

2007 Alfalfa Grazing Tolerance Report

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Introduction

Alfalfa (*Medicago sativa*) is the highest yielding, highest quality forage legume grown in Kentucky. It forms the basis of Kentucky's cash hay enterprise and is an important component in dairy, horse, beef, and sheep diets. Recent emphasis on its use as a grazing crop and the release of grazing tolerant varieties have raised the following question: Do varieties differ in tolerance to grazing? We have chosen to use the standard tolerance test recommended by the North American Alfalfa Improvement Conference. This test uses continuous heavy grazing to sort out differences in grazing tolerance in a relatively short period of time.

This report summarizes current research on the grazing tolerance of alfalfa varieties when subjected to continuous heavy grazing pressure during the grazing season. Table 5 shows a summary of all alfalfa varieties tested in Kentucky during the last 13 years. Go to the UK Forage Extension Web site at <www.uky.edu/Ag/Forage> to obtain electronic versions of all forage variety testing reports from Kentucky, from surrounding states and a large number of other forage publications.

Description of the Tests

Alfalfa variety tests for grazing tolerance were established in Lexington in the fall of 2004, 2005 and 2006. The soils at this location are well-drained silt loams and are well suited to alfalfa. Plots were 5 by 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. All seed lots were treated with metalaxyl fungicide and inoculated if not supplied with these treatments. Plots were grazed continuously beginning the first spring after seeding. Grazing pressure was maintained to keep plant height to less than 3 inches. In general, plots were grazed from April until mid-September. Supplemental hay was fed during periods of slowest growth. Visual ratings of percent stand were made in the fall several weeks after the cattle were removed to check stand survival after the grazing season. Ratings were made 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. Pests (weeds and insects) were controlled so they would not limit yield or persistence. Fertilizers (lime, P, K, and Boron) were applied as needed. In each trial, Alfagraze was the grazing-tolerant check variety, and either Apollo or 5432 was the grazing-intolerant check variety.

Results and Discussion

Weather data for Lexington for 2004, 2005, 2006 and 2007 are presented in Table 1.

Data on percent stand are presented in Tables 2, 3 and 4. Statistical analyses were performed on all alfalfa yield data (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.

Apollo and 5432 have been used widely in trials as the grazing-intolerant varieties. Therefore, the response of these varieties provides a useful measure of the severity of the grazing pressure applied to the plots. In general, types developed for tolerance to grazing tolerated heavy grazing pressure better than hay types. Table 5 summarizes information about distributors, fall dormancy ratings, disease resistance information, and persistence across years for all varieties included in these tests.

Table 6 is a summary of stand persistence data from 1994-2007 of commercial varieties that have been entered in the Kentucky trials. The data for each specific trial is listed as a percentage of the grazing tolerant variety Alfagraze. In other words, in each trial Alfagraze is 100%—varieties with percentages over 100 persisted better than Alfagraze and varieties with percentages less than 100 persisted less than Alfagraze. Direct, statistical comparisons of varieties cannot be made using the summary Table 6, but these comparisons do help to identify varieties for further consideration. Varieties that have performed better than average over many years and at several locations have 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 the information can be found in the yearly reports. See footnote in Table 6 to determine which yearly report to refer to.

Summary

Measurements taken after multiple years of grazing in these trials indicate that alfalfa varieties have been developed that exhibit improved tolerance to heavy continuous grazing pressure compared to standard hay-type varieties. The grazing management imposed in these trials included continuous stocking from the initiation of grazing in spring until mid-September, when grazing was terminated for the season to allow stands to acclimate to winter. Heavy grazing pressure was used purposely in these trials to better differentiate among varieties for relative grazing tolerance. Research has shown that abusive grazing tests are a good way to sort out differences in grazing tolerance between varieties in a relatively short period of time. Recommended rotational grazing management would improve alfalfa forage productivity and stand persistence.

The information in this report should be used in conjunction with other yield, pest resistance, and adaptation information in selecting the best alfalfa varieties for use in each individual situation.

Good management for maximum life when grazing alfalfa includes:

- Allowing grazing alfalfa to become completely established before grazing.
- Using rotational grazing where animals harvest available forage in seven days or less, followed by resting for 28 days before regazing.
- Adding any needed fertilizer and lime.
- Removing grazing livestock from alfalfa fields from mid-September until November 1 to replenish root reserves for winter survival.

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Table 1. Temperature and rainfall at Lexington, Kentucky in 2004, 2005, 2006, and 2007.

	2004				2005				2006				2007 ²			
	Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall		Temp.		Rainfall	
	°F	DEP ¹	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	30	-1	3.14	+0.28	37	+6	4.35	+1.49	42	+11	4.77	+1.91	37	+6	2.93	+0.07
FEB	36	+1	1.32	-1.89	39	+4	1.68	-1.53	36	+1	2.13	-1.08	27	-8	1.83	-1.38
MAR	47	+3	3.43	-0.97	41	-3	2.79	-1.61	44	0	3.05	-1.35	52	+8	1.97	-2.43
APR	55	0	3.06	-0.82	56	+1	3.30	-0.58	59	+4	3.52	-0.36	53	-2	3.87	-0.01
MAY	68	+4	9.79	+5.32	61	-3	1.78	-2.69	62	-2	2.99	-1.48	68	+4	1.45	-3.02
JUN	72	0	3.13	-0.53	75	+3	1.33	-2.33	70	-2	1.82	-1.84	74	+2	1.77	-1.89
JUL	73	-3	7.65	+2.65	77	+1	3.30	-1.70	76	0	5.13	+0.13	74	-2	6.90	+1.90
AUG	71	-4	2.91	-1.02	78	+3	3.34	-0.59	76	+1	3.23	-0.70	80	+5	2.56	-1.37
SEP	68	0	2.61	-0.59	72	+4	0.59	-2.21	64	-4	9.27	+6.07	72	+4	1.15	-2.05
OCT	58	+1	5.65	+3.08	58	+1	0.92	-1.65	54	-3	4.88	+2.31	63	+6	5.28	+2.71
NOV	49	+4	6.29	+2.90	47	+2	1.54	-1.85	47	+2	1.78	-1.61	46	+1	2.86	-0.53
DEC	36	0	3.20	-0.78	32	-4	2.19	-1.79	42	+6	2.45	-1.53				
Total			52.18	+7.63			27.51	-17.04			45.02	+0.47			32.57	-8.00

¹ DEP is departure from the long-term average.

² 2007 data is for 11 months through November.

Table 2. Seedling vigor and stand persistence of alfalfa varieties sown September 3, 2004 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Nov 8, 2004	Percent Stand					
		2005		2006		2007	
		Apr 8	Oct 31	Apr 6	Oct 23	Mar 30	Oct 25
Commercial Varieties-Availble for Farm Use							
Alfagraze	3.3	83	97	98	45	38	45*
5432	3.2	88	95	97	25	22	25
Experimental Varieties							
GA984	4.3	80	98	100	50	38	43*
GA1-01-1	3.5	76	95	95	47	33	40*
GA4-01-1	4.7	86	98	100	45	25	40*
GA3-01-1	4.2	83	97	98	42	25	23
Mean	3.9	83	97	98	42	30	36
CV,%	17.5	13	4	6	32	45	38
LSD,0.05	0.8	13	5	7	16	16	16

¹ Vigor score based on 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 3. Seedling vigor and stand persistence of alfalfa varieties sown September 8, 2005 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Nov 7, 2005	Percent stand			
		2006		2007	
		Apr 17	Oct 20	Mar 30	Oct 16
Commercial Varieties-Available for Farm Use					
Ameristand 407TQ	3.2	88	88	88	77*
Ameristand 403T	3.2	83	87	89	74*
Integrity	3.2	85	88	88	71*
Triple Trust 450	3.7	79	83	81	64*
Spredor 3	3.5	83	78	76	60
Alfagraze	2.3	78	68	68	59
Apollo	3.3	77	72	64	28
Mean	3.2	82	80	79	62
CV,%	33.6	11	11	13	18
LSD,0.05	1.3	10	11	12	13

¹ 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 4. Seedling vigor and stand persistence of alfalfa varieties sown September 8, 2006 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 25, 2006	Percent Stand		
		2006		2007
		Oct 25	Mar 30	Oct 15
Commercial Varieties-Available for Farm Use				
Ameristand403T	4.2	96	97	97*
Rugged	4.7	98	98	95*
Rebel	4.5	98	99	91*
Alfagraze	4.5	96	96	82
Apollo	4.5	97	96	27
Experimental Varieties				
TS4079	4.5	98	97	91*
Mean	4.5	97	97	80
CV,%	10.7	4	3	11
LSD,0.05	0.6	4	3	10

¹ 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 5. Characterization and summary of persistence of alfalfa varieties under heavy grazing pressure across years at Lexington.

Variety	Proprietor/KY Distributor	Variety Characteristics ¹						2004 ³						2005			2006		
		Disease Resistance ²						Apr	Oct	Apr	Oct	Mar	Oct	Apr	Oct	Mar	Oct	Mar	Oct
		FD ⁴	BW	FW	AN	PRR	APH	2005 ⁵	2006	2007	2006	2007	2007	2007	2007	2007	2007		
Commercial Varieties-Available for Farm Use																			
Alfagraze	America's Alfalfa	4	MR	R	MR	LR	-	*	*	*	*	*	*	*	x ⁶	x	x	*	x
Ameristand 403T	America's Alfalfa	4	HR	HR	HR	HR	R							*	*	*	*	*	*
Ameristand 407TQ	America's Alfalfa													*	*	*	*		
Apollo	ABI/America's Alfalfa	4	R	R	LR	R	-							x	x	x	x	*	x
Integrity	PGI Alfalfa, Inc.	4	HR	HR	HR	HR	HR							*	*	*	*	*	
5432	Pioneer	4	HR	HR	-	MR	-	*	*	*	x	*	x						
Rebel	Target Seed	4	HR	HR	HR	HR	HR											*	*
Rugged	Target Seed	3	HR	HR	HR	HR	HR											*	*
Spredor 3	Syngenta	1	HR	HR	R	MR	S							*	*	*	x		
Triple Trust 450	ABI/America's Alfalfa	5	HR	HR	HR	HR	HR							*	*	*	*		
Experimental Varieties																			
GA1-01-1	University of Georgia							*	*	*	*	*	*						
GA3-01-1	University of Georgia							*	*	*	*	*	x						
GA4-01-1	University of Georgia							*	*	*	*	*	*						
GA984	University of Georgia							*	*	*	*	*	*						
TS 4079	Target Seed																	*	*

¹ Variety Characteristics: FD=Fall Dormancy, BW=Bacterial Wilt, FW=Fusarium Wilt, AN=Anthracnose, PRR=Phytophthora Root Rot, APH=Aphanomyces Root Rot.

² Disease Resistance: S=Susceptible, LR=Low Resistance, MR=Medium Resistance, R=Resistance, HR=High Resistance.

³ Establishment year.

⁴ Fall Dormancy: 2=Vernal, 3=Ranger, 4=Saranac, 5=DuPuits.

⁵ Date of rating percent stand.

⁶ x in the block indicates the variety was in the test but the stand survival was significantly less than the most persistent variety.

An open block indicates the variety was not in the test.

* Not significantly different from the most persistent variety.

Table 6. Summary of Kentucky alfalfa grazing trials 1994-2007 (stand persistence shown as a percent of the grazing tolerant Alfagraze).

Variety	Proprietor	Variety Characteristics ¹						1994 ^{3,4} 3yr ⁶	1996 3yr	1997 4yr	1998 3yr	2000 2yr	2000 3yr	2001 3yr	2004 3yr	2005 2yr	Mean ⁵ (#trials)
		FD	Disease Resistance ²														
			Bw	Fw	An	PRR	APH										
ABT 205	W-L Research	2	HR	HR	HR	HR	R	94		84							89(2)
ABT 350	W-L Research	3	HR	HR	HR	HR	HR					46					-
ABT 405	W-L Research	4	HR	HR	HR	HR	R	71	129	69		46	100				83(5)
Alfagraze	Americas Alfalfa	2	MR	R	MR	R	-	100	100	100	100	100	100	100	100	100	100(9)
Amerigraze 401+Z	Americas Alfalfa	4	HR	HR	HR	HR	R		120	53	56	26	85	125			78(6)
Ameristand 403T	Americas Alfalfa	4	HR	HR	HR	HR	HR									125	-
Ameristand 407TQ	Americas Alfalfa															131	-
Apollo	Americas Alfalfa	4	R	R	R	R	-	48	75	33	47	17	31	25		47	40(8)
Arc (certified)	Public	4	LR	MR	HR	-	-		38								-
Baralfa 54	Barenbrug USA	-	R	HR	HR	HR	HR				78						-
Cut-n-Graze	Americas Alfalfa	3	HR	HR	HR	HR	R	68									-
FK 421	Donley Seed Co.	4	HR	H	H	H	H							100			-
Feast	Garst Seeds	3	HR	HR	HR	HR	R		146			87	92				108(3)
Fortress	Syngenta	3	R	R	R	HR	R	40	71								56(2)
Gold Plus	PGI Alfalfa	4	HR	HR	HR	HR	R				81						-
Grazeking	FFR/Southern States	5	MR	HR	HR	R	S		91	41				50			61(3)
Haygrazer	Great Plains Research	4	HR	HR	R	R	MR		75	39			38				51(3)
Integrity	PGI Alfalfa	4	HR	HR	HR	HR	HR									120	-
Legacy	Green Seed	4	R	R	R	R	R	32									-
Magnagraze	Dairyland Seed Co.	3	HR	HR	R	HR	-	56									-
Pasture Plus	MBS	3	HR	HR	R	HR	MR	60									-
Pioneer 98	Pioneer	3	HR	R	HR	R	-				56						-
ProGro	MBS Inc.	4	HR	HR	R	HR	MR				81						-
Quantum	ABI Alfalfa	2	HR	HR	HR	HR	R	71									-
Rushmore	Syngenta	4	HR	HR	HR	HR	HR	32									-
Saranac AR (cert.)	Public	4	MR	R	HR	LR	-		77					100			89(2)
Spredor 3	Syngenta	1	HR	HR	R	MR	S	71	123		75					102	93(4)
Stampede	Allied Seed	3	HR	R	R	HR	R		73								-
Triple Trust 450	ABI/America's Alfalfa	5	HR	HR	HR	HR	HR									108	-
Wintergreen	ABI Alfalfa	3	HR	HR	HR	HR	R	95		57	72						75(3)
WL 326GZ	W-L Research	4	HR	HR	HR	HR	HR		118		88						103(2)
115 Brand	Monsanto	3	HR	HR	R	HR	R					56	85				71(2)
5373	Pioneer	4	HR	HR	HRT	MR	LR	21									-
5432	Pioneer	4	HR	HR	-	MR	-								56		-

¹ Variety characteristics: FD=fall dormancy, Bw=bacterial wilt, Fw=fusarium wilt, An=anthracnose, PRR=phytophthora root rot, APH-aphanomyces root rot. Information provided by seed companies.

² Disease resistance: S=susceptible, LR=low resistance, MR=moderate resistance, R=resistance, HR=high resistance.

³ Year trial was established.

⁴ Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in stand persistence between varieties. To find actual persistence ratings, look in the yearly report for the final year of each specific test. For example, the Lexington trial planted in 1996 was grazed for 3 years so final persistence report would be "1999 Alfalfa Grazing Tolerance Report" archived in the KY Forage website at <www.uky.edu/Ag/Forage>.

⁵ Mean only presented when respective variety was included in two or more trials.

⁶ Number of years of data.



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