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2013 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 research on the grazing tolerance of alfalfa varieties when subjected to continuous heavy grazing pressure during the grazing season. Table 7 shows a summary of all alfalfa varieties tested in Kentucky during the last 15 years. The UK Forage Extension Web site, at www.uky.edu/Ag/Forage, contains electronic versions of all forage variety testing reports from Kentucky and surrounding states and from a large number of other forage publications.

Important Selection Considerations

Local Adaptation and Seasonal Yield. The variety should be adapted to Kentucky as indicated by good winter survival and good performance across years and locations in replicated yield and grazing trials, such as those presented in this publication. Choose high-yielding, persistent varieties and varieties that are productive during the desired season of use. Refer to the 2013 Alfalfa Report (or previous years if needed) for yield data on specific varieties of interest.

Seed Quality. Buy premium-quality seed that is high in germination, high in purity, and free from weed seed. Buy certified seed or proprietary seed of an improved variety. An improved variety is one that has performed well in independent trials. Other information on the label will include the test date (which must be within the previous nine months), the level of germination, and percentage of other crop and weed seed. Order seed well in advance of planting time to assure that it will be available when needed.

Description of the Tests

Alfalfa variety tests for grazing tolerance were established in Lexington in the fall of 2009, 2010, 2011 and 2012. The soils at this location are well-drained silt loams and are well-suited to alfalfa. Plots were 5 feet by 20 feet in a randomized complete block design, with each variety replicated six times. In each test, 20 pounds per acre 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.

Table 1. Temperature and rainfall at Lexington, Kentucky, in 2010, 2011, 2012, and 2013.

	2010				2011				2012				2013[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	29	-2	2.40	-0.46	29	-2	2.10	-0.76	38	+7	4.80	+1.94	38	+7	4.50	+1.64
FEB	29	-6	1.38	-1.83	39	+4	6.34	+3.13	40	+5	5.39	+2.18	36	+1	1.78	-1.43
MAR	47	+3	1.05	-3.35	47	+3	4.76	+0.36	56	+12	5.64	+1.24	39	-5	5.47	+1.07
APR	59	+4	2.74	-1.14	58	+3	12.36	+8.48	56	+1	3.26	-0.62	55	0	4.46	+0.58
MAY	67	+3	7.84	+3.37	64	0	6.72	+2.25	69	+5	4.02	-0.45	65	+1	5.23	+.076
JUN	76	+4	4.61	+0.95	74	+2	2.61	-1.05	73	+1	2.42	-1.24	72	0	7.32	+3.66
JUL	78	+2	5.49	+0.49	80	+4	6.29	1.29	81	+5	2.50	-2.50	72	-4	9.33	+4.33
AUG	78	+3	1.54	-2.39	75	0	2.89	-1.04	75	0	1.68	-2.25	72	-3	3.68	-0.25
SEP	71	+3	1.14	-2.06	66	-2	5.52	+2.32	67	-1	6.40	+3.20	67	-1	2.21	-0.99
OCT	59	+2	1.22	-1.35	55	-2	4.10	+1.53	55	-2	2.00	-0.57	55	-2	8.10	+5.53
NOV	47	+2	4.58	+1.19	50	+5	9.53	+6.14	43	-2	1.81	-0.65				
DEC	28	-8	2.15	-1.93	41	+5	5.58	+1.60	42	+6	9.57	+4.94				
Total			36.14	-8.41			68.80	+24.25			49.49	+4.94			52.08	+14.90

[1] DEP is departure from the long-term average.
[2] 2013 data is for the ten months through October

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 2010, 2011, 2012 and 2013 are presented in Table 1.

Data on percent stand are presented in tables 2, 3, 4, and 5. Statistical analyses were performed on all alfalfa yield data (including experimentals) to determine whether 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 whether 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 6 summarizes information about distributors, fall dormancy ratings, disease resistance information and persistence across years for all varieties included in these tests.

Table 7 is a summary of stand persistence data from 1994 to 2013 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 7, 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 stable performance, while others may have performed 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 7 to determine to which yearly report to refer.

Table 2. 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	2010		2011		2012		2013	
		Oct 12	Apr 7	Nov 22[2]	Apr 14	Nov 7	Mar 23	Oct 24	Mar 28	Oct 29
Commercial Varieties—Available for Farm Use										
Ameristand 403TPlus	4.7	99	100	–	49	23	32	31	22	8*
Alfagraze	3.9	96	97	–	53	24	23	23	16	6*
TS 4010/A4535	4.8	100	99	–	38	20	19	17	14	5
Ameristand 407TQ	4.9	100	99	–	32	18	10	10	9	3
Archer III	4.7	100	100	–	26	14	13	11	9	2
Apollo	4.2	100	99	–	35	17	14	13	11	1
PGI 459	4.8	100	100	–	26	12	8	7	7	1
Mean	4.6	99	99	–	37	18	17	16	13	4
CV,%	8.0	2	2	–	49	63	49	38	46	67
LSD,0.05	0.4	3	2	–	21	13	10	7	7	3

[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.

Table 3. Stand persistence of alfalfa varieties sown September 1, 2010, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Percent Stand						
	2010	2011		2012		2013	
	Oct 14	Mar 15	Nov 7	Mar 23	Oct 29	Mar 28	Oct 17
Commercial Varieties—Available for Farm Use							
TS 4010/A4535	100	100	43	46	44	36	28*
Ameristand 403T	100	99	45	40	35	31	21*
Alfagraze	99	99	44	31	28	26	15
TS 4007	99	98	39	29	23	20	13
PGI 424	97	96	37	34	28	23	11
Apollo	99	99	37	23	19	14	5
Mean	99	99	41	34	30	25	15
CV,%	1	2	26	32	39	44	65
LSD,0.05	1	2	13	13	14	13	12

*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 13, 2011, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 11, 2011	Percent Stand				
		2011	2012[2]		2013	
		Oct 11	Mar 23	Oct 10	Mar 21	Oct 15
Commercial Varieties—Available for Farm Use						
Alfagraze 300RR	4.0	100	97	99	99	73*
Alfagraze	3.8	100	99	100	100	71*
TS 4010/A4535	4.6	100	97	99	99	68*
Ameristand 403TPlus	3.8	100	100	100	100	66*
Archer III	4.8	100	98	99	99	65*
LegenDairy 5.0	4.6	100	96	99	99	63*
PGI 459	4.5	100	98	98	99	60
Apollo	4.0	100	96	85	99	56
Ameristand 407TQ	4.4	100	97	99	98	55
Experimental Varieties						
TS 4013	4.3	100	98	100	100	73*
Mean	4.3	100	97	98	99	65
CV,%	11.2	0	4	12	1	13
LSD,0.05	0.6	0	5	14	1	10

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth
[2] Due to sclerotinia outbreak after sowing this trial and new seedling growth in the spring of 2012, this trial was grazed rotationally during the summer of 2012 to allow establishment of the alfalfa.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 5. Seedling vigor and stand persistence of alfalfa varieties sown August 30, 2012, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor[1] Oct 8, 2012	Percent Stand 2012 Oct 8	2013 Mar 21	2013 Sep 19
Commercial Varieties—Available for Farm Use				
Alfalgraze	3.9	98	99	57*
Apollo	4.7	99	99	47*
Ameristand 403T	4.0	99	99	44*
GA-505	5.0	100	100	41*
Experimental Varieties				
GA-ALFG-1	4.7	100	100	44*
Mean	4.5	99	99	47
CV,%	13.7	1	1	36
LSD,0.05	0.7	2	1	20

[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.

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.

When grazing alfalfa, good management for maximum life 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 6. Characterization and summary of persistence of alfalfa varieties under heavy grazing pressure across years at Lexington, Kentucky.

Variety	Proprietor/KY Distributor	Variety Characteristics[1] FD[4]	Disease Resistance[2] BW	FW	AN	PRR	APH	2009[3] Apr 2010[5]	Apr	Nov	Mar	Oct	2010 Mar	Oct	Nov	Mar	Oct	2011 Mar	Oct	Mar	Oct	2012 Mar	Sep
								2011			2012			2013			2011			2012		2013	
Commercial Varieties—Available for Farm Use																							
Alfagraze	America's Alfalfa	4	MR	R	MR	LR	-	x[6]	*	*	*	x	*	*	x	x	x	*	x	*	*	*	*
Alfalfagraze 300 RR	America's Alfalfa	3	HR	HR	R	HR	HR													*	*	*	
Ameristand 403T	America's Alfalfa	4	HR	HR	HR	HR	R						*	*	*	*	*					*	*
Ameristand 403TPlus	America's Alfalfa	4	HR	HR	HR	HR	HR	*	*	*	*	*								*	*	*	
Ameristand 407TQ	America's Alfalfa	4	HR	HR	HR	HR	HR	*	*	*	x	x	x	x						*	*	x	x
Apollo	ABI/America's Alfalfa	4	R	R	LR	R	-	*	*	*	x	x	x	x	*	x	x	x	x	*	x	*	x
Archer III	America's Alfalfa	5	HR	HR	HR	HR	HR	*	x	*	x	x	x	x						*	*	*	*
GA-505	Univ. of GA	–	–	–	–	–	–															*	*
LegenDairy 5.0	Croplan Genetics	3	HR	HR	HR	HR	HR													*	*	*	
PGI 424	Producer's Choice	4	HR	HR	HR	HR	HR								x	*	*	x	x				
PGI 459	Producer's Choice	4	HR	HR	HR	HR	HR	*	x	*	x	x								*	*	*	x
TS 4007	Producer's Choice	4	HR	R	HR	HR	HR								x	*	x	x	x				
TS 4010/A4535	Producer's Choice	4	HR	R	HR	HR	HR	*	*	*	x	x	x	x	*	*	*	*	*	*	*	*	
Experimental Varieties																							
GA-ALFG-1	Univ. of GA	–	–	–	–	–	–															*	*
TS 4013	Producer's Choice	4	HR	HR	HR	HR	HR													*	*	*	

[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 7. Summary of Kentucky alfalfa grazing trials 1994-2013 (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	2008	2009	2010	Mean[5]
Variety	Proprietor	FD	Bw	Fw	An	PRR	APH	3yr[6]	3yr	4yr	3yr	2yr	3yr	3yr	4yr	4yr	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	100	100	100(13)
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	50		140	119(4)
Ameristand 403TPlus	Americas Alfalfa	4	HR	HR	HR	HR	HR												133		–
Ameristand 407TQ	Americas Alfalfa	4	HR	HR	HR	HR	HR									136			50		93(2)
Apollo	Americas Alfalfa	4	R	R	R	R	–	48	75	33	47	17	31	25		36	27	25	17	33	35(12)
Arc (certified)	Public	4	LR	MR	HR	–	–		38												–
Archer III	Americas Alfalfa	5	HR	HR	HR	HR	HR												33		–
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													–
LegenDairy5.0	Croplan Genetics	3	HR	HR	HR	HR	HR											0			–
Magnagraze	Dairyland Seed Co.	3	HR	HR	R	HR	–	56													–
Pasture Plus	MBS	3	HR	HR	R	HR	MR	60													–
PGI 424	Producers Choice	4	HR	HR	HR	HR	HR													73	–
PGI 459	Producers Choice	4	HR	HR	HR	HR	HR												17		–
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)
Spredor 4	Syngenta	2	HR	HR	HR	HR	R											25			–
Stampede	Allied Seed	3	HR	R	R	HR	R		73												–
TS 4007	Producers Choice	4	HR	R	HR	HR	HR													87	–
TS 4010/A4535	Producers Choice	4	HR	R	HR	HR	HR												83	186	135(2)
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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