



# 1999 Alfalfa Grazing Tolerance Variety Report

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## Introduction

Alfalfa (*Medicago sativa*) is historically 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 they are subjected to continuous, heavy grazing pressure during the grazing season. Although some yield data are presented, the focus is on plant stand survival.

## Description of the Tests

Alfalfa variety tests for grazing tolerance were established in Lexington in the fall of 1996, 1997, and 1998. The soils at this location are well-drained silt loams and are well suited to alfalfa. Plots were 5 x 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 and inoculated if not supplied with these treatments. Plots were harvested with a sickle-type mechanized harvester in the spring for yield. Fresh weights were measured in the field and converted to dry matter production using subsamples taken at harvest that were oven-dried. Plots were allowed to regrow to 6 to 8 inches and were then grazed down to below 4 inches quickly by cows and/or heifers and kept at that height or below for the remainder of the grazing season. Supplemental hay was fed during periods of slowest growth.

Animals were removed from alfalfa plots annually on September 15. Visual ratings of percent stand were made in the fall and spring after each grazing season. Pests (weeds and insects) were controlled so they would not limit yield or persistence. Fertilizer (lime, P, K, and Boron) were applied as needed.

Included in each trial were AlfaGraze as the grazing-tolerant check variety and Apollo as the grazing-susceptible check variety.

The varieties seeded in the 1996 trial for grazing tolerance were re-randomized and planted in a small plot yield trial operated under hay management for all cuttings. The initial seeding

was made on the same day as that of the grazing tolerance study. However, due to severe erosion, the original seeding was destroyed and replanted in the spring of 1997 (Table 3).

## Results and Discussion

Weather data for Lexington are presented in Table 1. The 1997 and 1998 growing seasons were wet during the first half but drier than normal during the last half. The year 1999 was a drought year with above-average temperatures, and forage growth was significantly reduced.

Data on percent stand and on dry matter yield are presented in Tables 2 through 5. Table 3 represents only dry matter yield data taken from the study planted with identical varieties as those in Table 2. The intent of this "parallel" structure was to determine both grazing tolerance and yield under the same environmental conditions. Due to problems with the establishment of the 1996 hay management trial (erosion), this trial was reseeded in the spring of 1997. Therefore the data from Table 3 are from a slightly different period of time than that of Table 2.

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.

In general, the level of grazing pressure applied was sufficient to severely deplete the stands of Apollo in each trial after two years of grazing. Stands of other varieties that are good when managed for hay (such as Stampede and Fortress) were also depleted by this abusive grazing management. Varieties which had been developed using grazing during the breeding process (such as AlfaGraze) tended to be tolerant of the abusive grazing employed in these studies. Some varieties (such as Amerigraze 401 Z, ABT 405, and WL326GZ) exhibit both high yields and grazing tolerance (Tables 2-3).

Table 6 summarizes information about proprietors, distributors, disease resistance, and persistence across years and locations for all the varieties currently included in these tests.

## Summary

These studies indicate alfalfa varieties have been developed which express tolerance to overgrazing without going out of stand, compared to standard hay-type alfalfas. In addition, newer grazing-tolerant varieties have significantly improved yields over AlfaGraze. It should be noted, however, that though these varieties were abused during the growing season, they were allowed to regrow and be cut for hay each spring and were rested after September 15 to prepare for winter.

This information should be used along with yield and pest resistance information in selecting the best alfalfa variety for each individual use. It is *not* recommended that alfalfa be continuously grazed as was done in this trial. While several varieties expressed tolerance to the level of grazing pressure used in these trials, overgrazing greatly reduces yield and therefore profitability of these alfalfas.

Good management for maximum life from grazing alfalfa would be to:

- allow it to become completely established before grazing.
- use rotational grazing where animals harvest available forage in seven days or less followed by resting for 28 days before re-grazing.
- add any needed fertilizer and lime.
- remove grazing livestock from alfalfa fields from mid-September to November 1 to replenish root reserves.

**Table 1. Temperature and rainfall at Lexington during the 1997, 1998, and 1999 growing seasons.**

MON	1997				1998				1999			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	31	+0	3.70	+0.84	41	+10	3.96	+1.10	36	+5	5.64	+2.78
FEB	41	+6	3.96	+0.75	41	+6	2.54	-0.67	40	+5	2.32	-0.89
MAR	46	+2	13.82	+9.42	46	+2	3.40	-1.00	40	-4	3.27	-1.13
APR	50	-5	1.89	-1.99	54	-1	6.20	+2.32	56	+1	1.87	-2.01
MAY	58	-6	8.84	+4.37	67	+3	6.14	+1.67	65	+1	1.35	-3.12
JUN	70	-2	9.54	+5.88	73	+1	10.81	+7.15	74	+2	3.89	+0.23
JUL	76	+0	3.32	-1.68	75	-1	7.98	+2.98	80	+4	1.00	-4.00
AUG	73	-2	2.58	-1.35	76	+1	0.29	-3.64	75	0	1.31	-2.62
SEP	67	-1	2.37	-0.83	74	+6	0.61	-2.59	69	+1	1.03	-2.17
OCT	56	-1	1.92	-0.65	58	+1	2.41	-0.16	57	0	1.91	-0.66

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

**Table 2. Dry matter yields (tons/acre) and percent stand of alfalfa varieties sown 23 August 1996 at Lexington, Kentucky, for grazing tolerance.**

Variety	Harvest May 19, 1997	Harvest May 21, 1998	2-yr Total	% Stand Jun 8, 1998	% Stand Sep 9, 1998	% Stand July 6, 1999
<b>Commercial Varieties—Available for Farm Use</b>						
Feast	1.78 *	1.86	3.64 *	96.67 *	82.40 *	72.50 *
Amerigraze 401+Z	2.01 *	1.95 *	3.96 *	92.67*	66.66*	65.83 *
WL326GZ	1.65	1.98 *	3.63 *	91.67*	65.73*	63.33 *
ABT405	1.70	1.90	3.60 *	91.33*	72.21*	59.17 *
Spredor 3	1.79 *	1.91	3.70 *	85.00*	68.51*	52.50
Grazeking	1.82 *	1.77	3.59 *	87.00*	50.92	45.83
Alfagraze	1.69	1.86	3.55 *	86.67*	55.55	45.00
Stampede	1.67	2.22 *	3.89 *	87.67*	40.74	35.00
Saranac-AR	1.80 *	1.98 *	3.78 *	82.67	42.59	34.17
Haygrazer	1.79 *	1.87	3.66 *	91.67*	41.66	33.33
Fortress	1.81 *	1.91	3.72 *	80.00	39.81	27.50
Apollo	1.66	1.83	3.50	75.00	41.66	23.33
Arc	1.64	1.79	3.43	58.33	21.29	9.17
<b>Experimental Varieties—Not Available for Farm Use</b>						
CAR9426	1.82 *	2.00 *	3.82 *	95.17*	71.29 *	65.00 *
GA-APGC	1.83 *	1.88	3.71 *	91.67*	70.36 *	62.50 *
W116	1.72	1.99 *	3.71 *	93.33*	60.18	58.33 *
A9508	1.72	1.98 *	3.70 *	82.67	54.62	36.67
94IO5PL1	1.72	1.93	3.65 *	81.67	31.48	20.00
Mean	1.76	1.92	3.68	86.16	54.32	44.95
CV, %	12.90	12.69	9.55	13.95	26.86	28.55
LSD, 0.05	0.26	0.28	0.40	13.80	16.74	14.74

\* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 3. Dry matter yields (tons/acre) of alfalfa varieties sown 15 April 1997 at Lexington, Kentucky, for hay management purposes.							
Variety	1997 Total	1998 Total	1999 Harvests			1999 Total	3-yr Total
			May 13	Jun 15	Jul 19		
<b>Commercial Varieties—Available for Farm Use</b>							
Apollo	2.45 *	5.77 *	3.77 *	0.99 *	0.84 *	5.61 *	13.83 *
Amerigraze 401+Z	2.17 *	5.75 *	3.85 *	0.94 *	0.63 *	5.41 *	13.34 *
Arc	2.13 *	5.69 *	3.77 *	0.88 *	0.78 *	5.43 *	13.25 *
Haygrazer	2.19 *	5.79 *	3.68 *	0.83 *	0.72 *	5.23 *	13.21 *
ABT405	2.24 *	5.61 *	3.66 *	0.87 *	0.74 *	5.27 *	13.12 *
WL326GZ	2.12 *	5.72 *	3.68 *	0.82 *	0.57 *	5.07 *	12.92 *
Fortress	2.25 *	5.62 *	3.49 *	0.97 *	0.59 *	5.04 *	12.91 *
Alfagraze	2.14 *	5.46 *	3.63 *	0.79 *	0.87 *	5.29 *	12.89 *
Feast	2.09 *	5.47 *	3.52 *	0.91 *	0.86 *	5.29 *	12.85 *
Saranac-AR	1.97	5.73 *	3.54 *	0.86 *	0.68 *	5.08 *	12.79 *
Grazeking	2.02	5.57 *	3.57 *	0.83 *	0.78 *	5.19 *	12.78 *
Stampede	1.90	5.56 *	3.73 *	0.80 *	0.66 *	5.19 *	12.65 *
Spredor 3	2.02	5.60 *	3.34 *	0.76	0.72 *	4.82 *	12.44
<b>Experimental Varieties—Not Available for Farm Use</b>							
94IO5PL1	2.34 *	5.84 *	3.81 *	0.86 *	0.71 *	5.38 *	13.56 *
W116	2.13 *	5.89 *	3.83 *	0.93 *	0.62 *	5.37 *	13.40 *
GA-APGC	2.31 *	5.62 *	3.63 *	0.87 *	0.72 *	5.22 *	13.15 *
A9508	2.05	5.71 *	3.73 *	0.85 *	0.68 *	5.26 *	13.02 *
CAR9426	2.26 *	5.67 *	3.28 *	0.82 *	0.80 *	4.89 *	12.82 *
Mean	2.16	5.67	3.47	0.87	0.74	5.22	13.05
CV,%	11.79	6.26	11.73	17.51	33.13	10.77	7.04
LSD, 0.05	0.38	0.50	0.58	0.22	0.35	0.81	1.32

\* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 4. Dry matter yields (tons/acre) and percent stand of alfalfa varieties sown 2 September 1997 at Lexington, Kentucky, in a grazing tolerance study.**

Variety	Harvest May 18, 1998	Harvest May 12, 1999	2-yr Total	% Stand		
				Jun 8, 1998	Sep 29, 1998	Nov 11, 1999
<b>Commercial Varieties—Available for Farm Use</b>						
ABT405	1.51 *	1.36	2.87 *	98.0 *	96.3 *	70.0 *
Alfagraze	1.36	1.44 *	2.81	98.7 *	94.5 *	70.0 *
ABT205	1.56 *	1.55 *	3.11 *	98.7 *	90.8	70.0 *
Amerigraze 401+Z	1.54 *	1.61	3.15 *	98.7 *	89.0	66.7
Wintergreen	1.51 *	1.32	2.84	99.7 *	87.2	58.3
Grazeking	1.46 *	1.15	2.61	99.3 *	78.0	58.3
Apollo	1.34	1.20	2.54	99.3 *	85.3	51.7
Haygrazer	1.60 *	1.40	3.00	99.3 *	81.7	51.7
<b>Experimental Varieties—Not Available for Farm Use</b>						
ZG9632	1.63 *	1.55 *	3.18 *	99.3 *	98.2 *	80.0 *
ZG9641	1.57 *	1.57 *	3.14 *	98.3 *	98.2 *	76.7 *
ZG9631A	1.36	1.50 *	2.86	100.0 *	98.2 *	75.0 *
ZG9633	1.41 *	1.53 *	2.95 *	98.7 *	96.3 *	73.3 *
ZG9640	1.54 *	1.48 *	3.02 *	99.3 *	94.5 *	70.0 *
A9201	1.44 *	1.41	2.85	97.3	90.8	60.0
BARUSA96-54	1.59 *	1.31	2.89 *	97.0	90.8	56.7
A9303	1.36	1.29	2.65	99.3 *	79.8	48.3
Mean	1.49	1.42	2.90	98.8	90.6	64.8
CV, %	13.14	11.15	9.19	2.1	6.6	14.3
LSD, 0.05	0.22	0.18	0.31	2.4	6.8	10.7
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.						

**Table 5. Dry matter yields (tons/acre) of alfalfa varieties sown 15 September 1998 in a grazing tolerance trial.**

Variety	Harvest May 18, 1999	% Stand Nov 9, 1999
<b>Commercial Varieties— Available for Farm Use</b>		
Apollo	1.09	90.0 *
Baralfa54	1.12	88.3 *
Alfagraze	1.17 *	88.3 *
Wintergreen	1.18 *	86.7 *
ProGro	1.20 *	86.7 *
Amerigraze 401+Z	1.24 *	86.7 *
Goldplus	1.22 *	85.0 *
WL326GZ	1.33 *	85.0 *
Spreador 3	1.36 *	83.3
<b>Experimental Varieties— Not Available for Farm Use</b>		
ZG9741	1.33 *	90.0 *
I97PE98	1.13	88.3 *
ZG9740	1.12	88.3 *
Mean	1.21	87.2
CV, %	14.11	5.06
LSD, 0.05	0.20	0.51
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.		

Table 6. Characterization and persistence of alfalfa varieties under heavy grazing pressure across years and locations.		Variety Characteristics <sup>1</sup>							Lexington						
		Disease Resistance <sup>2</sup>							1996 <sup>3</sup>			1997			1998
		FD <sup>4</sup>	BW	FW	AN	PRR	APH	Jun <sup>5</sup> 1998	Sep 1998	Jul 1999	Jun 1998	Sep 1998	Nov 1999	Nov 1999	
Variety	Proprietor/KY Distributor														
<b>Commercial Varieties—Available for Farm Use</b>															
ABT205	ABT/Scott Seed/Sphar Seed	2	HR	HR	HR	HR	R				*		*		
ABT405	ABT/Scott Seed/Sphar Seed	4	HR	HR	HR	HR	R	*	*	*	*	*	*		
Alfagraze	America's Alfalfa/Scott Seed/SS	2	MR	R	MR	LR	-	*			*	*	*	*	
Amerigraze 401+Z	ABI/America's Alfalfa	4	HR	HR	HR	HR	R	*	*	*	*			*	
Apollo	ABI/America's Alfalfa/Scott Seed	4	R	R	LR	R	-				*			*	
Arc	Public	4	LR	MR	HR	-	-								
Baralfa54	Barenbrug	5	R	HR	HR	HR	-							*	
Feast	ABI/AgriPro	3	HR	HR	MR	HR	R	*	*	*					
Fortress	Northrup King	3	R	R	R	HR	-								
Gold Plus	MBS Inc.	4	HR	HR	HR	HR	R							*	
Grazeking	FFR/Southern States	5	MR	HR	HR	R	S	*			*				
Haygrazer	Great Plains Research	4	HR	HR	R	R	MR	*			*				
ProGro	MBS Inc.	4	HR	HR	R	HR	MR							*	
Saranac-AR	Public	4	MR	R	HR	LR	-								
Spredor 3	Novartis	1	HR	HR	R	MR	S	*	*						
Stampede	Allied Seed	3	HR	R	R	HR	R	*							
Wintergreen	ABI Alfalfa/Reuk Seed (Wisconsin)	3	HR	HR	HR	HR	R				*			*	
WL326GZ	W-L Research Inc./Green Seed	4	HR	HR	HR	HR	HR	*	*	*				*	
<b>Experimental Varieties—Not Available for Farm Use</b>															
941O5PL1	Pioneer/Experimental	4	HR	-	HR	R	LR								
A9201	FFR Cooperative	4	HR	HR	HR	HR	R								
A9303	FFR Cooperative	4	R	HR	R	HR	R				*				
A9508	FFR/Experimental	-	-	-	-	-	-								
BARUSA96-54	Barenbrug	HR	R	HR	HR	HR	HR								
CAR9426	ABI Alfalfa/Experimental	-	-	-	-	-	-	*	*	*					
GA-APGC	GA Agric. Exp. Sta./Experimental	3	R	R	R	R	MR	*	*	*					
I97PE98	Pioneer/Experimental	2	-	-	HR	MR	MR							*	
W116	W-L Research/Experimental	3	HR	HR	R	HR	LR	*		*					
ZG9631A	ABI Alfalfa/Experimental	3	HR	HR	HR	HR	HR				*	*	*		
ZG9632	ABI Alfalfa/Experimental	3	HR	HR	HR	HR	HR				*	*	*		
ZG9633	ABI Alfalfa/Experimental	3	HR	HR	HR	HR	HR				*	*	*		
ZG9640	ABI Alfalfa/Experimental	4	HR	HR	HR	HR	HR				*	*	*		
ZG9641	ABI Alfalfa/Experimental	3	HR	HR	HR	HR	HR				*	*	*		
ZG9740	ABI Alfalfa/Experimental	4	HR	HR	HR	HR	HR							*	
ZG9741	ABI Alfalfa/Experimental	4	HR	HR	HR	HR	HR							*	

<sup>1</sup> Variety characteristics: FD = Fall Dormancy, BW = Bacterial Wilt, FW = Fusarium Wilt, AN = Anthracnose, PRR = Phytophthora Root Rot, APH = Aphanomyces Root Rot.

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

<sup>3</sup> Establishment year.

<sup>4</sup> Fall dormancy: 2 = Vernal, 3 = Ranger, 4 = Saranac, 5 = DuPuits.

<sup>5</sup> Date of measurement of percent stand.

Shaded boxes indicate that the variety was not in the test.

Open boxes indicate the variety was in the test but its persistence was significantly less than the top-ranked variety in the test.

\* Not significantly different from the top-ranked variety in the test.

