

2005 Alfalfa Grazing Tolerance Report

G.L. Olson, S.R. Smith, G.D. Lacefield and E. Vanzant

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. Go to the UK Forage Extension Web site at www.uky.edu/AG/Forage to obtain electronic versions of all forage variety testing reports as well as other forage publications.

Description of the Tests

Alfalfa variety tests for grazing tolerance were established in Lexington in the fall of 2001 and 2004. A test was sown in the fall of 2003 but, due to high plant mortality during the winter of 2003/2004, the test was replanted in the fall of 2004. 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. To check stand survival after the grazing season, visual ratings of percent stand were made in the fall several weeks after the cattle were removed 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. 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 PIO5432 was the grazing-intolerant check variety.

Results and Discussion

Weather data for Lexington for 2002, 2003, 2004, and 2005 are presented in Table 1.

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

Table 1. Temperature and rainfall at Lexington, Kentucky in 2002, 2003, 2004 and 2005.

	2002				2003				2004				2005			
	Temperature		Rainfall		Temperature		Rainfall		Temperature		Rainfall		Temperature		Rainfall	
	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	38	+7	2.12	-0.74	26	-5	0.96	-1.90	30	-1	3.14	+0.28	37	+6	4.35	+1.49
FEB	38	+3	1.28	-1.93	32	-3	3.59	+0.38	36	+1	1.32	-1.89	39	+4	1.68	-1.53
MAR	45	+1	7.93	+3.53	47	+3	2.09	-2.31	47	+3	3.43	-0.97	41	-3	2.79	-1.61
APR	58	+3	4.19	0.31	57	+2	3.14	-0.74	55	0	3.06	-0.82	56	+1	3.30	-0.58
MAY	61	-3	4.36	-0.11	63	-1	6.68	+2.21	68	+4	9.79	+5.32	61	-3	1.78	-2.69
JUN	74	+2	2.45	-1.21	69	-3	4.85	+1.19	72	0	3.13	-0.53	75	+3	1.33	-2.33
JUL	78	+2	1.10	-3.90	74	-2	2.68	-2.32	73	-3	7.65	+2.65	77	+1	3.30	-1.70
AUG	77	+2	0.95	-2.98	75	0	5.26	+1.33	71	-4	2.91	-1.02	78	+3	3.34	-0.59
SEP	72	+4	4.90	1.70	65	-3	4.22	+1.02	68	0	2.61	-0.59	72	+4	0.59	-2.21
OCT	55	-2	5.61	3.04	56	-1	1.61	-0.96	58	+1	5.65	+3.08	58	+1	0.92	-1.65
NOV	43	-2	3.76	0.37	50	+5	4.63	+1.24	49	+4	6.29	+2.90	47	+2	1.54	-1.85
DEC	36	0	4.11	-1.13	36	0	3.26	-0.72	36	0	3.20	-0.78				
Total			42.73	-1.79			42.97	-1.58			52.18	+7.63			25.32	-15.25

DEP is departure from the long-term average.

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.

Significant varietal differences in grazing tolerance were observed in the 2001 seeding (Table 2). Apollo has been used widely in trials as the grazing-intolerant variety. Therefore, the response of this variety 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. Observations in October 2003 on the 2001 trial also showed lower stand ratings for Apollo and Saranac AR than for most other varieties (Table 2). Table 4 summarizes information about distributors, fall dormancy ratings, disease resistance information, and persistence across years for all varieties included in these tests.

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.

Authors

- G.L. Olson, Research Specialist, Forages, UK Department of Plant and Soil Sciences
- S.R. Smith, Extension Associate Professor, Forages, UK Department of Plant and Soil Sciences
- G.D. Lacefield, Extension Professor, Forages, UK Department of Plant and Soil Sciences
- E. Vanzant, Associate Professor, Beef Cattle Nutrition, UK Department of Animal and Food Sciences

Table 2. Percent stand of alfalfa varieties sown September 12, 2001 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Percent Stand					
	Apr 4, 2002	Oct 15, 2002	Mar 28, 2003	Oct 30, 2003	Apr 8, 2004 ¹	Nov 8, 2004
Commercial Varieties—Available for Farm Use						
Amerigraze 401+Z	90	60	84	21	3	5*
ABT 405	90	73	88	33	2	4*
Alfagraze	90	65	88	23	4	4*
Saranac AR	90	51	81	5	1	4*
FK 421	90	75	90	38	5	4*
Grazeking	90	57	81	12	3	2
Apollo	90	53	76	7	2	1
Experimental Varieties						
CW 83053	90	67	88	36	4	6*
PHI EXP1	90	72	88	18	4	3
Mean	90	64	85	21	3	4
CV,%	0	16	7	30	48	62
LSD, 0.05	0	12	7	7	2	3

*Not significantly different from the highest value in the column, based on the 0.05 LSD.
¹ High plant mortality over the winter of 2003/2004. Only a few plants remained in the test area in the spring of 2005.

Table 3. Percent stand and vigor rating 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	
		Apr 8, 2005	Oct 31, 2005
Commercial Varieties—Available for Farm Use			
Alfagraze	3.3	83	97*
PIO5432	3.2	88	95*
Experimental Varieties			
GA984	4.3	80	98*
GA4-01-1	4.7	86	98*
GA3-01-1	4.2	83	97*
GA1-01-1	3.5	76	95*
Mean	3.9	83	97
CV,%	17.5	13	4
LSD,0.05	0.8	13	5

*Not significantly different from the highest value in the column, based on the 0.05 LSD.
¹ Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.

Table 4. Characterization and summary of persistence of alfalfa varieties under heavy grazing pressure across years at Lexington.

Variety	Proprietor/KY Distributor	Variety Characteristics ¹						2001 ³					2004		
		FD ⁴	Disease Resistance ²					Apr 2002 ⁵	Oct 2002	Mar 2003	Oct 2003	Apr 2004	Nov 2004	Apr 2005	Oct 2005
			BW	FW	AN	PRR	APH								
Commercial Varieties—Available for Farm Use															
ABT 405	Kentucky America Seeds	4	HR	HR	HR	HR	R	*	*	*	*	X	*		
Alfagraze	America's Alfalfa	4	MR	R	MR	LR	-	*	*	*	*	*	*	*	*
Amerigraze 401+Z	ABI/America's Alfalfa	4	HR	HR	HR	HR	R	*	X	*	X	X	*		
Apollo	ABI/America's Alfalfa	4	R	R	LR	R	-	*	X	X	X	X	X		
FK 421	Donley Seed Co.	4	HR	HR	HR	HR	HR	*	*	*	*	*	*		
Grazeking	FFR/Southern States	5	MR	HR	HR	R	S	*	X	X	X	X	*		
PIO5432														*	*
Saranac AR	Public	4	MR	R	HR	LR	-	*	X	X	X	X	*		
Experimental Varieties															
CW 83053	Cal/West Seeds	-	-	-	-	-	-	*	*	*	*	*	*		
GA1-01-1	University of Georgia													*	*
GA3-01-1	University of Georgia													*	*
GA4-01-1	University of Georgia													*	*
GA984	University of Georgia													*	*
PHI exp 1	Pioneer Hi-Bred Int'l	-	-	-	HR	R	LR	*	*	*	X	*	X		
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. *Not significantly different from the most persistent variety. An 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.															



Mention or display of a trademark, proprietary product, or firm in text or figures does not constitute an endorsement and does not imply approval to the exclusion of other suitable products or firms.