

# 2006 Cool-Season Grass Horse Grazing Tolerance Report

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## Introduction

Cool-season grasses such as bluegrass, tall fescue, and orchardgrass are dominant pasture grasses for horses in Kentucky. While variety evaluations for yield have been carried out for many years, little work has been done to establish the effect of variety on persistence when subjected to close, continuous grazing by horses.

The purpose of this report is to summarize current research on the grazing tolerance of varieties of tall fescue, orchardgrass, and other species when subjected to continuous heavy grazing pressure by horses within the grazing season. The main focus will be on stand survival.

Go to the UK Forage Extension Web site at <[www.uky.edu/Ag/Forage](http://www.uky.edu/Ag/Forage)> to obtain electronic versions of all forage variety testing reports from Kentucky and surrounding states and from a large number of other forage publications.

## Description of the Tests

Tests were established in Lexington in the fall of 2002, 2003, 2004, and 2005. The soils at this location are well-drained silt loams and are well suited to tall fescue, orchardgrass, and other cool-season grasses. Plots were 5 by 15 feet in a randomized complete block design, with each variety replicated six times. Plots were seeded at the recommended seeding rate per acre and were planted into a prepared seedbed using a disk drill. Grazing was continuous from April to October.

Plots were grazed down to below 4 inches quickly and were maintained at 2 to 4 inches (sometimes less) for the remainder of the grazing season. Supplemental hay was fed during periods of slowest growth. Visual ratings of percent stand were made in the fall several weeks after the horses were removed to check stand survival after the grazing season and in the spring prior to grazing to check on winter survival and spring growth. Since trials were seeded in rows, persistence ratings were based on density within a row and not total ground cover. Grass plots were fertilized with 60 pounds of actual N per acre in the spring and 30 to 40 pounds of actual N in early November after horses were removed from the pasture. Other fertilizers (lime, P, and K) were applied as needed.

## Results and Discussion

Weather data for Lexington for 2003, 2004, 2005, and 2006 are presented in Table 1.

Data on percent stand are presented in Tables 2, 3, 4, and 5.

Statistical analyses were performed on all entries (including experimentals) to determine if numerical differences are truly due to variety. 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.

In general, commercial varieties of tall fescue and orchardgrass tolerated overgrazing well (Tables 2, 3, and 4), but the varieties of timothy and prairie brome (prairiegrass) [*Bromus willdenoii*] in these trials did not. The sensitivity of timothy and prairie brome to heavy grazing was not surprising, as these are both erect species and sensitive to heavy defoliation. Perennial ryegrasses and Kentucky bluegrasses vary in tolerance to grazing.

The lack of a defined “grazing-tolerant variety” for these species makes absolute interpretation difficult. For example, endophyte-infected “Kentucky 31” (KY31+) is known to be grazing tolerant. However, there are no proven grazing-tolerant varieties for the other species. Still, certain varieties were clearly more tolerant than others.

Differences in tolerance among varieties could be due to true grazing tolerance but also to preference, especially where highly palatable species such as bluegrass and ryegrass are alongside tall fescue. These data should be taken as an indication of tolerance to periods of overgrazing. For best pasture stands, forage grasses should not be abused as in this study.

## Ranking Varieties by Preference

Differences in tolerance among varieties could be due to true grazing tolerance but also to preference, as horses may graze the preferred varieties more intensely than the less preferred varieties. In the spring 2004 and spring 2005, the varieties sown in fall 2003 were used to assess the grazing preferences of horses. During the first week of grazing in both years, variety plots were measured for forage height and scored for forage density and evidence of grazing. Measurements were made before horses were given access to plots and on day 2, 5, and 7. Forage density was scored from 0 to 10, where 10 indicated that 100% of the plot was covered with the seeded variety and 0 indicated that there were no plants of the seeded variety. Similarly, grazing intensity was scored from 0 to 10; where 10 indicated that 100% of the plants had been grazed and 0 indicated that none of the plants had been grazed.

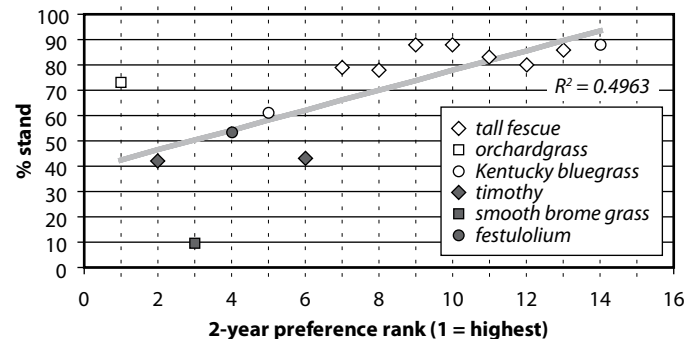
Preference rankings were generated using a combination of measurements including: the % reduction in forage height between day 0 and day 7 (greatest reduction = most preferred); the unit decrease in forage density from day 0 to day 7 (largest unit reduction = most preferred); and the grazing intensity scores from day 7 (highest grazing score = most preferred). The rankings for each characteristic were then totaled and the varieties with the lowest totals were considered most preferred. Table 4 shows the preference rankings determined in spring 2004 and spring 2005 for the forage varieties sown in fall 2003. A two-year ranking was also determined which was based on the total from the 2004 and 2005 rankings. When two forages had the same two-year total, the tie was broken using the 2004 score. In general, tall fescue varieties were less preferred by horses than timothy or orchardgrass. However, only one variety of orchardgrass was included in this test. Common bluegrass also appeared to have low palatability to horses, although the “Ginger” variety of bluegrass was well accepted.

To determine whether grazing preferences might affect the grazing tolerance of cool-season grass varieties, the relationship of the two-year grazing preference ranking to the % stand remaining in fall 2006 was plotted in Figure 1. There is a moderate relationship between preference rank and % stand ( $R^2 = 0.49$ ); least preferred varieties had the highest % stand after three grazing seasons. Two varieties appear to have performed differently than the others; “Haymate” orchardgrass had a relatively high stand percentage (73%) even though it was highly preferred. The “Peak” variety of smooth brome grass had an extremely low stand percentage (10%) compared to all other varieties.

## Summary Table

Table 6 summarizes information about distributors and persistence across years for all varieties in these tests. Varieties are listed in alphabetical order, with experimental varieties listed at the bottom. An open block indicates that the variety was not in that particular test (labeled at the top of the column), while

**Figure 1.** Relationship of preference ranking to percent stand remaining, fall, 2006.



an “x” in the block indicates the variety was in the test but was significantly different from the most persistent variety. A single asterisk (\*) means that the variety was not significantly different from the most persistent 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 by horses for three to four seasons and still maintain reasonable stands. This information should be used along with yield and other information (for example, relative maturity in spring) in selecting the best grass variety for each individual use. It is not generally recommended that tall fescue, orchardgrass, or other cool-season grasses be continuously overgrazed as was done in this trial. Although several varieties expressed tolerance to the level of grazing pressure used in these trials, overgrazing greatly reduces forage production. This information should be an indication of those varieties that will better withstand overgrazing when it occurs.

Good management for maximum life from any grass would be to allow complete establishment before grazing and to avoid overgrazing during times of extreme stress, such as drought.

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**Table 1. Temperature and rainfall at Lexington, Kentucky, in 2003, 2004, 2005, and 2006.**

	2003				2004				2005				2006			
	Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall	
	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	26	-5	0.96	-1.90	30	-1	3.14	+0.28	37	+6	4.35	+1.49	42	+11	4.77	+1.91
FEB	32	-3	3.59	+0.38	36	+1	1.32	-1.89	39	+4	1.68	-1.53	36	+1	2.13	-1.08
MAR	47	+3	2.09	-2.31	47	+3	3.43	-0.97	41	-3	2.79	-1.61	44	0	3.05	-1.35
APR	57	+2	3.14	-0.74	55	0	3.06	-0.82	56	+1	3.30	-0.58	59	+4	3.52	-0.36
MAY	63	-1	6.68	+2.21	68	+4	9.79	+5.32	61	-3	1.78	-2.69	62	-2	2.99	-1.48
JUN	69	-3	4.85	+1.19	72	0	3.13	-0.53	75	+3	1.33	-2.33	70	-2	1.82	-1.84
JUL	74	-2	2.68	-2.32	73	-3	7.65	+2.65	77	+1	3.30	-1.70	76	0	5.13	+0.13
AUG	75	0	5.26	+1.33	71	-4	2.91	-1.02	78	+3	3.34	-0.59	76	+1	3.23	-0.70
SEP	65	-3	4.22	+1.02	68	0	2.61	-0.59	72	+4	0.59	-2.21	64	-4	9.27	+6.07
OCT	56	-1	1.61	-0.96	58	+1	5.65	+3.08	58	+1	0.92	-1.65	54	-3	4.88	+2.31
NOV	50	+5	4.63	+1.24	49	+4	6.29	+2.90	47	+2	1.54	-1.85	47	+2	1.78	-1.61
DEC	36	0	3.26	-0.72	36	0	3.20	-0.78	32	-4	2.19	-1.79				
Total			42.97	-1.58			52.18	+7.63			27.51	-17.04			42.57	+2.00

DEP is departure from the long-term average.

**Table 2. Seedling vigor rating and percent stand of forage grasses sown Sept. 19, 2002, at Lexington, Kentucky, in a horse grazing tolerance study.**

Variety	Species	Seedling Vigor <sup>1</sup> Oct 31, 2002	Percent Stand							
			2003		2004		2005		2006	
			Mar 25	Oct 30	Mar 26	Nov 8	Mar 30	Oct 31	Apr 4	Nov 3
<b>Commercial Varieties—Available for Farm Use</b>										
Select	tall fescue	4.2	90	78	94	85	83	87	95	94*
Kenblue (certified)	KY bluegrass	1.5	88	36	53	22	63	70	93	86*
Jesup MaxQ <sup>2</sup>	tall fescue	3.7	90	71	93	80	78	82	89	84*
Barderbly	KY bluegrass	1.5	88	45	46	30	53	65	77	77
Potomac (certified)	orchardgrass	3.8	89	67	87	73	72	78	73	76
Potomac (uncertified)	orchardgrass	4.0	88	65	85	67	70	73	72	74
Benchmark Plus	orchardgrass	4.0	89	74	88	73	75	83	80	72
Haymate	orchardgrass	3.3	85	68	79	65	70	73	70	63
Crown Royale Plus	orchardgrass	3.8	89	73	88	73	73	77	76	63
Tekapo	orchardgrass	2.8	82	55	78	63	54	68	72	60
Benchmark	orchardgrass	3.5	86	60	78	60	65	68	67	55
Duo	festulolium	5.0	90	79	91	80	85	83	88	53
<b>Experimental Varieties</b>										
KYFA 9304	tall fescue	4.7	90	79	95	88	87	90	95	91*
KYPP 9901	KY bluegrass	1.2	84	8	17	13	58	77	86	88*
KY 31 E- <sup>2</sup>	tall fescue	4.3	90	79	94	78	85	88	95	86*
VB 5649	KY bluegrass	1.7	88	34	13	13	42	63	73	77
HB 120	KY bluegrass	1.3	89	26	19	16	47	68	75	69
HB 121	KY bluegrass	1.5	90	19	16	9	32	43	56	50
Mean		3.1	88	56	67	55	66	74	80	73
CV,%		15.9	3	17	10	18	17	19	16	20
LSD,0.05		0.6	3	11	8	11	13	16	14	17

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

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

<sup>2</sup> KY 31 E- is the variety of KY 31 where the toxic endophyte has been removed. Jesup MaxQ is a variety that contains a nontoxic endophyte that provides stand persistence with no animal toxicity. All other fescue varieties in this test do not contain an endophyte.

**Table 3. Seedling vigor rating and percent stand of forage grasses sown Sept. 17, 2003, at Lexington, Kentucky, in a horse grazing tolerance study.**

Variety	Species	Seedling Vigor <sup>1</sup> Oct 31, 2003	Percent Stand					
			2004		2005		2006	
			Mar 26	Nov 8	Mar 30	Oct 31	Apr 4	Nov 3
<b>Commercial Varieties—Available for Farm Use</b>								
Common bluegrass	KY bluegrass	3.0	99	75	87	97	96	88*
Select	tall fescue	3.7	99	88	88	97	99	83*
Haymate	orchardgrass	4.2	98	83	82	95	91	73*
Ginger	KY bluegrass	2.5	81	10	65	90	93	61
Barfleo	timothy	3.0	96	72	87	42	63	42
Peak	smooth brome	3.0	91	37	30	14	13	10
<b>Experimental Varieties</b>								
KYFA9304	tall fescue	4.8	98	90	88	100	99	88*
KYFA9611	tall fescue	3.5	96	88	88	99	97	88*
KY 31 E- <sup>2</sup>	tall fescue	5.0	99	88	90	100	100	86*
KYTF 2	tall fescue	4.7	99	90	90	98	99	80*
KYFA 0006	tall fescue	5.0	99	90	85	99	99	79*
KYFA 9602	tall fescue	4.0	96	83	83	95	92	78*
KYFA 9819	tall fescue	5.0	99	87	80	84	61	53
TM 9901	timothy	4.0	96	78	80	39	43	43
Mean		4.0	96	76	81	83	83	69
CV,%		8.7	10	11	11	12	14	25
LSD,0.05		0.4	11	10	10	11	13	20
* Not significantly different from the highest value in the column, based on the 0.05 LSD.								
<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.								
<sup>2</sup> KY 31 E- is the variety of KY 31 where the toxic endophyte has been removed. All other fescue varieties in this test do not contain an endophyte.								

**Table 4. Preference rankings determined in the first week of grazing in spring 2004 and spring 2005 for cool-season grass varieties sown Sept. 17, 2003, at Lexington, Kentucky.**

Variety	Species	Preference Rank <sup>1</sup>		2-yr Rank <sup>2</sup>
		Spring 2004	Spring 2005	
Haymate	orchardgrass	2	1	1
Barfleo	timothy	1	6	2
Peak	smooth brome	3	4	3
KYFA 9819	festulolium	5	3	4
Ginger	KY bluegrass	4	5	5
TM 9901	timothy	8	2	6
KYFA 0006	tall fescue	7	7	7
KYFA 9602	tall fescue	6	11	8
KYFA 9611	tall fescue	9	8	9
KYFA 9304	tall fescue	10	10	10
Select	tall fescue	12	12	11
KYTF 2	tall fescue	15	9	12
KY 31-	tall fescue	11	14	13
Common	KY bluegrass	13	13	14
AR 1	tall fescue	14	15	15
<sup>1</sup> 1=most preferred; see text for explanation of ranking process.				
<sup>2</sup> 1=most preferred based on 2-year total; when two varieties had the same 2-year total, ties were broken using the 2004 rank.				

Variety	Species	Seedling Vigor <sup>1</sup> Nov 8, 2004	Percent stand			
			2005		2006	
			Mar 30	Oct 31	Apr 4	Nov 3
<b>Commercial Varieties—Available for Farm Use</b>						
Seine	tall fescue	4.2	93	100	100	98*
Stockman	tall fescue	3.8	98	98	99	94*
Select	tall fescue	4.2	100	99	100	94*
Ginger	KY bluegrass	2.2	88	89	93	91*
Haymate	orchardgrass	3.5	98	98	98	97*
GrandDaddy	tetraploid perennial ryegrass	5.0	82	95	98	83
Express	timothy	1.8	50	53	53	37
Aries	diploid perennial ryegrass	4.7	13	65	61	32
<b>Experimental Varieties</b>						
KYFA9304	tall fescue	4.2	100	100	100	97*
KYPP9901	KY bluegrass	2.0	93	98	98	97*
KYDG9303	orchardgrass	4.3	95	98	99	95*
OG0204G	orchardgrass	3.7	98	99	99	95*
KYFA9811	tall fescue	4.5	97	100	100	94*
OG0205G	orchardgrass	3.5	95	99	98	91*
94-100	orchardgrass	3.2	98	99	97	88*
KY31 <sup>-2</sup>	tall fescue	4.7	98	99	100	87
Mean		3.7	87	93	93	85
CV,%		15.4	8	8	8	12
LSD,0.05		0.7	8	8	9	11
* Not significantly different from the highest value in the column, based on the 0.05 LSD.						
<sup>1</sup> Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.						
<sup>2</sup> KY 31 E- is the variety of KY 31 where the toxic endophyte has been removed. All other fescue varieties in this test do not contain an endophyte.						

Variety	Species	Seedling Vigor <sup>1</sup> Nov 10, 2005	Percent stand	
			Apr 4, 2006	Nov 3, 2006
			<b>Commercial Varieties—Available for Farm Use</b>	
Select	tall fescue	3.0	94	94*
KY31 <sup>+2</sup>	tall fescue	3.8	98	87*
Benchmark Plus	orchardgrass	3.5	96	87*
Tekapo	orchardgrass	2.8	90	78
Jesup MaxQ <sup>2</sup>	tall fescue	2.5	96	77
Persist	orchardgrass	3.2	89	76
Spring Green	festulolium	4.3	95	75
Summit	timothy	2.0	86	55
Talon	timothy	2.0	80	45
Derby	timothy	2.7	78	28
<b>Experimental Varieties</b>				
SW ER3575	perennial ryegrass	4.8	100	97*
KYFA 9821	tall fescue	3.5	98	96*
SW ER3508 FR1	perennial ryegrass	4.0	96	95*
KY31 <sup>-2</sup>	tall fescue	3.5	98	93*
KYFA 9821/AR584 <sup>2</sup>	tall fescue	3.3	96	93*
KYFA 9821/AR542 <sup>2</sup>	tall fescue	3.5	98	92*
SW ER3579	perennial ryegrass	4.5	97	91*
OG 0203G	orchardgrass	3.5	91	81*
Mean		3.5	94	81
CV,%		21.7	7	18
LSD,0.05		0.9	8	17
* Not significantly different from the highest value in the column, based on the 0.05 LSD.				
<sup>1</sup> Vigor score based on a rating of 1 to 5 with 5 being the most vigorous seedling growth.				
<sup>2</sup> KY31 E- is the variety of KY 31 where the toxic endophyte has been removed. Jesup MaxQ contains a nontoxic endophyte that provides stand persistence with no animal toxicity. AR584 and AR542 are nontoxic endophytes. KY31+ contains the toxic endophyte. All other fescue varieties in this test do not contain an endophyte.				

**Table 7. Summary of persistence of forage grasses under heavy grazing pressure by horses across years at Lexington, Kentucky.**

Variety	Species	Proprietor	2002 <sup>1</sup>						2003						2004				2005			
			Oct <sup>2</sup> 03	Mar 04	Nov 04	Mar 05	Oct 05	Apr 06	Nov 06	Mar 04	Nov 04	Mar 05	Oct 05	Apr 06	Nov 06	Mar 05	Oct 05	Apr 06	Nov 06	Apr 06	Nov 06	
<b>Commercial Varieties—Available for Farm Use</b>																						
Aries	diploid per. ryegrass	Ampac Seed Company																x	x	x	x	
Barderby	KY bluegrass	Barenbrug USA	x	x	x	x	x	x	x													
Barfleo	timothy	Barenbrug USA								*	x	*	x	x	x							
Benchmark	orchardgrass	FFR/Southern States	x	x	x	x	x	x	x													
Benchmark Plus	orchardgrass	FFR/Southern States	*	*	x	*	*	x	x											*	*	
Crown Royale Plus	orchardgrass	Grassland Oregon	*	*	x	*	*	x	x													
Derby	timothy	FFR/Southern States																		x	x	
Duo	festulolium	Ampac Seed Company	*	*	*	*	*	*	*	x										*	*	
Express	timothy	Seed Research of Oregon															x	x	x	x		
Ginger	KY bluegrass	Dye Seed Ranch, Inc; ProSeeds Marketing									x	x	x	*	*	x	x	x	*	*		
Grand Daddy	tetraploid per. ryegrass	Smith Seed Services															x	*	*	x		
Haymate	orchardgrass	FFR/Southern States	*	x	x	*	x	x	x	*	*	*	*	*	*	*	*	*	*	*	*	
Jesup Max Q	tall fescue	Pennington Seed	*	*	*	*	*	*	*											*	x	
Kenblue	KY bluegrass	Public	x	x	x	x	x	*	*													
Common	KY bluegrass	Public								*	x	*	*	*	*							
KY 31+	tall fescue	Public																		*	*	
Peak	smooth brome	Allied Seed, L.L.C.								*	x	x	x	x	x							
Persist	orchardgrass	Smith Seed Services																		x	x	
Potomac (cert.)	orchardgrass	Public	x	*	x	*	*	x	x													
Potomac (uncert.)	orchardgrass	Public	x	x	x	*	x	x	x													
Seine	tall fescue	Seed Research of Oregon															*	*	*	*		
Select	tall fescue	FFR/Southern States	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Spring Green	festulolium	Turf-Seed																		*	x	
Stockman	tall fescue	Seed Research of Oregon															*	*	*	*		
Summit	timothy	Allied Seed, L.L.C.																		x	x	
Talon	timothy	Seed Research of Oregon																		x	x	
Tekapo	orchardgrass	Ampac Seed Company	x	x	x	x	x	x	x											x	x	
<b>Experimental Varieties</b>																						
94-100	orchardgrass	Agri. Food of Canada															*	*	*	*		
HB 120	KY bluegrass	DLF-Jenks	x	x	x	x	x	x	x													
HB 121	KY bluegrass	DLF-Jenks	x	x	x	x	x	x	x													
KY 31-	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	x	*	*
KYDG 9303	orchardgrass	KY Agric. Exp. Station															*	*	*	*		
KYFA 0006	tall fescue	KY Agric. Exp. Station								*	*	*	*	*	*	*						
KYFA 9304	tall fescue	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
KYFA 9602	tall fescue	KY Agric. Exp. Station								*	*	*	*	*	*							
KYFA 9611	tall fescue	KY Agric. Exp. Station								*	*	*	*	*	*							
KYFA 9811	tall fescue	KY Agric. Exp. Station														*	*	*	*			
KYFA 9819	festulolium	KY Agric. Exp. Station								*	*	*	*	x	x							
KYFA 9821	tall fescue	KY Agric. Exp. Station																		*	*	
KYFA 9821/AR542	tall fescue	KY Agric. Exp. Station																		*	*	
KYFA 9821/AR584	tall fescue	KY Agric. Exp. Station																		*	*	
KYTF 2	tall fescue	KY Agric. Exp. Station								*	*	*	*	*	*							
KYPP 9901	KYbluegrass	KY Agric. Exp. Station	x	x	x	x	*	*	*							*	*	*	*			
OG0203G	orchardgrass	FFR/Southern States																		x	*	
OG0204G	orchardgrass	FFR/Southern States															*	*	*	*		
OG0205G	orchardgrass	FFR/Southern States															*	*	*	*		
SW ER3508FRI	perennial ryegrass	SW Seed Ltd																		*	*	
SW ER3575	perennial ryegrass	SW Seed Ltd																		*	*	
SW ER3579	perennial ryegrass	SW Seed Ltd																		*	*	
TM 9901	timothy	FFR/Southern States								*	x	*	x	x	x							
VB 5649	KY bluegrass	Barenbrug USA	x	x	x	x	x	x	x													

\* Not significantly different from the most persistent variety in the test. An open block indicates the variety was not in the test, while an "x" in the block indicates the variety was in the test but the stand survival was significantly less than the most persistent variety.

<sup>1</sup> Establishment year.

<sup>2</sup> Date of rating of percent stand.



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