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# 2016 Cool-Season Grass Grazing Tolerance Report

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## Introduction

Cool-season grasses such as tall fescue, orchardgrass, and Kentucky bluegrass are the primary pasture grasses in Kentucky. Other species such as perennial ryegrass, festulolium, and the brome grasses can be used in pasture systems. Little is known about the effect of variety on the grazing tolerance of these cool-season grass species.

The purpose of this report is to summarize current research on the grazing tolerance of varieties of tall fescue, orchardgrass, perennial ryegrass, and other species when they are subjected to continual, heavy grazing pressure by cattle within the grazing season. This is not our recommendation on-farm, but indicates which varieties will survive a worst-case scenario, which often occurs over the life of a typical pasture. The main focus will be on plant stand survival. Tables 17, 18, and 19 show the summaries of all tall fescue, orchardgrass, and perennial ryegrass varieties tested in Kentucky during the past 15 years. The UK Forage Extension website, 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.

## 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 appropriate yield trial reports for yield data on specific varieties of interest.

**Seed quality.** Buy premium-quality seed that is high in germination and 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), 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.

## Description of the Tests

Grass variety tests for grazing tolerance were established in Lexington in the fall of 2012, 2013, 2014, and 2015. The soil at Lexington (Maury) is a well-drained silt loam and is well-suited to tall fescue, orchardgrass, and perennial ryegrass production. Plots were 5 feet by 15 feet in a randomized complete block design, with each variety replicated six times. Plots were seeded at the recommended seeding rate per acre and were sown into a prepared seedbed using a disk drill. Grazing began in April and was continuous until late September. Plots were grazed down to below 4 inches quickly by steers or heifers and kept at 2 to 4 inches for the remainder of the grazing season. The trials were rated for grazing preference 10 to 20 days after cattle were allowed to start grazing. (A rating of 1 indicates no forage removed and a rating of 9 indicates all forage was grazed.) Individual trials occasionally were clipped to remove seedheads or weed growth not controlled by herbicides. Supplemental hay or soybean hulls were fed during periods of slowest growth. Animals were removed from plots after all fall growth had been removed and when little regrowth was expected. 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. Grass plots were fertilized with 30 pounds of actual N per acre in March, 30 pounds of actual N in May and 40 pounds of

**Table 1. Temperature and rainfall at Lexington, Kentucky, in 2013, 2014, 2015, and 2016.**

| | 2013 | | | | 2014 | | | | 2015 | | | | 2016[2] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temp | | Rainfall | | Temp | | Rainfall | | Temp | | Rainfall | | Temp | | Rainfall | |
| | °F | DEP[1] | IN | DEP | °F | DEP | IN | DEP | °F | DEP | IN | DEP | °F | DEP | IN | DEP |
| JAN | 38 | +7 | 4.50 | +1.64 | 25 | -6 | 2.28 | -.58 | 32 | +1 | 2.17 | -0.69 | 32 | +1 | 0.80 | -2.06 |
| FEB | 36 | +1 | 1.78 | -1.43 | 30 | -5 | 5.47 | +2.26 | 26 | 14 | 3.08 | -0.13 | 38 | +3 | 6.09 | +2.88 |
| MAR | 39 | -5 | 5.47 | +1.07 | 39 | -5 | 3.08 | -1.32 | 45 | +1 | 7.34 | +2.94 | 52 | +8 | 4.07 | -0.33 |
| APR | 55 | 0 | 4.46 | +0.58 | 58 | +3 | 5.27 | -1.89 | 57 | +2 | 13.19 | +9.31 | 57 | +2 | 3.97 | +0.09 |
| MAY | 65 | +1 | 5.23 | +.076 | 66 | +2 | 5.72 | +1.25 | 69 | +5 | 3.02 | -1.45 | 64 | 0 | 9.17 | +4.70 |
| JUN | 72 | 0 | 7.32 | +3.66 | 75 | +3 | 2.93 | -0.73 | 75 | +3 | 8.20 | +4.54 | 76 | +4 | 5.09 | +1.43 |
| JUL | 72 | -4 | 9.33 | +4.33 | 74 | -2 | 3.18 | -1.82 | 77 | +1 | 10.22 | +5.22 | 79 | +3 | 7.43 | +2.43 |
| AUG | 72 | -3 | 3.68 | -0.25 | 76 | +1 | 6.53 | +2.60 | 74 | -1 | 3.49 | -0.44 | 79 | +4 | 4.37 | +0.44 |
| SEP | 67 | -1 | 2.21 | -0.99 | 69 | +1 | 3.63 | +.43 | 72 | +4 | 3.49 | +0.29 | 74 | +6 | 2.18 | -1.02 |
| OCT | 55 | -2 | 7.02 | +4.45 | 57 | 0 | 5.55 | +2.98 | 59 | +2 | 2.78 | +0.21 | 64 | +7 | 0.37 | -2.20 |
| NOV | 41 | -4 | 3.06 | -0.33 | 41 | -4 | 2.79 | -0.60 | 51 | +6 | 3.72 | +0.33 | | | | |
| DEC | 36 | 0 | 4.19 | +0.21 | 40 | +4 | 2.47 | -1.51 | 49 | +13 | 8.42 | +4.44 | | | | |
| Total | | | 58.25 | +13.70 | | | 49.4 | +4.85 | | | 69.12 | +24.57 | | | 43.54 | +6.36 |

[1] DEP is departure from the long-term average.
[2] 2016 data is for the ten months through October.

**Table 2. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown August 30, 2012, in a cattle grazing tolerance study at Lexington, Kentucky.**

| Variety | Seedling Vigor[1] | Grazing Preference[2] | | | | Percent Stand | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | | 2014 | | 2015 | | 2016 | |
| | Oct 8, 2012 | May 8 | May 15 | May 4 | May 3 | Oct 8 | Mar 21 | Oct 14 | Apr 3 | Nov 3 | Apr 6 | Oct 21 | Mar 24 | Oct 5 |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | | | | |
| KY31+[3] | 3.1 | 2.3 | 1.7 | 1.2 | 1.7 | 97 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 99* |
| Jesup EF | 2.7 | 1.0 | 1.0 | 1.0 | 1.0 | 98 | 100 | 100 | 99 | 99 | 99 | 99 | 99 | 99* |
| Jesup MaxQ[3] | 3.2 | 1.2 | 1.0 | 1.0 | 1.2 | 99 | 99 | 100 | 99 | 99 | 99 | 99 | 99 | 98* |
| Select | 3.3 | 1.2 | 1.2 | 1.0 | 1.3 | 98 | 99 | 99 | 99 | 100 | 99 | 99 | 99 | 98* |
| Cowgirl | 4.0 | 2.8 | 1.3 | 1.0 | 1.3 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 98* |
| Flourish | 3.6 | 4.5 | 1.2 | 1.8 | 2.2 | 98 | 98 | 99 | 99 | 99 | 99 | 98 | 97 | 97 |
| BarOptima PLUS E34[3] | 3.9 | 3.5 | 2.3 | 2.2 | 2.7 | 100 | 99 | 100 | 99 | 99 | 99 | 99 | 98 | 97 |
| **Experimental Varieties** | | | | | | | | | | | | | | |
| KYFA0906 | 3.0 | 2.5 | 1.3 | 1.5 | 2.2 | 98 | 99 | 99 | 99 | 100 | 100 | 100 | 99 | 99* |
| KYFA0901 | 3.3 | 2.8 | 1.2 | 1.0 | 1.0 | 98 | 99 | 100 | 100 | 100 | 99 | 99 | 99 | 99* |
| KYFA0905 | 3.3 | 3.3 | 1.5 | 1.7 | 2.0 | 99 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 99* |
| KY31-[3] | 3.7 | 2.0 | 1.2 | 1.2 | 1.3 | 100 | 100 | 100 | 100 | 100 | 99 | 99 | 99 | 99* |
| PPG-FTF104 | 2.9 | 2.3 | 1.7 | 1.8 | 1.7 | 98 | 99 | 99 | 99 | 99 | 99 | 98 | 98 | 97 |
| | | | | | | | | | | | | | | |
| Mean | 3.3 | 2.5 | 1.4 | 1.4 | 1.6 | 99 | 99 | 99 | 99 | 100 | 99 | 99 | 99 | 98 |
| CV,% | 33.8 | 42.5 | 37.2 | 38.7 | 32.9 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| LSD,0.05 | 1.3 | 1.2 | 0.6 | 0.6 | 0.6 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2013-16 days, 2014-23 days,2015-13 days, 2016-20 days.
[3] KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ contains a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. The other fescue varieties in this test do not contain an endophyte.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

actual N in November. Other fertilizers (lime, P, and K) were applied as needed according to the University of Kentucky soil test recommendations.

## Results and Discussion

Weather data for Lexington are presented in Table 1. Data on percent stand are presented in tables 2 through 13. Statistical analyses were performed on all entries (including experimentals) to determine if the apparent differences are truly due to variety. 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),

**Table 3. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown September 6, 2013, in a cattle grazing tolerance study at Lexington, Kentucky.**

| Variety | Seedling Vigor[1] Oct 14, 2013 | Grazing Preference[2] | | | Percent Stand | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2014 | 2015 | 2016 | 2013 | 2014 | | 2015 | | 2016 | |
| | | May 1 | May 1 | May 3 | Oct 14 | Apr 2 | Oct 6 | Apr 6 | Oct 21 | Mar 24 | Oct 5 |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | |
| KY31+[3] | 3.8 | 5.7 | 2.0 | 1.3 | 85 | 89 | 92 | 93 | 94 | 93 | 94* |
| BarOptima PLUS E34[3] | 3.3 | 5.3 | 2.5 | 3.2 | 78 | 81 | 89 | 90 | 94 | 93 | 93* |
| Select | 3.3 | 4.8 | 1.0 | 1.0 | 83 | 85 | 89 | 93 | 93 | 94 | 93* |
| Lacefield MaxQ II[3] | 3.9 | 4.7 | 1.8 | 1.7 | 89 | 89 | 92 | 93 | 92 | 92 | 93* |
| Jesup MaxQ[3] | 3.1 | 4.0 | 1.7 | 1.0 | 73 | 82 | 89 | 92 | 88 | 91 | 92* |
| Bull | 2.8 | 3.5 | 1.2 | 1.0 | 71 | 75 | 87 | 89 | 91 | 92 | 90* |
| Cajun II | 2.8 | 6.3 | 1.3 | 1.0 | 43 | 47 | 57 | 64 | 63 | 66 | 74 |
| **Experimental Varieties** | | | | | | | | | | | |
| KYFA0701 | 3.9 | 5.3 | 1.8 | 87.0 | 88 | 90 | 90 | 94 | 94 | 94 | 94* |
| GT213/AR584[3] | 4.3 | 5.0 | 2.3 | 2.3 | 90 | 88 | 89 | 91 | 91 | 92 | 93* |
| AGRFA-200/ AR584[3] | 4.3 | 5.5 | 4.8 | 5.7 | 92 | 91 | 93 | 94 | 89 | 93 | 93* |
| KYFA9821/AR584[3] | 3.1 | 5.7 | 1.3 | 1.0 | 54 | 74 | 86 | 91 | 91 | 92 | 93* |
| KY31-[3] | 2.7 | 5.8 | 1.7 | 1.0 | 72 | 73 | 86 | 89 | 90 | 90 | 93* |
| KYFA9732/AR584[3] | 3.9 | 6.0 | 3.3 | 2.5 | 89 | 87 | 92 | 92 | 92 | 91 | 92* |
| HTWC4 | 3.0 | 5.5 | 2.0 | 1.0 | 69 | 78 | 87 | 90 | 90 | 92 | 92* |
| AGRFA-201/ AR605[3] | 2.8 | 5.0 | 1.3 | 1.0 | 52 | 61 | 77 | 83 | 80 | 87 | 87 |
| AGRFA-179/ AR584[3] | 3.3 | 6.3 | 4.2 | 6.2 | 75 | 74 | 83 | 88 | 86 | 86 | 86 |
| BARFAF13131 | 2.0 | 6.3 | 2.2 | 1.0 | 23 | 35 | 42 | 47 | 53 | 64 | 74 |
| | | | | | | | | | | | |
| Mean | 3.4 | 5.3 | 2.1 | 1.9 | 72 | 76 | 83 | 86 | 86 | 88 | 90 |
| CV,% | 24.2 | 21.1 | 34.3 | 22.2 | 21 | 14 | 12 | 11 | 12 | 9 | 6 |
| LSD,0.05 | 1.0 | 1.3 | 0.8 | 0.5 | 18 | 12 | 11 | 11 | 12 | 9 | 7 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2014-23 days, 2015-9 days, 2016-20 days.
[3] KY 31- is the variety KY31 from which the toxic endophyte has been removed. Jesup MaxQ and Lacefield MaxQ II contain a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. AR584 and AR605 are non-toxic endophytes inserted into the experimental tall fescue varieties. KY31+ contains the toxic endophyte. The other fescue varieties in this test do not contain an endophyte.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

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.

Kentucky 31 tall fescue with the endophyte (KY31+) is considered to be the most grazing-tolerant variety and was the grazing-tolerant check entry in all tall fescue trials. The central questions in grazing tolerance among tall fescues are: Can endophyte-free varieties persist as well as KY31+? and Will the new novel, or "friendly," endophyte materials persist as well as other tolerant varieties? After three and four seasons, several fescue varieties were comparable to KY31+ in regard to grazing tolerance (tables 2 and 3).

Table 14 (fescue), Table 15 (orchardgrass), and Table 16 (perennial ryegrass and festulolium) summarize information about distributors and persistence across years for all varieties in these tests. Varieties are listed in alphabetical order, with experimental varieties listed at the bottom. An open block indicates that the variety was not in that particular test (labeled at the top of the column); an "x" in the block indicates that the variety was in the test but plant survival was significantly less than the most persistent variety. A single asterisk (*) means that the variety was not significantly different from the most persistent variety in that study based on the 0.05 LSD. It is best to choose a variety that has performed well over several years.

Tables 17, 18, and 19 are summaries of stand persistence data from 2000 to 2016 of commercial tall fescue, orchardgrass, and perennial ryegrass varieties that have been entered in the Kentucky trials. In Table 17 the data is listed as a percentage of KY31+. In other words, in the tall fescue trials KY31+ is 100 percent. Varieties with percentages over 100 persisted better than KY31+, and varieties with percentages less than 100 persisted less than KY31+. In tables 18 and 19 the data are listed as a percentage of the mean of the commercial varieties entered in each specific trial. In

**Table 4. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown September 9, 2014, in a cattle grazing tolerance study at Lexington, Kentucky.**

| | Seedling Vigor[1] | Grazing Preference[2] | | Percent Stand | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2014 | 2015 | | 2016 | |
| Variety | Oct 9, 2014 | May 1 | May 3 | Oct 9 | Apr 6 | Oct 21 | Mar 24 | Oct 5 |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | |
| BarOptima PLUS E34[3] | 4.1 | 3.0 | 3.3 | 98 | 98 | 100 | 100 | 100* |
| Cajun II | 4.8 | 1.5 | 1.0 | 100 | 100 | 100 | 100 | 100* |
| Jesup MaxQ[3] | 4.8 | 2.0 | 1.0 | 100 | 100 | 100 | 100 | 100* |
| KY31+[3] | 4.8 | 2.7 | 1.3 | 100 | 100 | 100 | 100 | 100* |
| Lacefield MaxQ II[3] | 4.8 | 2.3 | 1.0 | 100 | 100 | 100 | 100 | 100* |
| SS-0705TFSL | 4.8 | 2.3 | 1.0 | 100 | 100 | 100 | 100 | 100* |
| Select | 4.6 | 1.2 | 1.0 | 99 | 99 | 100 | 100 | 100* |
| **Experimental Varieties** | | | | | | | | |
| KY31-[3] | 4.8 | 2.3 | 1.0 | 100 | 100 | 100 | 100 | 100* |
| KYFA1113/AR584[3] | 4.7 | 2.2 | 1.3 | 99 | 100 | 100 | 100 | 100* |
| KYFA1114/AR584[3] | 4.8 | 2.8 | 1.2 | 99 | 100 | 100 | 100 | 100* |
| KYFA1115/AR584[3] | 4.4 | 3.0 | 2.3 | 99 | 99 | 100 | 100 | 100* |
| NFTF 1044 | 4.3 | 2.0 | 1.0 | 99 | 100 | 100 | 100 | 100* |
| NFTF 1051 | 4.6 | 1.5 | 1.0 | 100 | 100 | 100 | 100 | 100* |
| NFTF 1370 | 4.7 | 1.8 | 1.0 | 100 | 100 | 100 | 100 | 100* |
| | | | | | | | | |
| Mean | 4.6 | 2.2 | 1.3 | 99 | 100 | 100 | 100 | 100 |
| CV,% | 10.3 | 39.3 | 32.8 | 1 | 1 | 0 | 0 | 0 |
| LSD,0.05 | 0.6 | 1.0 | 0.5 | 1 | 1 | 0 | 0 | 0 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2015-9 days, 2016-20 days.
[3] KY 31- is the variety KY31 from which the toxic endophyte has been removed. Jesup MaxQ and Lacefield MaxQ II contain a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. AR584 is a non-toxic endophyte inserted into the experimental tall fescue varieties. KY31+ contains the toxic endophyte. The other fescue varieties in this test do not contain an endophyte.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 5. Seedling vigor, grazing preference, and stand persistence of tall fescue varieties sown September 3, 2015, in a cattle grazing tolerance study at Lexington, Kentucky.**

| | Seedling Vigor[1] | Grazing Preference[2] | Percent Stand | | |
|---|---|---|---|---|---|
| | | | 2015 | 2016 | |
| Variety | Oct 19, 2015 | April 26, 2016 | Oct 19 | Mar 24 | Oct 4 |
| **Commercial Varieties-Available for Farm Use** | | | | | |
| KY31+[3] | 4.8 | 2.3 | 99 | 100 | 100* |
| Lacefield MaxQ II[3] | 4.6 | 2.3 | 99 | 100 | 100* |
| SS-0705TFSL | 4.5 | 1.4 | 99 | 100 | 100* |
| Jesup MaxQ[3] | 4.7 | 1.5 | 99 | 100 | 100* |
| BarOptima PLUS E34[3] | 3.8 | 2.4 | 98 | 99 | 100* |
| Select | 4.1 | 2.0 | 99 | 99 | 100* |
| Drover | 4.4 | 1.0 | 98 | 99 | 99* |
| FSG 402TF | 4.3 | 1.8 | 98 | 99 | 99* |
| Cajun II | 4.1 | 1.3 | 96 | 100 | 99 |
| Baguala | 4.4 | 1.8 | 98 | 100 | 98 |
| Dominate | 4.4 | 2.0 | 98 | 100 | 97 |
| **Experimental Varieties** | | | | | |
| KYFA1113 | 4.8 | 2.2 | 100 | 100 | 100* |
| KYFA1311 | 4.6 | 2.5 | 100 | 100 | 100* |
| KYFA9821/AR584[3] | 4.8 | 1.8 | 99 | 100 | 100* |
| KYFA1114 | 4.6 | 2.2 | 98 | 100 | 100* |
| KY31-[3] | 4.8 | 2.3 | 99 | 100 | 100* |
| BAR FAF131 | 3.7 | 3.5 | 98 | 100 | 99* |
| Drover+E34[3] | 4.3 | 1.2 | 99 | 100 | 99* |
| | | | | | |
| Mean | 4.4 | 2.0 | 98 | 100 | 99 |
| CV,% | 8.8 | 31.7 | 2 | 1 | 1 |
| LSD,0.05 | 0.4 | 0.7 | 3 | 1 | 1 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 13 days.
[3] KY 31- is the variety KY31 from which the toxic endophyte has been removed. Jesup MaxQ and Lacefield MaxQ II contain a non-toxic endophyte. BarOptima PLUS E34 and Drover+E34 contain a beneficial endophyte. AR584 is a non-toxic endophyte inserted into the experimental tall fescue variety. KY31+ contains the toxic endophyte. The other fescue varieties in this test do not contain an endophyte.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 6. Seedling vigor, grazing preference, and stand persistence of orchardgrass varieties sown August 30, 2012, in a cattle grazing tolerance study at Lexington, Kentucky.**

| | Seedling | Grazing Preference[2] | | | | Percent Stand | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vigor[1] | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | | 2014 | | 2015 | | 2016 | |
| Variety | Oct 8, 2012 | May 8 | May 1 | May 1 | May 3 | Oct 8 | Mar 21 | Oct 14 | Apr 3 | Nov 3 | Apr 6 | Nov 10 | Mar 24 | Oct 17 |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | | | | |
| Benchmark Plus | 4.5 | 2.0 | 3.5 | 2.3 | 5.2 | 99 | 99 | 99 | 99 | 98 | 99 | 82 | 83 | 33* |
| Persist | 3.8 | 1.8 | 4.0 | 2.8 | 6.2 | 99 | 99 | 99 | 99 | 96 | 97 | 68 | 59 | 33* |
| Elise | 3.4 | 3.7 | 5.5 | 4.5 | 6.2 | 99 | 100 | 100 | 100 | 99 | 98 | 74 | 66 | 28* |
| Profit | 4.3 | 1.8 | 5.3 | 4.7 | 6.3 | 100 | 100 | 99 | 98 | 97 | 97 | 72 | 66 | 27* |
| Tekapo | 3.3 | 4.0 | 4.8 | 6.5 | 5.8 | 100 | 100 | 99 | 99 | 98 | 96 | 68 | 64 | 23* |
| **Experimental Varieties** | | | | | | | | | | | | | | |
| PPG-OG106 | 2.7 | 4.2 | 5.8 | 4.7 | 6.2 | 98 | 99 | 99 | 99 | 98 | 98 | 73 | 68 | 30* |
| | | | | | | | | | | | | | | |
| Mean | 3.7 | 2.9 | 4.8 | 4.3 | 6.0 | 99 | 99 | 99 | 99 | 98 | 97 | 73 | 68 | 29 |
| CV,% | 14.4 | 19.7 | 18.8 | 31.3 | 20.7 | 1 | 1 | 1 | 1 | 2 | 2 | 13 | 16 | 34 |
| LSD,0.05 | 0.6 | 0.7 | 1.1 | 1.6 | 1.5 | 2 | 1 | 1 | 1 | 2 | 2 | 11 | 12 | 12 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2013-16 days, 2014-9 days, 2015-10 days 2016-20 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 7. Seedling vigor, grazing preference, and stand persistence of orchardgrass varieties sown September 6, 2013, in a cattle grazing tolerance study at Lexington, Kentucky.**

| | Seedling | Grazing Preference[2] | | | Percent Stand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vigor[1] | 2014 | 2015 | 2016 | 2013 | 2014 | | 2015 | | 2016 | |
| Variety | Oct 14, 2013 | May 1 | May 1 | May 3 | Oct 14 | Apr 2 | Oct 6 | Apr 6 | Nov 10 | Mar 24 | Oct 17 |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | |
| Benchmark Plus | 3.7 | 7.8 | 2.7 | 6.7 | 77 | 33 | 49 | 53 | 43 | 44 | 25* |
| Prairie | 4.2 | 6.8 | 3.0 | 6.3 | 78 | 34 | 48 | 53 | 43 | 42 | 24* |
| Persist | 3.3 | 7.6 | 2.2 | 6.0 | 70 | 31 | 51 | 55 | 44 | 33 | 16 |
| Prodigy | 4.1 | 7.0 | 3.7 | 6.8 | 83 | 51 | 63 | 69 | 40 | 36 | 13 |
| Profit | 3.7 | 7.8 | 4.0 | 6.5 | 71 | 31 | 39 | 43 | 34 | 31 | 13 |
| Tekapo | 4.5 | 8.3 | 4.2 | 8.0 | 88 | 12 | 23 | 22 | 18 | 13 | 8 |
| Harvestar | 3.4 | 7.8 | 3.5 | 7.8 | 63 | 18 | 29 | 27 | 22 | 14 | 7 |
| **Experimental Varieties** | | | | | | | | | | | |
| B-SIG613 | 3.0 | 7.3 | 2.7 | 6.8 | 45 | 23 | 38 | 46 | 45 | 45 | 27* |
| | | | | | | | | | | | |
| Mean | 3.8 | 7.5 | 3.2 | 6.8 | 72 | 29 | 42 | 46 | 36 | 32 | 17 |
| CV,% | 17.7 | 9.3 | 21.6 | 12.1 | 21 | 43 | 49 | 40 | 36 | 43 | 54 |
| LSD,0.05 | 0.8 | 0.9 | 0.8 | 1.0 | 18 | 15 | 24 | 21 | 15 | 16 | 11 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2014-9 days, 2015-10 days 2016-20 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 8. Seedling vigor, grazing preference, and stand persistence of orchardgrass varieties sown September 9, 2014, in a cattle grazing tolerance study at Lexington, Kentucky.**

| | Seedling | Grazing Preference[2] | | Percent Stand | | | | |
|---|---|---|---|---|---|---|---|---|
| | Vigor[1] | 2015 | 2016 | 2014 | 2015 | | 2016 | |
| Variety | Oct 9, 2014 | May 1 | Apr 26 | Oct 9 | Apr 6 | Oct 21 | Mar 24 | Oct 17 |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | |
| Persist | 3.7 | 2.7 | 3.4 | 98 | 99 | 98 | 98 | 78* |
| Prodigy | 4.8 | 2.7 | 3.3 | 100 | 100 | 97 | 98 | 75* |
| SS-0708OGDT | 4.7 | 2.5 | 3.2 | 99 | 99 | 98 | 99 | 75* |
| Benchmark Plus | 4.8 | 2.5 | 3.3 | 98 | 98 | 98 | 98 | 73* |
| Prairie | 4.3 | 2.8 | 2.8 | 98 | 98 | 97 | 98 | 65 |
| Profit | 4.8 | 3.5 | 3.2 | 99 | 98 | 97 | 98 | 65 |
| Tekapo | 4.3 | 8.8 | 4.4 | 99 | 81 | 81 | 83 | 52 |
| Harvestar | 4.2 | 6.5 | 4.0 | 98 | 95 | 93 | 93 | 42 |
| **Experimental Varieties** | | | | | | | | |
| B-SIG613 | 4.5 | 2.0 | 3.3 | 98 | 99 | 98 | 98 | 86* |
| 2014.90.16 | 4.3 | 2.2 | 2.5 | 98 | 98 | 99 | 99 | 81* |
| | | | | | | | | |
| Mean | 4.4 | 3.6 | 3.3 | 98 | 96 | 96 | 96 | 69 |
| CV,% | 10.6 | 24.3 | 26.6 | 2 | 4 | 3 | 3 | 16 |
| LSD,0.05 | 0.5 | 1.0 | 1.0 | 3 | 4 | 4 | 3 | 13 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2015-10 days 2016-13 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

other words, the mean for each trial is 100 percent. Varieties with percentages over 100 persisted better than average, and varieties with percentages less than 100 persisted less than average. Direct, statistical comparisons of varieties cannot be made using the summary tables 17, 18, and 19, but these comparisons do help identify varieties for further consideration. Varieties that have performed better than average over many years have very stable performance; others may have performed 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 footnotes in tables 17, 18, and 19 to determine to which yearly report to refer.

## Summary

These studies indicate that there are varieties of cool-season grasses that can tolerate overgrazing for multiple seasons and still maintain reasonable stands. Some varieties of endophyte-free as well as novel, or "friendly," endophyte tall fescue have been able to maintain

**Table 9. Seedling vigor, grazing preference, and stand persistence of orchardgrass varieties sown September 3, 2015, in a grazing tolerance study at Lexington, Kentucky.**

| Variety | Seedling Vigor[1] Oct 19, 2015 | Grazing Preference[2] April 26, 2016 | Percent Stand 2015 Oct 19 | 2016 Mar 24 | 2016 Oct 4 |
|---|---|---|---|---|---|
| **Commercial Varieties-Available for Farm Use** | | | | | |
| SS-0708OGDT | 4.8 | 3.3 | 100 | 100 | 99* |
| Persist | 4.6 | 3.3 | 100 | 100 | 99* |
| Prairie | 4.2 | 3.5 | 99 | 100 | 99* |
| Profit | 4.7 | 3.8 | 100 | 100 | 99* |
| Potomac | 5.0 | 3.0 | 100 | 100 | 99* |
| Tekapo | 4.5 | 7.0 | 100 | 96 | 97 |
| **Experimental Varieties** | | | | | |
| OG-0707 | 4.8 | 3.2 | 100 | 100 | 100* |
| KYDG1002 | 4.3 | 5.0 | 100 | 100 | 99* |
| KYDG1001 | 3.8 | 4.7 | 100 | 100 | 98 |
| Dg82Ro1 | 3.5 | 4.5 | 99 | 100 | 97 |
| | | | | | |
| Mean | 4.4 | 4.1 | 100 | 100 | 99 |
| CV,% | 44.2 | 24.8 | 1 | 1 | 1 |
| LSD,0.05 | 0.6 | 1.2 | 1 | 1 | 2 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating-13 days.

**Table 10. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass and festulolium (FL) varieties sown August 30, 2012, in a cattle grazing tolerance study at Lexington, Kentucky.**

| Variety | Seedling Vigor[1] Oct 8, 2012 | Grazing Preference[2] 2013 Apr 30 | 2014 May 1 | 2015 May 1 | 2016 May 4 | Percent Stand 2012 Oct 8 | 2013 Mar 21 | 2013 Oct 14 | 2014 Apr 3 | 2014 Nov 3 | 2015 Apr 6 | 2015 Nov 10 | 2016 Mar 24 | 2016 Oct 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | | | | |
| BG34 | 3.8 | 4.0 | 5.3 | 3.2 | 4.2 | 99 | 100 | 99 | 99 | 98 | 98 | 96 | 96 | 80* |
| Calibra | 4.5 | 3.7 | 3.8 | 3.2 | 4.5 | 100 | 100 | 99 | 99 | 97 | 97 | 95 | 94 | 78* |
| Spring Green (FL) | 4.1 | 4.3 | 4.7 | 3.5 | 4.8 | 100 | 100 | 99 | 99 | 97 | 98 | 94 | 83 | 78* |
| Duo (FL) | 4.5 | 4.7 | 4.0 | 3.0 | 3.8 | 100 | 100 | 99 | 99 | 96 | 97 | 92 | 91 | 75* |
| TetraGain | 3.4 | 5.0 | 4.7 | 3.2 | 4.0 | 98 | 99 | 98 | 98 | 97 | 97 | 91 | 91 | 73* |
| Power | 4.3 | 4.3 | 3.7 | 3.2 | 4.3 | 100 | 100 | 98 | 98 | 96 | 97 | 91 | 90 | 71* |
| Boost | 4.4 | 3.8 | 4.8 | 3.2 | 4.2 | 100 | 100 | 98 | 98 | 96 | 96 | 90 | 85 | 68* |
| Linn (certified) | 4.2 | 3.2 | 3.8 | 1.8 | 3.8 | 99 | 100 | 100 | 99 | 90 | 90 | 87 | 80 | 67* |
| Grand Daddy | 4.1 | 4.3 | 4.3 | 3.0 | 3.8 | 100 | 100 | 99 | 99 | 95 | 95 | 87 | 75 | 67* |
| Meadow Green (FL) | 5.0 | 6.7 | – | – | – | 100 | 85 | 2 | 0 | 0 | 5 | 8 | 8 | 10 |
| | | | | | | | | | | | | | | |
| Mean | 4.2 | 4.4 | 4.4 | 3.0 | 4.2 | 100 | 98 | 89 | 90 | 86 | 87 | 83 | 79 | 67 |
| CV,% | 13.2 | 26.9 | 26.5 | 27.0 | 23.7 | 1 | 3 | 2 | 1 | 3 | 3 | 8 | 18 | 19 |
| LSD,0.05 | 0.6 | 1.4 | 1.3 | 1.2 | 1.3 | 1 | 3 | 2 | 1 | 3 | 3 | 7 | 16 | 15 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2013-16 days, 2014-9 days, 2015-10 days 2016-20 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 11. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass varieties sown September 6, 2013, in a cattle grazing tolerance study at Lexington, Kentucky.**

| Variety | Seedling Vigor[1] Oct 14, 2013 | Grazing Preference[2] 2014 May 1 | 2015 May 1 | 2016 May 3 | Percent Stand 2013 Oct 14 | 2014 Apr 2 | 2014 Oct 6 | 2015 Apr 6 | 2015 Oct 21 | 2016 Mar 24 | 2016 Oct 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | |
| Victorian | 4.6 | 4.7 | 1.8 | 3.7 | 98 | 93 | 94 | 96 | 91 | 93 | 90* |
| Linn (certified) | 3.6 | 4.8 | 3.0 | 4.0 | 95 | 95 | 96 | 97 | 91 | 92 | 85* |
| Grand Daddy | 3.6 | 6.2 | 3.8 | 3.3 | 95 | 94 | 94 | 93 | 92 | 92 | 83 |
| PayDay | 3.6 | 5.8 | 4.3 | 4.5 | 92 | 93 | 94 | 95 | 92 | 95 | 82 |
| Power | 3.7 | 6.0 | 4.3 | 4.8 | 94 | 95 | 94 | 96 | 91 | 93 | 80 |
| **Experimental Varieties** | | | | | | | | | | | |
| B-13.0205 | 3.8 | 5.8 | 3.8 | 4.7 | 95 | 95 | 93 | 94 | 92 | 92 | 78 |
| | | | | | | | | | | | |
| Mean | 3.8 | 5.6 | 3.5 | 4.2 | 95 | 94 | 94 | 95 | 91 | 93 | 83 |
| CV,% | 15.7 | 14.3 | 25.4 | 18.6 | 3 | 4 | 3 | 3 | 4 | 2 | 5 |
| LSD,0.05 | 0.7 | 0.9 | 1.1 | 0.9 | 3 | 4 | 4 | 3 | 4 | 2 | 5 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2014-9 days, 2015-10 days 2016-20 days.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

equivalent stands to endophyte-infected KY31. There is no KY31+ equivalent in orchardgrass; that is, no variety has historically been proven to be tolerant of overgrazing. However, some varieties have exhibited good tolerance to grazing abuse even after three and four seasons.

This information should be used along with yield and other information (for example, relative maturity in spring) in selecting the best grass variety for each individual use. It is not recommended that tall fescue or orchardgrass be continuously overgrazed as was done in these trials. Although several varieties expressed tolerance to the level of grazing pressure used in these trials, overgrazing greatly reduces yield and therefore profitability of these varieties. This information should be an indication of those varieties that will better withstand the occasional overgrazing that sometimes becomes necessary in livestock operations.

Good management for maximum life from any grass would be to: Allow it to become completely established before grazing, and avoid overgrazing it during times of extreme stress, such as drought.

## About the Authors

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**Table 12. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass varieties sown September 9, 2014, in a cattle grazing tolerance study at Lexington, Kentucky.**

| Variety | Seedling Vigor[1] Oct 9, 2014 | Grazing Preference[2] 2015 May 1 | Grazing Preference[2] 2016 May 3 | Winter Injury[3] Jan 29, 2015 | Percent Stand 2014 Oct 9 | 2015 Apr 6 | 2015 Oct 21 | 2016 Mar 24 | 2016 Oct 5 |
|---|---|---|---|---|---|---|---|---|---|
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | |
| LPTNEAROM | 4.8 | 5.0 | 3.5 | 2.5 | 100 | 100 | 100 | 100 | 100* |
| Remington | 4.4 | 4.3 | 3.8 | 2.3 | 97 | 99 | 99 | 100 | 99* |
| Grand Daddy | 3.9 | 3.5 | 2.0 | 2.7 | 96 | 98 | 97 | 97 | 96* |
| Calibra | 4.6 | 3.3 | 4.2 | 3.8 | 97 | 99 | 98 | 98 | 95 |
| BG34 | 4.9 | 3.2 | 3.7 | 2.8 | 100 | 100 | 99 | 99 | 95 |
| PayDay | 4.4 | 4.3 | 3.7 | 4.5 | 97 | 98 | 99 | 100 | 94 |
| Power | 4.2 | 4.5 | 3.8 | 4.7 | 95 | 98 | 97 | 98 | 92 |
| Linn (certified) | 4.5 | 2.8 | 2.5 | 7.0 | 99 | 100 | 99 | 99 | 92 |
| **Experimental Varieties** | | | | | | | | | |
| AGRLP157-AR1 | 4.8 | 3.5 | 3.7 | 3.3 | 100 | 100 | 100 | 100 | 98* |
| AGRLP156-AR1 | 5.0 | 3.2 | 3.0 | 4.3 | 100 | 100 | 99 | 99 | 94 |
| | | | | | | | | | |
| Mean | 4.5 | 3.8 | 3.4 | 3.8 | 98 | 99 | 99 | 99 | 95 |
| CV,% | 9.7 | 21.8 | 20.4 | 26.4 | 3 | 1 | 1 | 1 | 4 |
| LSD,0.05 | 0.5 | 1.0 | 0.8 | 1.2 | 3 | 2 | 2 | 1 | 4 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 2015-10 days 2016-20 days.
[3] Winter injury based on a scale of 1 to 9 with 9 being the greatest amount of injury.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 13. Seedling vigor, grazing preference, and stand persistence of perennial ryegrass and festulolium (FL) varieties sown September 3, 2015, in a cattle grazing tolerance study at Lexington, Kentucky.**

| Variety | Seedling Vigor[1] Oct 19, 2015 | Grazing Preference[2] April 26, 2016 | Winter Injury[3] Jan 29, 2016 | Percent Stand 2015 Oct 19 | 2016 Mar 24 | 2016 Oct 4 |
|---|---|---|---|---|---|---|
| **Commercial Varieties-Available for Farm Use** | | | | | | |
| LPTNEAROM | 4.3 | 1.8 | 1.0 | 100 | 100 | 100* |
| Remington | 4.4 | 1.7 | 0.9 | 100 | 100 | 100* |
| Power | 4.3 | 2.0 | 1.5 | 100 | 100 | 99* |
| Albion | 3.1 | 1.9 | 1.0 | 84 | 100 | 99* |
| BG-34 | 3.5 | 1.5 | 1.3 | 99 | 100 | 99* |
| Grand Daddy | 3.3 | 2.4 | 1.1 | 98 | 100 | 99* |
| Calibra | 4.7 | 2.1 | 1.1 | 100 | 100 | 98* |
| Linn (certified) | 3.8 | 1.8 | 2.7 | 100 | 100 | 97* |
| Spring Green (FL) | 4.3 | 2.3 | 1.3 | 99 | 100 | 96* |
| Duo (FL) | 4.9 | 4.8 | 7.5 | 100 | 92 | 88 |
| Barvitra | 5.0 | 3.5 | 2.3 | 100 | 100 | 62 |
| **Experimental Varieties** | | | | | | |
| GPT-14021 | 3.7 | 2.2 | 0.8 | 100 | 100 | 100* |
| BARLP15261 | 3.4 | 1.8 | 0.8 | 100 | 100 | 100* |
| KYFL1013 (FL) | 4.7 | 2.7 | 1.0 | 100 | 100 | 99* |
| GDP-14018 | 4.3 | 1.7 | 1.9 | 100 | 100 | 98* |
| KYFA9819 (FL) | 4.0 | 2.2 | 0.9 | 99 | 100 | 98* |
| GDP-14017 | 4.2 | 1.9 | 2.7 | 100 | 100 | 93* |
| TAL-PR-04 | 3.8 | 4.2 | 6.8 | 100 | 88 | 93* |
| TAL-PR-02 | 4.0 | 4.2 | 5.8 | 100 | 84 | 92* |
| TAL-PR-03 | 2.6 | 3.3 | 5.0 | 98 | 95 | 84 |
| GDP-14019 | 4.1 | 6.5 | 8.5 | 100 | 33 | 65 |
| GPT-14023 | 4.2 | 6.2 | 7.8 | 100 | 34 | 62 |
| | | | | | | |
| Mean | 4.0 | 2.8 | 2.9 | 99 | 92 | 92 |
| CV,% | 12.4 | 25.5 | 20.1 | 3 | 10 | 10 |
| LSD,0.05 | 0.6 | 0.8 | 0.7 | 4 | 11 | 10 |

[1] Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
[2] Preference score based on a scale of 1 to 9 with 9 indicating all forage was grazed. Grazing time before rating; 13 days.
[3] Winter injury score based on a scale of 1 to 9 with 9 being the greatest amount of injury.
*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 14. Summary of persistence of tall fescue varieties under heavy grazing pressure across years at Lexington, Kentucky.[1]**

| Variety | Proprietor/ KY Distributor | 2012[2] | | | | | | | | 2013 | | | | | | 2014 | | | | 2015 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mar | Oct | Apr | Nov | Apr | Oct | Mar | Oct | Apr | Nov | Apr | Oct | Mar | Oct | Apr | Oct | Mar | Oct | Apr | Oct |
| | | 2013[3] | | 2014 | | 2015 | | 2016 | | 2014 | | 2015 | | 2016 | | 2015 | | 2016 | | 2016 | |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | | | | | | | | | | | |
| Baguala | Allied Seed | | | | | | | | | | | | | | | | | | | * | x |
| BarOptima PLUS E34[4] | Barenbrug USA | * | * | * | x[5] | * | * | x | x | * | * | * | * | * | * | x | * | * | * | * | * |
| Bull | Caudill Seed | | | | | | | | | x | * | * | * | * | * | | | | | | |
| Cajun II | Smith Seed Services | | | | | | | | | x | x | x | x | x | x | * | * | * | * | * | x |
| Cowgirl | Pure Seed | * | * | * | * | * | * | * | * | | | | | | | | | | | | |
| Dominate | Allied Seed | | | | | | | | | | | | | | | | | | | * | x |
| Drover | Barenbrug USA | | | | | | | | | | | | | | | | | | | * | * |
| Flourish | Allied Seed | * | x | * | x | * | x | x | x | | | | | | | | | | | | |
| FSG 402TF | Farm Service Genetics | | | | | | | | | | | | | | | | | | | * | * |
| Jesup EF | Pennington Seed | * | * | * | * | * | * | * | * | | | | | | | | | | | | |
| Jesup MaxQ[4] | Pennington Seed | * | * | * | x | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| KY 31+[4] | KY Agric. Exp. Station | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| Lacefield MaxQ II[4] | Pennington Seed | | | | | | | | | * | * | * | * | * | * | * | * | * | * | * | * |
| Select | Southern States | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| SS-0705TFSL | Southern States | | | | | | | | | | | | | | | * | * | * | * | * | * |
| **Experimental Varieties** | | | | | | | | | | | | | | | | | | | | | |
| AGRFA-179/AR584[4] | AgResearch (USA) | | | | | | | | | x | * | * | * | * | x | | | | | | |
| AGRFA-200/AR584[4] | AgResearch (USA) | | | | | | | | | * | * | * | * | * | * | | | | | | |
| AGRFA-201/AR584[4] | AgResearch (USA) | | | | | | | | | x | x | x | x | * | x | | | | | | |
| BARFAF13131 | Barenbrug USA | | | | | | | | | x | x | x | x | x | x | | | | | * | * |
| Drover+E34[4] | Barenbrug USA | | | | | | | | | | | | | | | | | | | * | * |
| GT213/AR584[4] | AgResearch (USA) | | | | | | | | | x | * | * | * | * | * | | | | | | |
| HTWC4 | KY Agric. Exp. Station | | | | | | | | | x | * | * | * | * | * | | | | | | |
| KY 31-[4] | KY Agric. Exp. Station | * | * | * | * | * | * | * | * | x | * | * | * | * | * | * | * | * | * | * | * |
| KYFA0701 | KY Agric. Exp. Station | | | | | | | | | * | * | * | * | * | * | | | | | | |
| KYFA0901 | KY Agric. Exp. Station | * | * | * | * | * | * | * | * | | | | | | | | | | | | |
| KYFA0905 | KY Agric. Exp. Station | * | * | * | * | * | * | * | * | | | | | | | | | | | | |
| KYFA0906 | KY Agric. Exp. Station | * | * | * | * | * | * | * | * | | | | | | | | | | | | |
| KYFA1113 | KY Agric. Exp. Station | | | | | | | | | | | | | | | | | | | * | * |
| KYFA1113/AR584[4] | KY Agric. Exp. Station | | | | | | | | | | | | | | | * | * | * | * | | |
| KYFA1114 | KY Agric. Exp. Station | | | | | | | | | | | | | | | | | | | * | * |
| KYFA1114/AR584[4] | KY Agric. Exp. Station | | | | | | | | | | | | | | | * | * | * | * | | |
| KYFA1115/AR584[4] | KY Agric. Exp. Station | | | | | | | | | | | | | | | * | * | * | * | | |
| KYFA1311 | KY Agric. Exp. Station | | | | | | | | | | | | | | | | | | | * | * |
| KYFA9732/AR584[4] | KY Agric. Exp. Station | | | | | | | | | * | * | * | * | * | * | | | | | | |
| KYFA9821/AR584[4] | KY Agric. Exp. Station | | | | | | | | | x | * | * | * | * | * | | | | | * | * |
| NFTF 1044 | Noble Foundation | | | | | | | | | | | | | | | * | * | * | * | | |
| NFTF 1051 | Noble Foundation | | | | | | | | | | | | | | | * | * | * | * | | |
| NFTF 1370 | Noble Foundation | | | | | | | | | | | | | | | * | * | * | * | | |
| PPG-FTF 104 | Mountain View Seeds | * | x | * | x | * | x | x | x | | | | | | | | | | | | |

[1] For detailed stand ratings over years, see individual trial tables.
[2] Establishment year.
[3] Date of rating of percent stand.
[4] KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ and Lacefield MaxQ II contain a non-toxic endophyte. BarOptima PLUS E34 and Drover+E34 contain a beneficial endophyte. AR584 is a non-toxic endophyte inserted into experimental tall fescue varieties. The other fescue varieties in this table do not contain an endophyte.
[5] "x" in the block indicates the variety was in the test but plant 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 in the test.

**Table 15. Summary of persistence of orchardgrass varieties under heavy grazing pressure across years at Lexington, Kentucky.**

| Variety | Proprietor/ KY Distributor | 2012[1] | | | | | | | | 2013 | | | | | | 2014 | | | | 2015 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mar | Oct | Apr | Nov | Apr | Nov | Mar | Oct | Apr | Oct | Apr | Nov | Mar | Oct | Apr | Oct | Mar | Oct | Mar | Oct |
| | | 2013[2] | | 2014 | | 2015 | | 2016 | | 2014 | | 2015 | | 2016 | | 2015 | | 2016 | | 2016 | |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | | | | | | | | | | | |
| Benchmark Plus | Southern States | * | * | * | * | * | * | * | * | x[3] | * | * | * | * | * | * | * | * | * | | |
| Elise | Pure Seed | * | * | * | * | * | * | x | * | | | | | | | | | | | | |
| Harvestar | Columbia Seeds | | | | | | | | | x | x | x | x | x | x | * | x | * | x | | |
| Persist | Smith Seed Services | * | * | * | x | * | x | x | * | x | * | * | * | * | x | * | * | * | * | * | * |
| Potomac | Public | | | | | | | | | | | | | | | | | | | * | * |
| Prairie | Turner Seed | | | | | | | | | x | * | * | * | * | * | * | * | * | x | * | * |
| Prodigy | Caudill Seed | | | | | | | | | * | * | * | * | * | x | * | * | * | * | | |
| Profit | Ampac Seed Co. | * | * | x | * | * | * | x | * | x | * | x | * | * | x | * | * | * | x | * | * |
| SS-0708OGDT | Southern States | | | | | | | | | | | | | | | * | * | * | * | * | * |
| Tekapo | Ampac Seed Co. | * | * | * | * | x | x | x | * | x | x | x | x | x | x | x | x | x | x | x | x |
| **Experimental Varieties** | | | | | | | | | | | | | | | | | | | | | |
| 2014.90.16 | KY Agric. Exp. Station | | | | | | | | | | | | | | | * | * | * | * | | |
| B-SIG 613 | Blue Moon Farms | | | | | | | | | x | * | x | * | * | * | * | * | * | * | | |
| Dg82Ro1 | Barenbrug | | | | | | | | | | | | | | | | | | | * | x |
| KYDG1001 | KY Agric. Exp. Station | | | | | | | | | | | | | | | | | | | * | x |
| KYDG1002 | KY Agric. Exp. Station | | | | | | | | | | | | | | | | | | | * | * |
| OG-0707 | Allied | | | | | | | | | | | | | | | | | | | * | * |
| PPG-OG 106 | Mountain View Seeds | * | * | * | * | * | * | x | * | | | | | | | | | | | | |

[1] Establishment year.
[2] Date of visual rating of percent stand.
[3] "x" in the block indicate the variety was in the test but stand survival was significantly less than the most persistent variety. Open blocks indicate the variety was not in the test.
*Not significantly different from the most persistent variety.

**Table 16. Summary of persistence of perennial ryegrass and festulolium (FL) varieties under heavy grazing pressure across years at Lexington, Kentucky.**

| Variety | Proprietor/ KY Distributor | 2012[1] | | | | | | | | 2013 | | | | | | 2014 | | | | 2015 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mar | Oct | Apr | Nov | Apr | Nov | Mar | Oct | Apr | Nov | Apr | Oct | Mar | Oct | Apr | Oct | Mar | Oct | Mar | Oct |
| | | 2013[2] | | 2014 | | 2015 | | 2016 | | 2014 | | 2015 | | 2016 | | 2015 | | 2016 | | 2016 | |
| **Commercial Varieties-Available for Farm Use** | | | | | | | | | | | | | | | | | | | | | |
| Albion | Grassland Oregon | | | | | | | | | | | | | | | | | | | * | * |
| Barvitra | Barenbrug USA | | | | | | | | | | | | | | | | | | | * | x[3] |
| BG34 | Barenbrug USA | * | * | * | * | * | * | * | * | | | | | | | * | * | * | x | * | * |
| Boost | Allied Seed | * | * | * | * | * | * | * | * | | | | | | | | | | | | |
| Calibra | DLF International | * | * | * | * | * | * | * | * | | | | | | | * | x | x | x | * | * |
| Duo (FL) | Ampac Seed Co. | * | * | * | * | * | * | * | * | | | | | | | | | | | * | x |
| Grand Daddy | Smith Seed | * | * | * | x | * | x | x | * | * | * | x | * | * | x | * | x | x | * | * | * |
| Linn (certified) | Public | * | * | * | x | x | x | * | * | * | * | * | * | * | * | * | * | * | x | * | * |
| LPTNEAROM | Barenbrug USA | | | | | | | | | | | | | | | * | * | * | * | * | * |
| Meadow Green (FL) | Pure Seed | x | x | x | x | x | x | x | x | | | | | | | | | | | | |
| PayDay | Mountain View Seeds | | | | | | | | | * | * | * | * | * | x | * | * | * | x | | |
| Power | Ampac Seed Co. | * | * | * | * | * | * | * | * | * | * | * | * | * | x | * | x | x | x | * | * |
| Remington | Barenbrug USA | | | | | | | | | | | | | | | * | * | * | * | * | * |
| SpringGreen (FL) | Rose Agri-Seed | * | * | * | * | * | * | * | * | | | | | | | | | | | * | * |
| Tetra Gain | Pure Seed | * | * | * | * | * | * | * | * | | | | | | | | | | | | |
| Victorian | Caudill Seed | | | | | | | | | * | * | * | * | * | * | | | | | | |
| **Experimental Varieties** | | | | | | | | | | | | | | | | | | | | | |
| AGRLP156-AR1 | Ag. Research | | | | | | | | | | | | | | | * | * | * | x | | |
| AGRLP157-AR1 | Ag. Research | | | | | | | | | | | | | | | * | * | * | * | | |
| BARLP15261 | Barenbrug USA | | | | | | | | | | | | | | | | | | | * | * |
| B-13.0205 | Blue Moon Farms | | | | | | | | | * | * | * | * | * | x | | | | | | |
| GPD-14017 | Ag. Research | | | | | | | | | | | | | | | | | | | * | * |
| GPD-14018 | Ag. Research | | | | | | | | | | | | | | | | | | | * | * |
| GPD-14019 | Ag. Research | | | | | | | | | | | | | | | | | | | x | x |
| GPT-14021 | Ag. Research | | | | | | | | | | | | | | | | | | | * | * |
| GPT-14023 | Ag. Research | | | | | | | | | | | | | | | | | | | x | x |
| KYFA1013 (FL) | KY Agric.Exp. Station | | | | | | | | | | | | | | | | | | | * | * |
| KYFA9819 (FL) | KY Agric.Exp. Station | | | | | | | | | | | | | | | | | | | * | * |
| TAL-PR-02 | Ag. Research | | | | | | | | | | | | | | | | | | | x | * |
| TAL-PR-03 | Ag. Research | | | | | | | | | | | | | | | | | | | * | x |
| TAL-PR-04 | Ag. Research | | | | | | | | | | | | | | | | | | | x | * |

[1] Establishment year.
[2] Date of visual rating of percent stand.
[3] "x" in the block indicates the variety was in the test but plant 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 17. Summary of 2000-2016 Kentucky tall fescue grazing tolerance trials (stand persistence shown as a percent of the stand rating of KY 31+).**

| | | Lexington | | | | | | | | | | | | | | Princeton | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2000[1,2] | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2002 | Mean[3] |
| Variety | Proprietor | 4yr[4] | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 3yr | 4yr | (#trials) |
| Advance MaxQ[5] | Pennington Seed | | | | | | | 94 | | | | | | | | | – |
| Bariane | Barenbrug USA | | | | 89 | | 75 | 47 | 29 | | | | | | | | 60(4) |
| BarElite | Barenbrug USA | | | | | | | | 96 | | | | | | | | – |
| Barolex | Barenbrug USA | | | | | | 78 | 101 | 86 | | | | | | | | 88(3) |
| BarOptima PLUS E34[5] | Barenbrug USA | | | | | | 100 | | 97 | | | 98 | 100 | 98 | 99 | | 99(6) |
| Bronson | Ampac Seed | | | | | | | | | | 98 | 98 | | | | | 98(2) |
| Bull | Caudill Seed | | | | | | | | | | | | | | 96 | | – |
| Cajun II | Smith Seed Services | | | | | | | | | | | 98 | | | 79 | | – |
| Cattle Club | Green Seed | 93 | 91 | | | | | | | | | | | | | | 92(2) |
| Carmine | DLF-Jenks | | 90 | | | | | | | | | | | | | | – |
| Cowgirl | Rose Agri-Seed | | | | | 99 | | | | | | | | 99 | | | 99(2) |
| Festival | Pickseed West | | 100 | 101 | | | | | | | | | | | | 89 | 97(3) |
| Flourish | Allied Seed | | | | | | | | | | | | | 98 | | | – |
| Goliath | Ampac Seed | | | | | | | | | | | 98 | | | | | – |
| Hoedown | DLF-Jenks | 88 | | | | | | | | | | | | | | | – |
| HyMark | Fraser Seeds | | | | | | | | | 95 | | | 100 | | | | 98(2) |
| Jesup EF | Pennington Seed | | | | 99 | | | | | | | 99 | 100 | 100 | | | 100(4) |
| Jesup MaxQ[5] | Pennington Seed | | | 103 | 97 | | 68 | 102 | 97 | 97 | 99 | 98 | 100 | 99 | 98 | 105 | 97(12) |
| Johnstone | Proseeds | | 92 | | | | | | | | | | | | | | – |
| KY31+[5] | KY Agri. Exp Sta. | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100(15) |
| KY31-[5] | KY Agri. Exp Sta. | | 98 | 103 | 98 | 100 | 83 | 101 | 100 | 98 | 99 | 99 | 100 | 100 | 99 | 105 | 100(14) |
| Kokanee | Ampac Seed | 43 | | | | | | | | | | | | | | | – |
| Lacefield MaxQ II[5] | Pennington Seed | | | | | | 82 | 102 | 99 | 98 | 98 | 97 | | | 99 | | 96(7) |
| Maximize | Rose Agri-Seed | | 99 | | | | | | | | | | | | | | – |
| Nanryo | Japanese Grassland For.Seed | | | | | | | | 100 | | | | | | | | – |
| Orygun | – | | | 99 | | | | | | | | | | | | | – |
| Resolute | Ampac Seed | | 23 | | | | | | | | | | | | | | – |
| Select | Southern States | 107 | 101 | 100 | 100 | | 67 | 100 | 93 | 95 | 97 | 100 | 100 | 99 | 99 | 98 | 97(14) |
| Stargrazer | Southern States | 86 | 89 | | | | | | | | | | | | | | 79(4) |
| Stockman | Seed Res. of OR | | | | | 102 | | | | | | | | | | | – |
| Texoma MaxQ II[5] | Pennington Seed | | | | | | 88 | 100 | 98 | | | | | | | | 95(3) |
| Tuscany II | Seed Res. of OR | | | | | | | 101 | | | | | | | | | – |
| Verdant | Am.Grass Seed | | | | | | | 97 | | | | | | | | | – |

[1] Year trial was established.

[2] 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 trial. For example, the Lexington trial planted in in 2010 was grazed four years so the final report would be "2014 Cool-Season Grass Grazing Tolerance Report" archived in the KY Forage website at <www.uky.edu/Ag/Forage>.

[3] Mean only presented when respective variety was included in two or more trials.

[4] Number of years of data.

[5] KY 31- is the variety KY31 from which the toxic endophyte has been removed. KY31+ contains the toxic endophyte. Jesup MaxQ, Texoma MaxQ II, Advance MaxQ and Lacefield MaxQ II contain a non-toxic endophyte. BarOptima PLUS E34 contains a beneficial endophyte. The other fescue varieties in this table do not contain an endophyte.

**Table 18. Summary of 2000-2016 Kentucky orchardgrass grazing tolerance trials (stand persistence shown as a percent of the mean of the commercial varieties in the trial).**

| | | Lexington | | | | | | | | | | | | Princeton | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2000[1,2] | 2001 | 2002 | 2003 | 2004 | 2005[3] | 2007 | 2009 | 2010 | 2011 | 2012 | 2013[3] | 2002 | Mean[4] |
| Variety | Proprietor | 4yr[5] | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 4yr | 3yr | 4yr | (#trials) |
| Abertop | Pennington Seed | | | 38 | | | | | | | | | | | – |
| Albert | Univ. of Wisconsin | | 115 | | | | | | | | | | | | – |
| Amba | DLF-Jenks | | 71 | | | | | | | | | | | | – |
| Ambrosia | Pennington Seed | | | | | | | 94 | | | | | | | – |
| Athos | DLF-Jenks | | 93 | | | | 60 | | | | | | | | – |
| Benchmark | Southern States | 118 | 123 | 114 | | | | | | | | | | 133 | 122(4) |
| Benchmark Plus | Southern States | | | 120 | | | 152 | 135 | 106 | 106 | 108 | 115 | 158 | 133 | 118(7) |
| Boone | Public | 102 | | | | | | | | | | | | | – |
| Command | Seed Research of OR | | | | | 81 | | | | | | | | | – |
| Crown Royale | Donley Seed | | 100 | | | | | | | | | | | | – |
| Crown Royale Plus | Donley Seed | | | 124 | | | | | | | | | | 83 | 104(2) |
| Elise | Pure Seed | | | | | | | | | | | 97 | | | – |
| Hallmark | James VanLeeuwen | | 115 | | 113 | | | | | | | | | 83 | 104(3) |
| Harvestar | Columbia Seeds | | | | | | | 75 | | 89 | 94 | | 46 | | 86(3) |
| Haymate | Southern States | 53 | 115 | 100 | 118 | | | | | | | | | 83 | 94(5) |
| Intensiv | Barenbrug USA | | | | 51 | | | | | | | | | | – |
| Mammoth | DLF-Jenks | | 115 | | | | | | | | | | | | – |
| Megabite | Turf Seed | | 77 | | | | | | | | | | | | – |
| Niva | DLF-Jenks | | | 76 | | | | | | | | | | 83 | 80(2) |
| Persist | Smith Seed | | | | | | 138 | 107 | 103 | 100 | 96 | 115 | 86 | | 104(6) |
| Potomac | Public | | | 116 | | 119 | | | | | | | | 117 | 117(3) |
| Prairie | Turner Seed | 127 | 121 | | | | | | | | 94 | | 106 | 83 | 106(4) |
| Prodigy | Caudill Seed | | | | | | | | | | | | 86 | | – |
| Profile | Scott Seed | | | 116 | | | | | | | | | | | – |
| Profit | Ampac Seed | | | | | | | | 95 | 99 | 102 | 94 | 86 | | 98(4) |
| Tekapo | Ampac Seed | | 55 | 74 | 118 | | 50 | 103 | 95 | 105 | 106 | 80 | 53 | 100 | 93(9) |
| Takena | Smith Seed | | 99 | | | | | | | | | | | | – |
| Seco | Southern States | | | | | | | 85 | | | | | | | – |

[1] Year trial was established.
[2] 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 trial. For example, the Lexington trial planted in 2010 was grazed four years so the final report would be "2014 Cool-Season Grass Grazing Tolerance Report" archived in the KY Forage website at <www.uky.edu/Ag/Forage>.
[3] Due to high variation during 2005 and 2013 trials these values are not included in the overall mean.
[4] Mean only presented when respective variety was included in two or more trials.
[5] Number of years of data.
Stand thinning may have been greater for preferred varieties due to closer grazing. See individual trial tables for preference ratings.

**Table 19. Summary of 2000-2016 Kentucky perennial ryegrass and festulolium (FL) grazing tolerance trials in Lexington (stand persistence shown as a percent of the mean of the commercial varieties in the trial).**

| Variety | Type | Proprietor | 2000[1,2] 4yr[4] | 2001 3yr | 2003 4yr | 2005 3-yr | 2007 4yr | 2008 4yr | 2010 4yr | 2011 4yr | 2012 4yr | 2013 3yr | Mean[3] (#trials) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGRLP103 | – | AgResearch USA | 128 | | 86 | | | | | | | | 107(2) |
| Aries | diploid | Ampac Seed | | 139 | | | | | | | | | – |
| Barfest (FL) | MF x PR[6] | Barenbrug USA | | | | | | | 111 | 104 | | | 108(2) |
| BG 34 | diploid | Barenbrug USA | | | | 1765 | 1455 | | 129 | 147 | 119 | | 143(5) |
| Boost | tetraploid | Allied Seed | | | | | | 101 | 79 | 89 | 101 | | 93(4) |
| Calibra | tetraploid | DLF International | | | | | | | | | 116 | | – |
| Citadel | tetraploid | Donley Seed | 107 | | | | | | | | | | – |
| Duo (FL) | MF x PR6 | Ampac Seed | 116 | | | | | 95 | 68 | 84 | 112 | | 95(5) |
| Grand Daddy | tetraploid | Smith Seed Services | | 121 | | | 70 | | 95 | 76 | 100 | 99 | 94(6) |
| Lasso | diploid | DLF-Jenks | | 130 | | | | | | | | | – |
| Linn (certified) | diploid | Public | 112 | 129 | 63 | | | 95 | 103 | 89 | 100 | 101 | 99(8) |
| Maverick | tetraploid | Ampac Seed | | 36 | | | | | | | | | – |
| Meadow Green (FL) | – | Pure Seed | | | | | | | | | 15 | | – |
| PayDay | tetraploid | Mountain View Seeds | | | | | | | | | | 98 | – |
| Polly II | tetraploid | FS Growmark | 36 | 68 | | | | | | | | | 52(2) |
| Power | tetraploid | Ampac Seed | | | | | 134 | | 102 | 104 | 106 | 95 | 108(5) |
| Quartet | tetraploid | Ampac Seed | | 77 | | 63 | 50 | | | | | | 60(3) |
| Remington | tetraploid | Barenbrug USA | | | 151[5] | | | | | | | | – |
| Spring Green (FL) | MF x PR[6] | Rose Agri-Seed | 101 | | | | | 109 | 109 | 108 | 116 | | 109(5) |
| TetraGain | tetraploid | Pure Seed | | | | | | | | | 109 | | – |
| Tonga | tetraploid | Ampac Seed | | | | 61 | | | | | | | – |
| Victorian | | Caudill Seed | | | | | | | | | | 107 | – |

[1] Year trial was established.
[2] 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 trial. For example, the Lexington trial planted in 2010 was grazed four years so the final report would be "2014 Cool-Season Grass Grazing Tolerance Report" archived in the KY Forage website at <www.uky.edu/Ag/Forage>.
[3] Mean only presented when respective variety was included in two or more trials.
[4] Number of years of data.
[5] Grazing tolerance values for these entries may have been elevated due to the low survival of the other commercial varieties in the trials for these years.
[6] MF = meadow fescue, PR = perennial ryegrass.

11-2016