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2010 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 6 shows a summary of all alfalfa varieties tested in Kentucky during the last 15 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 and surrounding states and from 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 2006, 2008 and 2009. The soils at this location are well-drained silt loams and are well suited to alfalfa. Plots were 5 by 20 feet in a randomized complete block design, with each variety replicated six times. In each test, 20 lb/A of seed 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 2007, 2008, 2009 and 2010 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

Table 1. Temperature and rainfall at Lexington, Kentucky in 2007, 2008, 2009 and 2010.

	2007				2008				2009				2010[2]			
	Temperature		Rainfall		Temperature		Rainfall		Temperature		Rainfall		Temperature		Rainfall	
	°F	DEP[1]	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	37	+6	2.93	+0.07	32	+2	3.91	+1.05	28	-3	2.45	-0.41	29	-2	2.40	-0.46
FEB	27	-8	1.83	-1.38	36	+1	6.11	+2.90	38	+3	2.86	-0.35	29	-6	1.38	-1.83
MAR	52	+8	1.97	-2.43	44	+1	6.51	+1.91	48	+4	2.19	-2.21	47	+3	1.05	-3.35
APR	53	-2	3.87	-0.01	55	0	5.89	+2.01	55	0	4.48	+0.60	59	+4	2.74	-1.14
MAY	68	+4	1.45	-3.02	62	-2	4.33	+0.14	64	0	5.05	+0.58	67	+3	7.84	+3.37
JUN	74	+2	1.77	-1.89	74	+2	3.59	-0.07	74	+2	5.41	-1.75	76	+4	4.61	+0.95
JUL	74	-2	6.90	+1.90	76	0	3.41	-1.59	71	-5	5.89	+0.89	78	+2	5.49	+0.49
AUG	80	+5	2.56	-1.37	75	0	2.18	-1.75	73	-2	5.38	+1.45	78	+3	1.54	-2.39
SEP	72	+4	1.15	-2.05	72	+4	1.42	-1.78	68	0	5.37	+2.17	71	+3	1.14	-2.06
OCT	63	+6	5.28	+2.71	57	0	1.53	-1.04	54	-3	4.83	+2.26	59	+2	1.22	-1.35
NOV	46	+1	2.86	-0.53	43	-2	2.53	-0.86	49	+4	0.94	-2.45				
DEC	40	+4	5.29	+1.31	35	-1	6.03	+2.05	36	0	3.86	-0.12				
Total			37.86	-6.69			47.24	+2.69			48.71	+4.16			29.41	-7.77

[1] DEP is departure from the long-term average.
[2] 2010 data is for ten months through October.

Table 2. 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 Oct 25	2007 Mar 30	2007 Oct 15	2008 Apr 7	2008 Oct 17	2009 Apr 8	2009 Oct 9	2010 Mar 29	2010 Nov 22[2]
Commercial Varieties—Available for Farm Use										
Rugged	4.7	98	98	95	94	90	90	70	63	18*
Alfagraze	4.5	96	96	82	80	71	74	48	37	16*
Ameristand 403T	4.2	96	97	97	97	90	90	69	66	10
Rebel	4.5	98	99	91	89	81	75	38	27	7
Apollo	4.5	97	96	27	21	23	18	13	12	4
Experimental Varieties										
TS4079	4.5	98	97	91	84	82	77	50	38	8
Mean	4.5	96.8	96.9	80.4	77.4	72.6	70.6	47.9	40.1	10.5
CV,%	10.7	3.5	2.6	10.6	10.8	13.1	13.9	25.2	30.9	55.3
LSD,0.05	0.6	4.1	3.0	10.1	9.9	11.3	11.7	14.4	14.7	6.9

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Due to very dry weather there was not much regrowth after the cattle were removed, therefore these stand values may not be valid.
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

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 to 2009 of commercial varieties that have been entered in the Kentucky trials. The data for each specific trial are listed as a percentage of the grazing-tolerant variety Alfagraze. In other words, in each trial Alfagraze is 100 percent—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

Table 3. Seedling vigor and stand persistence of alfalfa varieties sown September 10, 2008 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 13, 2008	Percent Stand 2008 Oct 13	2009 Apr 8	2009 Oct 12	2010 Apr 6	2010 Nov 22[2]
Commercial Varieties—Available for Farm Use						
Alfagraze	4.2	100	100	93	84	19*
Ameristand 403T	4.0	100	100	95	92	18*
LegenDairy 5.0	4.7	100	100	93	89	13
Apollo	4.5	100	100	91	85	13
Spredor 4	4.5	100	100	93	88	13
Experimental Varieties						
GA-MPX	4.2	100	100	95	85	30*
Mean	4.3	100.0	100.0	93.4	87.2	17.6
CV,%	14.3	0.0	0.0	2.7	7.0	57.9
LSD,0.05	0.7	0.0	0.0	3.0	7.2	12.1

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Due to very dry weather there was not much regrowth after the cattle were removed; therefore, these stand values may not be valid.
* 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 3, 2009 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 12, 2009	Percent Stand 2009 Oct 12	2010 Apr 7	2010 Nov[2]
Commercial Varieties—Available for Farm Use				
Archer III	4.7	100	100*	
PGI 459	4.8	100	100*	
Ameristand 403TPlus	4.7	99	100*	
Apollo	4.2	100	99*	
Ameristand 407TQ	4.9	100	99*	
Alfagraze	3.9	96	97	
Experimental Varieties				
TS4010/A4535	4.8	100	99*	
Mean	4.6	99.2	98.2	
CV,%	8.0	2.2	1.8	
LSD,0.05	0.4	2.5	2.1	

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Due to very dry weather there was not enough growth after the cattle were removed to obtain a valid stand rating.
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

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 regrazing.
- 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 5. Characterization and summary of persistence of alfalfa varieties under heavy grazing pressure across years at Lexington, Kentucky.

Variety	Proprietor/KY Distributor	Variety Characteristics[1]						2006[3]																2009
			Disease Resistance[2]					Mar	Oct	Apr	Oct	Apr	Oct	Mar	Nov	Apr	Oct	Apr	Nov	Apr
		FD[4]	BW	FW	AN	PRR	APH	2007[5]		2008		2009		2010		2009		2010		2010
Commercial Varieties—Available for Farm Use																				
Alfagraze	America's Alfalfa	4	MR	R	MR	LR	-	*	x[6]	x	x	x	x	x	*	*	*	x	*	x
Ameristand 403T	America's Alfalfa	4	HR	HR	HR	HR	R	*	*	*	*	*	*	*	x	*	*	*	*	
Ameristand 403TPlus	America's Alfalfa	4	HR	HR	HR	HR	HR													*
Ameristand 407TQ	America's Alfalfa	4	HR	HR	HR	HR	HR													*
Apollo	ABI/America's Alfalfa	4	R	R	LR	R	-	*	x	x	x	x	x	x	x	*	x	*	x	*
Archer III	America's Alfalfa	5	Hr	HR	HR	HR	HR													*
Integrity	PGI Alfalfa, Inc.	4	HR	HR	HR	HR	HR													
LegenDairy 5.0	Croplan Genetics	3	HR	HR	HR	HR	HR									*	*	*	x	
PGI 459	Producer's Choice	4	HR	HR	HR	HR	HR													*
Rebel	Target Seed	4	HR	HR	HR	HR	HR	*	*	*	*	x	x	x	x					
Rugged	Target Seed	3	HR	HR	HR	HR	HR	*	*	*	*	*	*	*	*					
Spredor 4	Syngenta	2	HR	HR	HR	HR	R									*	*	*	x	
Experimental Varieties																				
GA-MPX	Univ. of Georgia															*	*	*	*	
TS 4010/A4535																				*
TS 4079	Target Seed							*	*	x	*	x	x	x	x					

[1] Variety Characteristics: FD=Fall Dormancy, BW=Bacterial Wilt, FW=Fusarium Wilt, AN=Anthracnose, PRR=Phytophera 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 GrazingTrials 1994-2010 (stand persistence shown as a percent of the grazing-tolerant Alfagraze).

		Variety Characteristics[1]						Lexington										
			Disease Resistance[2]					1994[3,4]	1996	1997	1998	2000	2000	2001	2004	2005	2006	Mean[5]
Variety	Proprietor	FD	Bw	Fw	An	PRR	APH	3yr[6]	3yr	4yr	3yr	2yr	3yr	3yr	4yr	4yr	3yr	(#trials)
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	100(10)
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									141	144	143(2)
Ameristand 407TQ	Americas Alfalfa	4	HR	HR	HR	HR	HR									136		–
Apollo	Americas Alfalfa	4	R	R	R	R	–	48	75	33	47	17	31	25		36	27	39(9)
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									172		–
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										–
Rebel	Target Seed	4	HR	HR	HR	HR	HR										79	–
Rugged	Target Seed	3	HR	HR	HR	HR	HR										146	–
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					68		96(4)
Stampede	Allied Seed	3	HR	R	R	HR	R		73									–
Triple Trust 450	ABI/America's Alfalfa	5	HR	HR	HR	HR	HR									145		–
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	–								51			–

[1] Variety characteristics: FD=fall dormancy, Bw=bacterial wilt, Fw=fusarium wilt, An=anthracnose, PRR=phytophthera 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 three years, so final persistence report would be "1999 Alfalfa Grazing Tolerance Report" archived in the KY Forage web site 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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