University of Kentucky
College of Agriculture, Food and Environment
Agricultural Experiment Station

2021 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? To answer this question, 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. A summary of all alfalfa varieties tested in Kentucky during the last 20 years and information about distributors, fall dormancy ratings, and disease resistance is included at the end of this report. The UK Forage Extension website (https://forages.ca.uky.edu) contains past versions of all forage variety testing reports from Kentucky and surrounding states and a large number of other forage publications.

Table 1. Temperature and rainfall at Lexington, Kentucky, in 2020 and 2021.

	2020				2021[2]			
	Temp		Rainfall		Temp		Rainfall	
	°F	DEP[1]	IN	DEP	°F	DEP	IN	DEP
JAN	40	+9	3.72	+0.86	34	+3	4.51	+1.65
FEB	38	+3	5.14	+1.93	31	-4	4.60	+1.39
MAR	51	+7	3.79	-0.61	50	+6	5.12	+0.72
APR	52	-3	4.92	+1.04	54	-1	2.72	-1.16
MAY	62	-2	5.69	+1.22	62	-2	4.34	-0.13
JUN	72	0	2.56	-1.10	73	+1	6.26	+2.60
JUL	79	+3	3.23	-1.77	75	-1	5.90	+0.90
AUG	75	0	3.41	-0.52	76	+1	6.16	+2.23
SEP	68	0	4.43	+0.83	69	+1	3.03	-0.17
OCT	57	0	4.98	+2.41	62	+5	3.68	+1.11
NOV	49	+4	2.18	-1.21				
DEC	36	0	2.27	-1.71				
Total			45.92	+1.37			46.32	+9.14

[1] DEP is departure from the long-term average.
[2] 2021 data is for ten months through October.

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 2021 Alfalfa Report (PR-799) (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.

Table 2. Stand persistence of alfalfa varieties sown April 3, 2020, in a cattle grazing tolerance study at Lexington, Kentucky.[1]

	Percent Stand			
	2020		2021	
Variety	Jun 5	Sep 30	Mar 29	Oct 7
Commercial Varieties-Available for Farm Use				
Ameristand 403TPlus	80	81	83	20*
Alfagraze	80	81	81	17*
Alfabar	83	80	81	10
Saranac AR (certified)	75	77	79	6
Mean	80	80	81	13
CV, %	18	18	12	37
LSD, 0.05	18	18	12	7

[1] This study was originally seeded September 5, 2019, but entire stand was killed by sclerotinia, therefore it was reseeded April 3, 2020.
*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 8, 2020, in a cattle grazing tolerance study at Lexington, Kentucky.

	Seedling Vigor[1]	Percent Stand		
		2020	2021	
Variety	Oct 2, 2020	Oct 2	Jul 2	Oct 7
Commercial Varieties-Available for Farm Use				
Ameristand 403TPlus	4.8	100	85	60*
Alfabar	4.3	100	87	53*
Alfagraze	4.2	100	73	52*
Saranac AR (certified)	4.8	100	76	48*
Experimental Varieties				
AFX164047	4.8	100	76	62*
Mean	4.6	100	79	55
CV, %	7.0	0	14	27
LSD, 0.05	0.4	0	13	18

[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.

Description of the Tests

Alfalfa variety tests for grazing tolerance were established in Lexington in the spring of 2020 (sclerotinia killed trial seeded in the fall of 2019) and in the fall of 2020. 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 pre-treated with these treatments. Plots were grazed continuously beginning the first spring after seeding. Grazing pressure was maintained to keep plant height to less than three inches. In general, plots were grazed from mid-May until mid-September. For the spring-seeded trial, grazing started in early July. 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 based on University of Kentucky soil test recommendations. In each trial, Alfagraze was the grazing-tolerant check variety.

Results and Discussion

Weather data for Lexington is 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 whether the apparent differences are due to variety or simply to chance. 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.

Table 4 summarizes information about distributors, fall dormancy ratings, and disease resistance information for all varieties included in current tests. You can find more detailed disease and insect resistance ratings at www.alfalfa.org/pdf/2019_Alfalfa_Variety_Leaflet.pdf.

How to Interpret the Summary Table

Table 5 is a summary of stand persistence data of commercial varieties that have been entered in the Kentucky trials from 2000 to 2021. The data for each trial are listed as a percentage of the grazing-tolerant variety Alfagraze. In other words, in each trial the rating for Alfagraze is set to 100—varieties with table values over 100 persisted better than Alfagraze, and varieties with values less than 100 persisted less than Alfagraze. Direct statistical comparisons of varieties cannot be made using the summary Table 5, 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 more information can be found in past yearly reports. See footnote in Table 5 to identify specific yearly reports, which contain more detailed persistence information.

Table 4. Characterization and proprietors of alfalfa varieties in current trials in Kentucky.

Variety	Proprietor/KY Distributor	Variety Characteristics[1]					
			Disease Resistance[2]				
		FD[3]	BW	FW	AN	PRR	APH
Commercial Varieties-Available for Farm Use							
Alfabar	Barenbrug USA	3	HR	HR	HR	HR	HR/R
Alfagraze	America's Alfalfa	2	MR	R	MR	LR	-
Ameristand 403T Plus	America's Alfalfa	4	HR	HR	HR	HR	HR
Saranac AR (certified)	Public	4	MR	R	HR	LR	–
Experimental Varieties[4]							
AFX164047	Alforex Seeds	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 (more detailed disease and insect resistance ratings at www.alfalfa.org/pdf/2021_Alfalfa_Variety_Leaflet.pdf).

[3] Fall Dormancy: 2 = Vernal, 3 = Ranger, 4 = Saranac, 5 = DuPuits.

[4] Experimental varieties are not available commercially but provide an indication of the progress being made by forage breeding companies.

Summary

Measurements taken after multiple years of grazing in these trials indicate that alfalfa varieties have been developed that exhibit improved tolerance to heavy 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 to select the best alfalfa varieties for each situation. Bloat prevention practices are recommended when grazing alfalfa, especially pure stands.

Stands of alfalfa persist better under grazing under the following conditions:

- 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 needed fertilizer and lime
- Removing grazing livestock from alfalfa fields from mid-September until November 1 to replenish root reserves for winter survival

Table 5. Summary of Kentucky alfalfa grazing trials, 2000-2021 (stand persistence shown as a percent of the grazing tolerant Alfagraze).

		Variety Characteristics[1]																						
			Disease Resistance[2]					2000[3,4]	2000	2001	2004	2005	2006	2008	2009	2010	2011	2012	2013	2014	2016	2017	2019	Mean[5]
Variety	Proprietor	FD	BW	FW	AN	PRR	APH	2yr[6]	3yr	3yr	4yr	4yr	3yr	4yr	4yr	4yr	4yr	4yr	4yr	3yr	4yr	2yr	2yr	(#trials)
ABT 350	W-L Research	3	HR	HR	HR	HR	HR		46															–
ABT 405	W-L Research	4	HR	HR	HR	HR	R		46	100														73(2)
Alfabar	Barenbrug USA	3	HR	HR	HR	HR	HR/R																59	–
Alfagraze	America's Alfalfa	3	MR	R	MR	R	–	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100(16)
Alfagraze 300 RR	America's Alfalfa	3	HR	R	HR	HR	HR										110							–
Alfagraze 600 RR	America's Alfalfa	6	–	R	HR	R	R													12				–
Amerigraze 401+Z	America's Alfalfa	4	HR	HR	HR	HR	R	26	85	125														79(3)
Ameristand 403T	America's Alfalfa	4	HR	HR	HR	HR	HR					141	144	50		91		144	118	65				108(7)
Ameristand 403TPlus	America's Alfalfa	4	HR	HR	HR	HR	HR								133		90				50	150	118	108(5)
Ameristand 407TQ	America's Alfalfa	4	HR	HR	HR	HR	HR					136			50		80							89(3)
Apollo	America's Alfalfa	4	R	R	R	R	–	17	31	25		36	27	25	17	27	70	55	86	24				37(12)
Archer III	America's Alfalfa	5	HR	HR	HR	HR	HR								33		83							58(2)
Bulldog-505	Univ. of GA	5	–	HR	–	R	–											144	100	57				100(3)
FK 421	Donley Seed Co.	4	HR	HR	HR	HR	HR			100														–
Feast	Garst Seeds	3	HR	HR	HR	HR	R	87	92															90(2)
Grazeking	Southern States	5	MR	HR	HR	R	S			50														–
Haygrazer	Great Plains Research	4	HR	HR	R	R	MR		38															–
Integrity	PGI Alfalfa	4	HR	HR	HR	HR	HR					172												–
LegenDairy5.0	Croplan Genetics	3	HR	HR	HR	HR	HR							0			87							44(2)
PGI 424	Producer's Choice	4	HR	HR	HR	HR	HR									45								–
PGI 459	Producer's Choice	4	HR	HR	HR	HR	HR								17		93							55(2)
Rebel	Target Seed	4	HR	HR	HR	HR	HR						79											–
Rugged	Target Seed	3	HR	HR	HR	HR	HR						146											–
Saranac AR (cert.)	Public	4	MR	R	HR	LR	–			100													35	68(2)
Spredor 3	Syngenta	1	HR	HR	R	MR	S					68												–
Spredor 4	Syngenta	2	HR	HR	HR	HR	R							25										–
TS 4007	Producer's Choice	4	HR	R	HR	HR	HR									82								–
TS 4010/A4535	Producer's Choice	4	HR	R	HR	HR	HR								83	145	120							116(3)
Triple Trust 450	ABI/America's Alfalfa	5	HR	HR	HR	HR	HR					145												–
115 Brand	Monsanto	3	HR	HR	R	HR	R	56	85															71(2)
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 (more detailed disease and insect resistance ratings at www.alfalfa.org/pdf/2019_Alfalfa_Variety_Leaflet.pdf)
[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 2011 was grazed for four years, so final persistence report would be "2015 Alfalfa Grazing Tolerance Report," archived in the UK Forage website (https://forages.ca.uky.edu).
[5] Mean only presented when respective variety was included in two or more trials.
[6] Number of years of data

For further information about grazing alfalfa management, refer to the following College of Agriculture publications, available at the local county Extension office or in the publications section of the UK Forage website (https://forages.ca.uky.edu).

- Grazing Alfalfa (https://www.alfalfa.org/pdf/GrazingAlfalfaFinal.pdf)
- Managing Legume-Induced Bloat in Cattle (ID-186)
- Extending Grazing and Reducing Stored Feed Needs (AGR-199)

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12-2021