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UNIVERSITY OF KENTUCKY College of Agriculture

# 2011 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 current research on the grazing tolerance of alfalfa varieties when subjected to continuous heavy grazing pressure during the grazing season. Table 6 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.

## Description of the Tests

Alfalfa variety tests for grazing tolerance were established in Lexington in the fall of 2008, 2009, and 2010. The soils at this location are well-drained silt loams and are well suited to alfalfa. Plots were 5 by 20 feet in a randomized complete block design, with each variety replicated six times. In each test, 20 lb/A 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. 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 2009, 2010, and 2011 are presented in Table 1.

Data on percent stand are presented in Tables 2, 3, and 4. 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.

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 5 summarizes information about distributors, fall dormancy ratings, disease resistance information and persistence

**Table 1. Temperature and rainfall at Lexington, Kentucky in 2009, 2010 and 2011.**

| | 2009 | | | | 2010 | | | | 2011[2] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temp. | | Rainfall | | Temp. | | Rainfall | | Temp. | | Rainfall | |
| | °F | DEP[1] | IN | DEP | °F | DEP | IN | DEP | °F | DEP | IN | DEP |
| JAN | 28 | -3 | 2.45 | -0.41 | 29 | -2 | 2.40 | -0.46 | 29 | -2 | 2.10 | -0.76 |
| FEB | 38 | +3 | 2.86 | -0.35 | 29 | -6 | 1.38 | -1.83 | 39 | +4 | 6.34 | +3.13 |
| MAR | 48 | +4 | 2.19 | -2.21 | 47 | +3 | 1.05 | -3.35 | 47 | +3 | 4.76 | +0.36 |
| APR | 55 | 0 | 4.48 | +0.60 | 59 | +4 | 2.74 | -1.14 | 58 | +3 | 12.36 | +8.48 |
| MAY | 64 | 0 | 5.05 | +0.58 | 67 | +3 | 7.84 | +3.37 | 64 | 0 | 6.72 | +2.25 |
| JUN | 74 | +2 | 5.41 | -1.75 | 76 | +4 | 4.61 | +0.95 | 74 | +2 | 2.61 | -1.05 |
| JUL | 71 | -5 | 5.89 | +0.89 | 78 | +2 | 5.49 | +0.49 | 80 | +4 | 6.29 | 1.29 |
| AUG | 73 | -2 | 5.38 | +1.45 | 78 | +3 | 1.54 | -2.39 | 75 | 0 | 2.89 | -1.04 |
| SEP | 68 | 0 | 5.37 | +2.17 | 71 | +3 | 1.14 | -2.06 | 66 | -2 | 5.52 | +2.32 |
| OCT | 54 | -3 | 4.83 | +2.26 | 59 | +2 | 1.22 | -1.35 | 55 | -2 | 4.10 | +1.53 |
| NOV | 49 | +4 | 0.94 | -2.45 | 47 | +2 | 4.58 | +1.19 | | | | |
| DEC | 36 | 0 | 3.86 | -0.12 | 28 | -8 | 2.15 | -1.93 | | | | |
| Total | | | 48.71 | +4.16 | | | 36.14 | -8.41 | | | 53.69 | +16.51 |

[1] DEP is departure from the long-term average.
[2] 2011 data is for the ten months through October

**Table 2. Seedling vigor and stand persistence of alfalfa varieties sown September 10, 2008 in a cattle grazing tolerance study at Lexington, Kentucky.**

| Variety | Seedling Vigor[1] Oct 13, 2008 | Percent Stand | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2008 | 2009 | | 2010 | | 2011 | |
| | | Oct 13 | Apr 8 | Oct 12 | Apr 6 | Nov 22 | Apr 14 | Nov 7 |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | |
| Alfagraze | 4.2 | 100 | 100 | 93 | 84 | 19 | 17 | 4 |
| Ameristand 403T | 4.0 | 100 | 100 | 95 | 92 | 18 | 15 | 3 |
| LegenDairy 5.0 | 4.7 | 100 | 100 | 93 | 89 | 13 | 10 | 3 |
| Apollo | 4.5 | 100 | 100 | 91 | 85 | 13 | 9 | 2 |
| Spredor 4 | 4.5 | 100 | 100 | 93 | 88 | 13 | 9 | 1 |
| **Experimental Varieties** | | | | | | | | |
| GA-MPX | 4.2 | 100 | 100 | 95 | 85 | 30 | 28 | 10* |
| | | | | | | | | |
| Mean | 4.3 | 100.0 | 100.0 | 93.4 | 87.2 | 17.6 | 14.5 | 3.9 |
| CV,% | 14.3 | 0.0 | 0.0 | 2.7 | 7.0 | 57.9 | 66.0 | 89.3 |
| LSD,0.05 | 0.7 | 0.0 | 0.0 | 3.0 | 7.2 | 12.1 | 11.4 | 4.1 |

[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.

**Table 3. 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 | |
| | | Oct 12 | Apr 7 | Nov[2] | Apr 14 | Nov 7 |
| **Commercial Varieties-Available for Farm Use** | | | | | | |
| Alfagraze | 3.9 | 96 | 97 | – | 53 | 24* |
| Ameristand 403TPlus | 4.7 | 99 | 100 | – | 49 | 23* |
| Ameristand 407TQ | 4.9 | 100 | 99 | – | 32 | 18* |
| Apollo | 4.2 | 100 | 99 | – | 35 | 17* |
| Archer III | 4.7 | 100 | 100 | – | 26 | 14* |
| PGI 459 | 4.8 | 100 | 100 | – | 26 | 12* |
| **Experimental Varieties** | | | | | | |
| TS4010/A4535 | 4.8 | 100 | 99 | – | 38 | 20* |
| | | | | | | |
| Mean | 4.6 | 99.2 | 99.2 | – | 36.9 | 18.2 |
| CV,% | 8.0 | 2.2 | 1.8 | – | 49.4 | 62.7 |
| LSD,0.05 | 0.4 | 2.5 | 2.1 | – | 21.5 | 13.5 |

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

| Variety | Percent Stand | | |
|---|---|---|---|
| | 2010 | 2011 | |
| | Oct 14 | Mar 15 | Nov 7 |
| **Commercial Varieties-Available for Farm Use** | | | |
| Ameristand 403T | 100 | 99 | 45* |
| Alfagraze | 99 | 99 | 44* |
| A4535 | 100 | 100 | 43* |
| TS4007 | 99 | 98 | 39* |
| Apollo | 99 | 99 | 37* |
| PGI424 | 97 | 96 | 37* |
| | | | |
| Mean | 99.1 | 98.5 | 40.7 |
| CV,% | 1.1 | 1.6 | 26.0 |
| LSD,0.05 | 1.3 | 1.8 | 12.6 |

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

across years for all varieties included in these tests.

Table 6 is a summary of stand persistence data from 1994 to 2011 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 6, 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 very stable performance, while others may have performed very 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 6 to determine which yearly report to refer to.

## 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 5. Characterization and summary of persistence of alfalfa varieties under heavy grazing pressure across years at Lexington.**

| Variety | Proprietor/KY Distributor | Variety Characteristics[1] | | | | | | 2008[3] | | | | | | 2009 | | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Disease Resistance[2] | | | | | Apr | Oct | Apr | Nov | Apr | Nov | Apr | Apr | Nov | Mar | Nov |
| | | FD[4] | BW | FW | AN | PRR | APH | 2009[5] | | 2010 | | 2011 | | 2010 | 2011 | | 2011 | |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | | | | | | | | |
| Alfagraze | America's Alfalfa | 4 | MR | R | MR | LR | - | * | * | x[6] | * | * | x | x | * | * | * | * |
| Ameristand 403T | America's Alfalfa | 4 | HR | HR | HR | HR | R | * | * | * | * | x | x | | | | * | * |
| Ameristand 403TPlus | America's Alfalfa | 4 | HR | HR | HR | HR | HR | | | | | | | * | * | * | | |
| Ameristand 407TQ | America's Alfalfa | 4 | HR | HR | HR | HR | HR | | | | | | | * | * | * | | |
| Apollo | ABI/America's Alfalfa | 4 | R | R | LR | R | - | * | x | * | x | x | x | * | * | * | * | * |
| Archer III | America's Alfalfa | 5 | Hr | HR | HR | HR | HR | | | | | | | * | x | * | | |
| LegenDairy 5.0 | Croplan Genetics | 3 | HR | HR | HR | HR | HR | * | * | * | x | x | x | | | | | |
| PGI 424 | Producer's Choice | 4 | HR | HR | HR | HR | HR | | | | | | | | | | x | * |
| PGI 459 | Producer's Choice | 4 | HR | HR | HR | HR | HR | | | | | | | * | x | * | | |
| Spredor 4 | Syngenta | 2 | HR | HR | HR | HR | R | * | * | * | x | x | x | | | | | |
| TS4007 | Producer's Choice | 4 | HR | R | HR | HR | HR | | | | | | | | | | x | * |
| TS 4010/A4535 | Producer's Choice | 4 | HR | R | HR | HR | HR | | | | | | | * | * | * | * | * |
| **Experimental Varieties** | | | | | | | | | | | | | | | | | | |
| GA-MPX | Univ. of Georgia | | | | | | | * | * | * | * | * | * | | | | | |

[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 6. Summary of Kentucky Alfalfa Grazing trials 1994-2011 (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 | Mean[5] |
| Variety | Proprietor | FD | Bw | Fw | An | PRR | APH | 3yr[6] | 3yr | 4yr | 3yr | 2yr | 3yr | 3yr | 4yr | 4yr | 3yr | 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(11) |
| 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 | 75 | 120(3) |
| Ameristand 407TQ | Americas Alfalfa | 4 | HR | HR | HR | HR | HR | | | | | | | | | 136 | | | – |
| Apollo | Americas Alfalfa | 4 | R | R | R | R | – | 48 | 75 | 33 | 47 | 17 | 31 | 25 | | 36 | 27 | 50 | 39(10) |
| Arc (certified) | Public | 4 | LR | MR | HR | – | – | | 38 | | | | | | | | | | – |
| 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 | | | | | | | | | | | 75 | – |
| Magnagraze | Dairyland Seed Co. | 3 | HR | HR | R | HR | – | 56 | | | | | | | | | | | – |
| Pasture Plus | MBS | 3 | HR | HR | R | HR | MR | 60 | | | | | | | | | | | – |
| 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 | | | | | | | | | | – |
| 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 3 years so final persistence report would be "1999 Alfalfa Grazing Tolerance Report" archived in the KY Forage website 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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