Table 10. Persistence of tall fescue and Kentucky bluegrass (BG) varieties under heavy grazing pressure across years and locations.		Lexington									
		1996 ¹						1997			1998
		Jan ² 1998	Apr 1998	Jun 1998	Nov 1998	Jul 1999	Oct 1999	Sep 1998	Mar 1999	Nov 1999	Oct 1999
Variety	Proprietor/KY Distributor										
Commercial Varieties— Available for Farm Use											
Barcel	Barenbrug Research/Barenbrug USA	*	*	*							
Bronson	Ampac Seeds										
Cattle-Club	Green Seed							*			*
Dovey	Barenbrug Research/Barenbrug USA		*	*							
Festorina	Advanta Seeds West/Oldfields Seeds	*	*	*	*	*		*	*	*	
Fuego	Advant Seeds										
Jesup EF	Pennington Seed							*	*	*	*
Johnstone	Willamette Seed Co./Public							*	*		*
Kenblue (BG)	KY Agric. Exp. Sta./Public	*			*	*	*				
KenHy											*
KY31+ (endophyte infected)	KY Agric. Exp. Sta./Public	*	*	*		*	*	*	*	*	
Lato (BG)	Turf-Seed Inc.			*	*						
Martin II	International Seeds Inc.							*	*		
Polly II	FFR/Southern States										
Select	FFR										*
Southern Cross											
Stargrazer	FFR/Southern States		*	*							
TF 33	Barenbrug										
Vulcan	International Seeds Inc.										
Experimental Varieties— Not Available for Farm Use											
Ampac PP1	Ampac Seeds										*
B-1	Olsen-Fennell Seeds Inc.							*	*		
BARFA2HG	Barenbrug Research/Experimental			*	*						
BARFA4113	Barenbrug Research/Experimental	*	*	*	*	*	*				
BARFA6FRD	Barenbrug Research/Experimental	*	*	*		*	*				
FA89K	Barenbrug Research/Experimental	*	*				*				
GA153	GA Agric. Exp. Sta./Experimental		*								
GA156	GA Agric. Exp. Sta./Experimental	*	*								
GA 5-542	GA Agric. Exp. Sta./Experimental										
GA Jesup EI	GA Agric. Exp. Sta./Experimental										*
Jesup 502	GA Agric. Exp. Sta./Experimental										*
Jesup 542	GA Agric. Exp. Sta./Experimental										*
KY31- (endophyte free)	KY Agric. Exp. Sta./Experimental	*		*		*		*	*	*	*
KYFA9301	KY Agric. Exp. Sta./Experimental	*	*	*				*	*		*
KYFA9302	KY Agric. Exp. Sta./Experimental		*	*		*	*	*	*		
KYFA9303	KY Agric. Exp. Sta./Experimental	*	*	*	*	*	*	*	*	*	
KYFA9304	KY Agric. Exp. Sta./Experimental	*	*	*		*	*	*	*	*	
KYFA9403	KY Agric. Exp. Sta./Experimental	*	*	*		*					
KYFA9404	KY Agric. Exp. Sta./Experimental	*	*	*			*				
KYTF2	KY Agric. Exp. Sta./Experimental	*		*		*		*	*		*
TF8805	FFR Cooperative							*	*	*	
TF9005	Barenbrug Research/Experimental			*			*				
TF9201	FFR Cooperative	*	*	*			*				
Woodburn 97	Western Production Inc.										
WVPB TF500	Western Production Inc.										

¹ Establishment year.
² Date of measurement of percent stand.
* Not significantly different from the most persistent variety in the test. Shaded boxes indicate that the variety was not in the test. Open boxes indicate the variety was in the test, but persistence was significantly less than the top-ranked variety in the test.

Table 11. Persistence of orchardgrass varieties under heavy grazing pressure across years and locations.		Lexington							
		1996 ¹				1997			1998
Variety	Proprietor/KY Distributor	Jan ² 1998	Nov 1998	Jul 1999	Oct 1999	Sep 1998	Mar 1999	Nov 1999	Oct 1999
Commercial Varieties— Available for Farm Use									
Ambrosia	Pennington Seeds								
Benchmark	FFR/Southern States	*	*	*		*	*		
Boone	KY Agric. Exp. Sta/Experimental								*
Cheyenne	Western Production Inc.								
Condor	Hansford Seed Co.					*			
Crown	Scott Seed Co./Sphar Seed Co.					*	*		
Hallmark 1996	James VanLeeuwen	*	*	*	*				*
Hallmark 1970	James VanLeeuwen								*
Haymate	FFR/Southern States					*			
Pizza	Advanta Seeds West								
Potomac	USDA/Public	*		*					
Profile	J. W. Jenks Seed/Scott Seed	*	*	*					
Progress	J. W. Jenks Seed/Scott Seed	*		*	*				
Shiloh	Green Seed								*
Takena	Smith Seed								
Tekapo	Modern Forage Systems/Oldfields Seed							*	*
Warrior	Olsen-Fennel Seeds Inc.								
WP300	Western Productions Inc.								
Experimental Varieties— Not Available for Farm Use									
9007238	NRCS/USDA		*	*	*				
Ampac pp 2	Ampac Seeds								
AV-61	Western Production Inc.					*	*		
KYOG2	KY Agric. Exp. Sta/Experimental	*	*	*	*				
KYOG9303	KY Agric. Exp. Sta/Experimental								*
KYO7G23-335	KY Agric. Exp. Sta/Experimental								
Mow Tol 85 II	International Seeds Inc.	*	*	*					
Mow Tol Gray	International Seeds Inc.	*		*	*				
OFI93E	Olsen-Fennel					*	*	*	
OFI93L	Olsen-Fennel					*			
OFI93M	Olsen-Fennel					*	*		
OG8703	Fine Lawn Research/Geo.W. Hill	*	*	*	*				
OG9201	J&M Seed	*	*	*	*				
OG9501	FFR Cooperative								*
OG9705G	FFR Cooperative								*

¹ Establishment year.

² Date of measurement of percent stand.

* Not significantly different from the most persistent variety in the test. Shaded boxes indicate that the variety was not in the test. Open boxes indicate the variety was in the test, but persistence was significantly less than the top-ranked variety in the test.

