

2004 Alfalfa Grazing Tolerance Report

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

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 varieties reported to be tolerant of heavy and even continuous grazing have raised the following question: Do varieties differ in tolerance to overgrazing?

This report summarizes current research on the grazing tolerance of alfalfa varieties when subjected to continuous, heavy grazing pressure during the grazing season.

Description of the Tests

Alfalfa variety tests for grazing tolerance were established in Lexington in the fall of 2000 and 2001. 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. 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 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 Apollo was the grazing-intolerant check variety.

Results and Discussion

Weather data for Lexington for 2001, 2002, 2003 and 2004 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 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 for both the 2000 and the 2001 seedings (Tables 2 and 3). 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.

Apollo stands seeded in the fall of 2000 were reduced to less than half that of varieties with the greatest stand densities by the end of the 2003 grazing season (Table 2). Ground cover declined dramatically during the 2003 grazing season for all varieties in the 2000 trial. Two experimental varieties had stands equal to those of the highest-rated commercial varieties in this trial.

Measurements in October 2003 on the 2001 trial also showed lower stand ratings for Apollo and Saranac AR than for most other varieties (Table 3). Stand percentages for hay-type varieties at the end of 2003 were numerically similar for the 2000 and 2001 seedings (Tables 2 and 3). Whereas several varieties from the 2001 trial had stand percentages above 30% at the end of 2003, stand percentages of all varieties in the 2000 trial had fallen to 17% or less by the end of 2003.

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 with 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 for winter. Heavy grazing pressure was purposely used in these trials to better differentiate among varieties for relative grazing tolerance. 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 regrowing.
- adding any needed fertilizer and lime.
- removing grazing livestock from alfalfa fields from mid-September to Nov. 1 to replenish root reserves for winter survival.

Authors

- G.L. Olson, Research Specialist, 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
- S.R. Smith, Extension Associate Professor, Forages, UK Department of Plant and Soil Sciences

Table 1. Temperature and rainfall at Lexington during the 2001, 2002, 2003 and 2004 growing seasons.

	2001				2002				2003				2004			
	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	31		0.92	-1.94	38	+7	2.12	-0.7	26	-5	0.96	-1.90	30	-1	3.14	+0.28
FEB	40	+5	3.20	-0.01	38	+3	1.28	-1.9	32	-3	3.59	+0.38	36	+1	1.32	-1.89
MAR	40	-4	2.73	-1.67	45	+1	7.93	+3.5	47	+3	2.09	-2.31	47	+3	3.43	-0.97
APR	59	+4	1.66	-2.22	58	+3	4.19	+0.3	57	+2	3.14	-0.74	55	0	3.06	-0.82
MAY	66	+2	4.85	+0.38	61	-3	4.36	-0.1	63	-1	6.68	+2.21	68	+4	9.79	+5.32
JUN	71	-1	2.04	-1.12	74	+2	2.45	-1.2	69	-3	4.85	+1.19	72	0	3.13	-0.53
JUL	75	-1	5.58	+0.58	78	+2	1.10	-3.9	74	-2	2.68	-2.32	73	-3	7.65	+2.65
AUG	76	+1	4.75	+0.82	77	+2	0.95	-3.0	75	0	5.26	+1.33	71	-4	2.91	-1.02
SEP	65	-3	2.99	-0.21	72	+4	4.90	+1.7	65	-3	4.22	+1.02	68	0	2.61	-0.59
OCT	56	-1	3.62	+1.05	55	-2	5.61	+3.0	56	-1	1.61	-0.96	58	+1	5.65	+3.08
NOV	51	+6	2.83	-0.56	43	-2	3.76	+0.4	50	+5	4.63	+1.24	49	+4	6.29	+2.90
Total			35.17	-5.40			38.65	-1.92			39.71	-0.86			48.98	+8.41

DEP is departure from the long-term average for that location.

Table 2. Percent stand of alfalfa varieties sown September 19, 2000 in a cattle grazing tolerance study at Lexington, Kentucky.						
Variety	Percent Stand					
	Apr 9, 01	Oct 17, 01	Apr 2, 02	Oct 14, 02	Mar 26, 03	Oct 31, 03 ¹
Commercial Varieties—Available for Farm Use						
Alfagraze	89	76	76	56	64	13*
Feast	89	62	63	53	59	12*
Amerigraze 401+Z	90	57	64	58	59	11
115brand	90	65	69	71	71	11
ABT 405	89	54	61	63	58	6
ABT 350	88	33	49	48	48	6
Haygrazer	88	32	55	41	44	5
Apollo	83	20	38	31	32	4
Experimental Varieties						
FOO 501	88	74	74	71	72	17*
ZG 9840	90	70	72	67	73	16*
CW 54056	88	51	58	53	53	10
5M85	90	13	35	18	23	3
Mean	88.6	51.1	59.6	52.4	54.7	9.4
CV, %	3.5	41.2	13.6	22.7	18.4	52.8
LSD, 0.05	3.6	24.4	9.4	13.8	11.6	5.8
* Not significantly different from the highest value in the column, based on the 0.05 LSD.						
¹ Experiment was terminated in the spring of 2004 due to high plant mortality across varieties during winter of 2003/2004.						

Table 3. Percent stand of alfalfa varieties sown September 12, 2001 in a cattle grazing tolerance study at Lexington, Kentucky.						
Variety	Percent Stand					
	Apr 4, 02	Oct 15, 02	Mar 28, 03	Oct 30, 03	Apr 8, 04 ¹	Nov 8, 04
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	63.5	84.8	21.3	3.0	3.6
CV,%	0	16.0	7.0	30.1	48.5	61.9
LSD, 0.05	0	11.8	6.9	7.5	1.7	2.6
* 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.						

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						2000 ³						2001					
		FD ⁴	Disease Resistance ²					Apr ⁵ 01	Oct 01	Apr 02	Oct 02	Mar 03	Oct 03	Apr 02	Oct 02	Mar 03	Oct 03	Apr 04	Nov 04
			BW	FW	AN	PRR	APH												
Commercial Varieties—Available for Farm Us																			
115 brand	Monsanto Global Seed	3	HR	HR	R	HR	R	*	*	*	*	*	*	x					
ABT 350		3	HR	HR	HR	HR	HR	*	x	x	x	x	x	x					
ABT 405	Kentucky America Seeds	4	HR	HR	HR	HR	R	*	x	x	x	x	x	*	*	*	*	x	*
Alfagraze	America's Alfalfa	4	MR	R	MR	LR	-	*	*	*	x	*	*	*	*	*	*	*	*
Amerigraze 401+Z	ABI/America's Alfalfa	4	HR	HR	HR	HR	R	*	x	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	x
Feast	ABI/AgriPro	3	HR	HR	HR	HR	R	*	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	*
Haygrazer	Great Plains	4	HR	HR	R	R	MR	*	x	x	x	x	x						
Saranac AR	Public	4	MR	R	HR	LR	-							*	x	x	x	x	*
Experimental Varieties																			
5M85	Forage Genetics Int'l	-	-	-	-	-	-	*	x	x	x	x	x						
CW 54056	Cal/West Seeds	-	-	-	-	-	-	*	x	x	x	x	x						
CW 83053	Cal/West Seeds	-	-	-	-	-	-							*	*	*	*	*	*
FOO-501	FFR/Southern States	-	-	-	-	-	-	*	*	*	*	*	*						
PHI exp 1	Pioneer Hi-Bred Int'l	-	-	-	HR	R	LR							*	*	*	x	*	x
ZG 9840	ABI Alfalfa	4	HR	HR	HR	HR	HR	*	*	*	*	*	*						

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.



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