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# 2019 Michigan Forage Variety Test Report

Kim Cassida and Joe Paling

***Forage Factsheet #20-01***

Forage crops are essential components of diversified agricultural production systems in Michigan. They provide feed for livestock, fix nitrogen for crop rotations, reduce soil erosion, improve soil structure, fertility and water retention, protect water quality, provide habitat for wildlife, generate biomass for fuel conversion, and create eye appeal to landscapes. Competition from row crops for land use continues to squeeze forage production acres while equipment, land, and labor costs increase. Under these market conditions, the importance of improving yield per acre through use of better forage varieties is an important component of profitability. Michigan hay prices were good in 2019, and a one-ton increase of average quality alfalfa hay yield was worth $130 to 160/acre.

**2019 Conditions**

Annual rainfall total and 30-year averages for April through October in East Lansing in southern Lower Michigan, Lake City in northern Lower Michigan, and Chatham in the Upper Peninsula are in **Table 1**. Weather conditions in 2019 in Michigan were challenging for almost every crop, and planting and harvesting of forages was no exception. Excessive rainfall started in late May and continued through much of June. Dry conditions prevailed in July and August and again turned wet in September and October. Precipitation totals in June and October were well above normal at all three locations in 2019. July and August totals were well below normal below normal. Wet conditions for much of the state in first cutting delayed harvest past the optimum maturity stage for cutting. Start of first cutting at East Lansing and Lake City was delayed 2 to 3 weeks due to rain. Even when rain was not falling the soil was too wet causing continued delays in harvest. First cutting at Chatham was also scheduled around the frequent rains, but harvest was completed on schedule. Subsequent harvests during the summer growing season were based on the plant maturity and growth. Fall harvests were again scheduled around weather and soil moisture conditions.

**2019 - Alfalfa and Red Clover**

**Alfalfa Variety Trials**

Total test yields of alfalfa varieties planted at multiple locations in Michigan variety trials since 2010 are listed in **Tables 4 through 7**. Yields for individual cuttings and years are in **Tables 11 to 19** (pages 19 to 22) and may also be found at the MSU Forage Connection Website http://www.forage.msu.edu.


In 2019, alfalfa variety trials were cut four times at East Lansing, three times at Lake City, and two times Chatham. First cutting at all three locations were scheduled around and between the wet weather. Alfalfa trial cutting dates at East Lansing were June 18-26, July 15-22, August 22-30, and October 25 - November 5. First cutting at Lake City was on July 3, about 3 weeks later than desired, second cutting was on August 14, and third was on October 9. Cutting dates at Chatham were on June 26 and July 31 and third cut was not removed due to the poor late season growth caused by the dry conditions. Yields from the 24 conventional varieties in the 2016 seeding averaged 5.71 and ranged from 4.99 to 6.10 tons/acre. The six Roundup Ready® varieties averaged 5.08 and ranged from 4.72 to 5.50 tons/acre. In the 2017 conventional trial, total yield averaged 5.20 and ranged from 4.70 to 5.76 tons per acre. Three Roundup Ready® alfalfa varieties in the 2017 seeding averaged 5.03 tons per acre. Fifteen conventional varieties were seeded in 2018 and the average total yield was 5.23 and ranged from 4.47 to 5.86 tons/acre. A new trial of 20 conventional varieties was established at East Lansing in 2019. Average total seeding-year yield in this trial was 1.13, with 0.66 and 0.47 tons/acre, respectively, in first and second cutting and are listed in **Table 26** (page 30).

The 2016 seeding was the only alfalfa trial harvested at Lake City in 2019. Varieties in this trial suffered substantial winter injury in one corner of the trial, approximately ¼ of the plots. Yearly yield in this trial has been between 3 and 3.5 tons per acre per year in 2017 and 2018 and the average total yield among the varieties in the remaining plots was similar to those obtained in the previous years. Average total yield of the four conventional varieties was 3.47 and ranged from 3.12 to 3.62 tons/acre. Average total yield of the four Roundup Ready® varieties was 3.24 and ranged from 3.03 to 3.52 tons/acre.

New trials of conventional and Roundup Ready® alfalfa varieties were seeded at Chatham in the Upper Peninsula in 2018. First cutting at Chatham was scheduled between the frequent rains, and was removed close to the desired maturity (late bud to early bloom). Average yield with two cuttings of the varieties in the conventional seeding was 2.77 and ranged from 2.60 to 2.86 tons/acre. Yields of the varieties in the Roundup Ready ® seeding averaged 2.30 and ranged from 2.22 to 2.36 tons/acre. A new trial of conventional alfalfa varieties was established at Chatham in 2019, but was not harvested for yield.

**Red Clover Variety Trials**

Red clover is a short-lived perennial legume that is well-adapted to Michigan. It is used for hay, haylage, pasture, and cover cropping. It is among the most shade-tolerant legumes and is easy to establish by conventional methods and frost-seeding. These trials are conducted using the same methods as the alfalfa tests, but for a shorter time period. A new red clover variety trial was seeded in May 2017 at East Lansing. The trial was cut two times in 2017, the seeding

| Table 1. Actual and 30-year average precipitation (Inches) from April to October 2012 to 2019 at three variety test sites across Michigan. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **Avg** |
| | **East Lansing** | | | | | | | | |
| Apr | 1.53 | 7.78 | 1.07 | 1.10 | 1.22 | 5.17 | 2.18 | 2.29 | **2.87** |
| May | 3.40 | 4.35 | 3.66 | 4.83 | 2.97 | 2.47 | 4.96 | 3.80 | **3.18** |
| June | 1.50 | 5.23 | 5.60 | 7.23 | 0.97 | 2.30 | 1.60 | 7.52 | **3.67** |
| July | 1.80 | 2.49 | 2.97 | 2.89 | 3.76 | 2.30 | 2.18 | 2.55 | **3.13** |
| Aug | 2.70 | 5.74 | 5.33 | 6.15 | 6.83 | 1.99 | 4.21 | 1.16 | **3.69** |
| Sept | 2.52 | 0.89 | 4.49 | 4.34 | 3.47 | 1.26 | 3.48 | 3.60 | **3.61** |
| Oct | 4.69 | 5.24 | 2.41 | 1.92 | 3.70 | 8.15 | 5.66 | 6.03 | **2.75** |
| **Total** | **18.14** | **31.72** | **25.53** | **28.46** | **22.92** | **23.64** | **24.27** | **26.95** | **22.90** |
| | **Lake City** | | | | | | | | |
| Apr | 2.20 | 5.09 | 6.58 | 2.58 | 2.20 | 5.50 | 3.69 | 3.32 | **2.95** |
| May | 5.30 | 3.02 | 3.29 | 4.57 | 2.26 | 2.78 | 3.70 | 4.00 | **3.22** |
| June | 3.03 | 1.87 | 2.94 | 2.91 | 2.21 | 4.96 | 1.01 | 5.57 | **3.39** |
| July | 7.32 | 2.03 | 3.17 | 2.25 | 5.74 | 2.43 | 2.24 | 1.74 | **2.81** |
| Aug | 1.97 | 4.15 | 1.69 | 4.10 | 2.25 | 2.31 | 3.69 | 2.14 | **3.72** |
| Sept | 3.45 | 1.66 | 4.07 | 4.14 | 3.30 | 1.66 | 2.15 | 5.29 | **3.63** |
| Oct | 4.35 | 3.09 | 4.29 | 2.78 | 3.07 | 7.62 | 5.00 | 5.49 | **3.30** |
| **Total** | **27.62** | **20.91** | **26.03** | **23.33** | **21.03** | **27.26** | **21.48** | **27.55** | **23.02** |
| | **Chatham** | | | | | | | | |
| Apr | 1.05 | 3.30 | 3.32 | 2.03 | 3.21 | 5.25 | 2.02 | 2.56 | **2.15** |
| May | 2.43 | 2.20 | 3.36 | 5.60 | 3.45 | 4.99 | 1.36 | 5.53 | **3.05** |
| June | 4.34 | 2.77 | 3.85 | 2.67 | 2.34 | 7.36 | 4.48 | 2.52 | **3.02** |
| July | 4.47 | 4.78 | 4.27 | 2.15 | 3.44 | 1.74 | 5.08 | 1.42 | **3.41** |
| Aug | 2.12 | 2.68 | 3.18 | 1.86 | 3.67 | 5.50 | 4.32 | 2.70 | **3.17** |
| Sept | 5.13 | 2.71 | 3.53 | 2.41 | 4.78 | 3.26 | 5.40 | 5.08 | **4.21** |
| Oct | 5.55 | 3.06 | 6.98 | 4.25 | 6.90 | 7.82 | 8.02 | 7.25 | **4.47** |
| **Total** | **25.09** | **21.50** | **28.49** | **20.97** | **27.79** | **35.92** | **30.68** | **27.06** | **23.48** |

year, four times in 2018, and only three times in 2019. 2019 yields of red clover in the 2017 seeding averaged 3.74 and ranged from 3.11 to 4.01 tons per acre. A second red clover trial was seeded in 2018 in late summer. This trial was not cut in the seeding year and was harvested for yield four times in 2019. Yields of the red clover varieties in the 2018 seeding averaged 4.73 and ranged from 3.26 to 5.28 tons/acre. The 'common' red clover variety was dead after the third cut in the 2018 seeding and after the second cut of the 2017 seeding. Yields from the two trials in 2019, per cut and total, are listed in **Tables 24 and 25** (page 29).

**2019 Grass Variety Trials**

**Perennial Cool-Season Variety Trials**

Cool-season grass species seeded in trials at East Lansing and Lake City since 2016 were harvested in 2019. Perennial grass trials seeded at East Lansing were harvested three times. Cutting dates in East Lansing were: cut 1 - June 8-14, cut 2 – July 23-25, and cut 3 was between October 10 and 20, as weather and soil conditions allowed. Yields at East Lansing were highest in the first cutting and lowest in the third and final cut. Three cuttings were removed at Lake City: July 3, August 14, and October 9. Yields at Lake City were highest in first cutting and lowest in the second, mid-summer cutting. Timely rain in late August and September resulted in respectable yields in October.

Five cool-season grass species or hybrid groups (orchardgrass, fescue, perennial ryegrass, timothy, and festulolium) are currently being evaluated for yield, maturity at first cutting, and persistence. A brief description of grass species with a summary of management recommendations is in **Table 2.** Long-term yields of grass varieties seeded in Michigan trials are reported in **Tables 8 and 9.** Yields for individual cuttings and years are in **Tables 20 to 23** (pages 23 to 28) and may also be found on the MSU Forage Connection Website at http://www.forage.msu.edu,

Grass trials at East Lansing were harvested before the alfalfa trials in 2019. The grass root system provided a firmer surface in the wet soil conditions and allowed for the harvest machinery to drive across the field without creating ruts that damage hayfields.

Distribution of yields in these three variety trials was concentrated in first and second cutting. Almost 90% of the yearly total yield was from first and second cutting. First-cut accounted for 55% and second cut 35% on the seasonal yield. Higher than average rainfall between first and second cut and low rainfall/dry between second and third cut caused low yields in October. The rain in September and early October was too little too late.

In 2016, 5 tall fescue, 2 meadow fescue, 2 festulolium (fescue type), 4 orchardgrass, 5 perennial ryegrass, and 3 timothy varieties, respectively, were seeded at East Lansing. Yields of tall fescue averaged 4.04 and ranged from 3.88 to 4.39, meadow fescue yields were 2.79 and 3.23, fescue- type festulolium yields were 3.50 and 4.12, respectively. Orchardgrass average total yield was 4.05 and ranged from 3.88 to 4.29, timothy average yield was 4.25 and ranged from 3.77 to 4.56, and the perennial ryegrass average yield was 3.10 and ranged from 2.60 to 3.66 tons per acre, respectively.

In 2017, 6 perennial ryegrass, 1 festulolium (ryegrass type), 3 tall fescue, 3 meadow fescue, 3 orchardgrass, and 2 timothy varieties, respectively, were seeded at East Lansing. The festulolium and ryegrass were seeded in the same trial. The festulolium variety yield was 4.75, slightly higher than the 6 ryegrass varieties that averaged 3.65, ranging from 3.28 to 4.14 tons/acre. Tall fescue varieties average yield 5.31 and ranged from 5.14 to 5.61, meadow fescue average was 4.27 and ranged from 3.95 to 4.67, orchardgrass average was 4.02 and ranged from 3.62 to 4.45, and the two timothy varieties yielded 4.79 and 5.49 tons per acre, respectively. Yields of the two timothy and the one festulolium variety were higher in 2019 than in 2018. Yields in 2019 of all of the other varieties in this trial were either the same or lower than in in 2018.

In 2018, 6 perennial ryegrass, 3 festulolium (ryegrass type), 6 tall fescue, 3 meadow fescue, and 3 timothy varieties, respectively, were seeded in trials at East Lansing. Dry matter yield of tall fescue averaged 5.91 and ranged from 5.41 to 6.40, meadow fescue yields averaged 5.32 and ranged from 5.20 to 5.50, timothy average yield was 5.01 and ranged from 4.87 to 5.20, the perennial ryegrass average yield was 4.54 and ranged from 3.54 to 5.40, festulolium (ryegrass-type) yield averaged was 6.13 and ranged from 5.89 to 6.31 tons per acre, respectively.

A new perennial grass variety trial was planted in the first week of August in 2019. The perennial ryegrass varieties were cut once in late October and the average yield was 1 ton/acre (Table 27, page 30).

At Lake City, perennial grass yields were obtained from three cuttings. Average total yield of tall fescue, orchardgrass, perennial ryegrass, festulolium, and timothy were more than 25 percent higher in 2019 than in 2018. The second-year yield of orchardgrass ranged from 4.38 to 4.98, tall fescue ranged from 5.95 to 6.22, perennial ryegrass and festulolium ranged from 4.21 to 5.38, and two varieties of timothy yielded 5.30 and 5.17 tons/acre, respectively. Two varieties of meadow fescue yielded 3.71 and 3.68 tons per acre. On average, more than 60 percent of the total forage yield was obtained in the first cutting and almost 85 percent of the total yield for the year was from the first and last cut. The mid-summer yield was again low due to dry conditions during the summer.

Grass varieties may be marketed as early, medium, or late maturing. Grass maturity should be matched to legume maturity when planting in mixtures. Plant maturity ratings are reported in **Table 10** for East Lansing and Lake City as the date when varieties reached 50% heading in the first cutting of the established trials. Variety maturity that does not reach 50% heading before the harvest date are rated as either vegetative, boot, or early heading. In general, earliest to latest maturity within a species at East Lansing and Lake City was about a week. In some instances, the span from earliest to latest date within a species has been as high as 10 days at East Lansing and about 7 days at the northern locations. Using 'Potomac' orchardgrass check as a marker in 2019, grasses generally reached 50% heading about 10 days later in Lake City than in East Lansing.

**Annual Forage Trials - 2019 Data**

A small annual grass trial of Italian and annual ryegrass varieties was planted in late July 2018 and harvested in September and in late October. Total dry matter yields with two cuttings averaged 1.25 tons/acre total in the seeding year. These plots were harvested as demonstration plots in June and July in 2019. Italian ryegrass averaged 2.2 and 1.3 tons/acre in cuts 1 and 2 in 2019, slightly higher than the annual ryegrass varieties average of 1.9 and 1.0 tons/acre for the 2 cuts 2019.

A similar trial with Italian and annual ryegrass varieties was planted in early August 2019. This trial was harvested once in October 2019. Seven varieties of Italian and annual ryegrass averaged 1.3 tons per acre, ranging from 1.1 to 1.5. (Table 28, page 30). This trial will be evaluated for winter survival and targeted for two cuttings in 2020.

**ALFALFA VARIETY TEST**

Michigan State University has evaluated more than 100 commercially available alfalfa varieties in its alfalfa variety trials since 2009. Plant breeders, developers, and marketers submit alfalfa varieties for evaluation. Varieties seeded in these trials are evaluated for yield and persistence for three full years after the seeding year. Testing locations in 2018 for the Michigan alfalfa variety trials were the Upper Peninsula Research and Extension Center at Chatham, the Lake City Research Center at Lake City, and the Michigan State University Agronomy Farm at East Lansing. Because glyphosate is used for weed control in Roundup-Ready trials, these are conducted as separate tests from conventional varieties. Vernal, a highly fall-dormant (FD 2) public variety released in 1953 has poor disease resistance compared to modern varieties, is used as the historical check variety to maintain long-term comparisons across time. An index value for variety yield as a percent of Vernal is presented for each conventional alfalfa entry. Because there is no industry standard check variety with the RR trait, index values in RR alfalfa tests are presented as a percentage of the test average.

**Alfalfa Trait Ratings**

Ratings for plant traits are shown in **Table 3**. *Roundup Ready (RR)* varieties are resistant to the herbicide glyphosate (Roundup and many other trade names) which can simplify weed control during the critical alfalfa establishment phase.

**Fall Dormancy and Winterhardiness Ratings.**

*Fall dormancy (FD)* ratings are determined by the amount of regrowth after a mid-September cutting. They depend on alfalfa response to daylength and temperature and are useful as an indicator of growth rate potential after cutting or winter dormancy. Moderately dormant (FD = 5) varieties grow earlier in the spring and later in the fall, grow back faster at every cutting, mature a few days earlier, and often yield more than dormant (FD =3-4) or very dormant (FD = 1-2) varieties in the East Lansing test. The yield advantage of FD5 is much less at the Lake City and UP test locations, but tested FD5 varieties with adequate WSI have been persistent in our northern tests. Non-dormant alfalfa varieties (FD = 6-11) are not recommended for use in Michigan except as an annual or cover crop where survival for more than one growing season is not expected.

*Winter survival index (WSI)* is the preferred rating system for evaluating winterhardiness of alfalfa varieties. A lower WSI value indicates better winterhardiness, and WSI of 1-2 is recommended for Michigan. Within a FD rating, varieties can differ considerably for winter survival index (WSI). The FD and WSI ratings for varieties in the Michigan tests are given in **Table 3.**

**Alfalfa Disease and Pest Ratings.**

An alfalfa variety consists of a population of plants which are genetically different from each other. Varieties are described

according to the mean response of all plants, such as average yield, and as a frequency of certain types of plants, such as the percentage of plants resistant to some pest or disease. Thus, even in a "resistant" variety, only a portion of the plants will be resistant. Moderate resistance, for example, means that 15 to 30% of the established plants are resistant, leaving 70 to 85% susceptible. Therefore, a variety classified as resistant may still suffer damage from a disease, especially in the seedling stage. Moderate resistance is generally considered adequate for good alfalfa production. A list of disease resistance ratings for varieties evaluated at MSU is provided in **Table 3.** Additional information and photos of alfalfa diseases can be found at www.alfalfa.org/pdf/AlfalfaAnalyst.pdf.

***Bacterial Wilt (BW).*** BW is present in all of Michigan. All of the named varieties sold in Michigan are adequately resistant to BW.

***Phytophthora Root Rot (PRR).*** This fungal disease, first found in Michigan in 1972, is now one of the state's most important alfalfa diseases. PRR occurs primarily on heavy or poorly drained soils, but any soil may result in severe injury if saturated for seven to ten days, especially to one- to two-month old seedlings. Planting seed treated with *Apron* or *Stamina* may further reduce disease when planting resistant varieties. Treating a susceptible variety, such as Vernal, with a seed fungicide is unlikely to compensate for susceptibility. Most of the highest yielding varieties entered in our tests are resistant to PRR.

***Anthracnose (AN).*** This disease was first found in Michigan in 1976. It occurs during hot, moist summers and is most common in the southern third of Lower Michigan. The fungus infects stems and crowns and may kill some plants. We recommend that only anthracnose resistant varieties be planted in Michigan.

***Verticillium Wilt (VW).*** First detected in Michigan in 1982, VW has not increased in severity as expected. It is generally introduced with infected seed and is usually not a problem until the third year, and then primarily in the first cutting. Growing alfalfa in rotation with corn will help break the disease cycle.

***Aphanomyces (APH).*** *Aphanomyces euteiches* is a soil-borne fungus that is similar to PRR and thrives in cool-moist conditions. It can kill or severely stunt young seedlings and causes a chronic root disease in established plants. Seedlings infected with APH will have yellow leaves (chlorosis) and gray roots and stems. There are three races of APH. Race 1 and 2 are confirmed to be present in Michigan. Alfalfa resistant to race 2 is also resistant to race 1; however, resistance to race 1 does not infer resistance to race 2. Resistance to APH should be considered when establishing alfalfa in poorly drained areas. Apron does not control APH, but Stamina may be helpful.

***Stem nematode (SN).*** *Ditylenchus dipsaci* is a microscopic pest that can become a problem in areas where alfalfa is grown for many years. Symptoms of nematode damage include stunted plants and club-like stems. Crop rotation is the best method for controlling stem nematode.

**How to Select an Alfalfa Variety for Michigan.** Appropriate variety selection depends on location, desired stand life, cutting management, yield goal, and forage quality goal. Location matters because fewer cuttings are possible in shorter growing seasons. Intensive six-cut systems are possible in southernmost counties, but it is rarely practical to get more than three cuts in the Upper Peninsula. Regardless of location, there is always a tradeoff between number of cuttings and stand persistence. More cuttings per year means shorter harvest intervals that result in greater forage quality and greater cumulative yield for the first three to four years. The tradeoff is reduced stand life because of stress on roots. Varieties chosen for short-term, intensively managed stands in Michigan (three to four years) should be: dormant to moderately dormant (FD= 4-5), winterhardy (WSI rating 1 to 2), high yielding, and resistant to bacterial wilt (BW) and anthracnose (AN). Resistance to phytophthora root rot (PRR) is also recommended when alfalfa is grown on damp, fine-textured soils. For stand life longer than four years or for

Northern Michigan and UP regions, select dormant (FD = 2-4), winterhardy (WSI 1 to 2) varieties with high yields and resistance to BW, AN, PRR, and VW. Keep in mind that the reliability of variety rankings increases with the number of environments (i.e. the number of tests) in which the variety has been tested. Therefore, varieties that have been entered in only one or two tests may not perform as expected in a farm situation.

## EVALUATION OF OTHER LEGUMES

Red clover (*Trifolium pratense*) varieties were seeded in 2017 and 2018 for evaluation in Michigan at East Lansing. Red clover is a good species for pasture renovation or works well as a short-term hay or haylage crop. Red clover usually produces greater yield in the seeding year than alfalfa, but generally only persists for two years. Improved varieties under proper management may persist beyond three years. These trials are being established and harvested for three years including the seeding year. Plot size is generally 3 ft wide by 20 to 25 ft long with 2 to 3 cuttings per year.

## PERENNIAL COOL-SEASON GRASS TEST

A brief description of grass species with a summary of management recommendations is in **Table 2.** When selecting a grass variety, first consider adaptation of the ***species*** to the conditions of the proposed site and intended use as hay/haylage or pasture. Only then should individual varieties and desired yield come under consideration. The reliability of variety rankings increases with the number of environments (i.e. the number of tests) in which the variety has been tested. Therefore, varieties that have been entered in only one or two tests may not perform as expected in a farm situation.

Perennial cool-season grasses are evaluated for yield and persistence. Commercially available and experimental entries of orchardgrass, tall fescue, meadow fescue, timothy, perennial ryegrass, Kentucky bluegrass, and festulolium have been seeded in trials at the three locations. More than 50 varieties have been evaluated at East Lansing and more than 25 varieties have been planted at Lake City or Chatham. Nitrogen fertilizer is applied at green-up in early April and after each cutting.

**Orchardgrass** (*Dactylis glomerata* L.) is a high-yielding, competitive, perennial bunchgrass that grows more rapidly than most other Michigan forages in the early spring. Orchardgrass grows well on a wide range of soil types, but is not well suited for wet sites. Orchardgrass has similar nutritive characteristics to timothy and smooth bromegrass and is often grown together with alfalfa. Because orchardgrass matures earlier than alfalfa, late-maturing varieties of orchardgrass are preferred when the two are grown in mixture.

**Bromegrasses** (*Bromus spp*.) are rhizomatous, sod-forming grasses that are high in forage quality and yield. **Smooth bromegrass** is one of the most winter-hardy grasses in Michigan and can be grown on a wide range of soil types. Smooth bromegrass has poor regrowth potential, producing most of its yield in the first cutting, and it should not be grazed or cut during stem elongation or early heading to prevent a reduction in tillering. **Meadow brome** has better regrowth potential and heat tolerance than smooth brome. Crosses between smooth and meadow brome, sometimes called **Intermediate Brome**, can have the best traits of both parents.

**Timothy** (*Phleum pratense* L.) is a bunchgrass that forms an open sod and persists well under poorly drained conditions. It is best known for its winterhardiness and ability to survive under ice sheeting. Timothy is a late-maturing grass that traditionally produces most of its yield in the first cutting and requires a long rest period after harvest, making it undesirable for harvest systems with more

than two cuttings. Newer timothy varieties are bred for better regrowth potential.

**Fescues** (*Schedonorus* spp.) are sod-forming grasses with good seasonal growth distribution, and especially good fall growth. Tall fescue is persistent under frequent short grazing, heavy traffic, heat, drought, and poor drainage on a range of soil types, but has less cold tolerance for Northern Michigan than many other grasses. Tall fescue naturally contains an endophytic fungus that aids plant stress tolerance, but produces alkaloids toxic to livestock eating the forage. Many new varieties of **tall fescue** are endophyte-free or contain "friendly" novel endophytes that are not toxic to animals. Tall fescue varieties containing the toxic wild-type endophyte (E+) are not recommended for Michigan. **Meadow fescue** has better forage quality, palatability, and cold tolerance than tall fescue and does not contain toxic endophytes, but yields less.

**Ryegrasses** (*Lolium spp.*) are sod-forming bunchgrasses that are noted for extremely high forage quality and good regrowth potential. **Perennial ryegrass** is suitable for rotational grazing and multiple harvests for haylage, but it lacks the winterhardiness of many other grasses in Michigan, will go dormant under hot, dry conditions, and is difficult to dry as hay because of its waxy leaf cuticle. It requires high fertility and performs best under irrigation in Michigan. **Annual (Westerwold)** and **Italian ryegrasses** are short-lived species that differ from each other primarily in vernalization requirement for flowering. Italian ryegrass requires a cold period to initiate heading and annual ryegrass do not. Italian and annual ryegrasses are generally similar to perennial in adaptation and use characteristics, except that many varieties are not winterhardy in Michigan.

**Festuloliums** (*Schedonorus x Lolium spp.*) are crosses between a fescue (meadow or tall fescue) and a ryegrass (perennial or Italian ryegrass), thus combining the persistence and productivity of fescue with the palatability and nutritive quality of ryegrass. The large number of possible parent combinations results in a great range of appearance, yield and quality characteristics among festulolium varieties—some resemble fescue while others resemble ryegrass.

**Kentucky bluegrass** (*Poa pratensis* L.) is a relatively short-statured, sod-forming perennial grass that is very palatable when vegetative. It persists under frequent, close grazing and is very winter hardy in Michigan, but is unpalatable when heading and quickly goes dormant under hot, dry summer conditions. Because of low yield potential, Kentucky bluegrass is more suitable for grazed than harvested forage systems.

## ANNUAL GRASS TESTS

Annual grass trials are planted in plots 4 ft wide by at least 20 ft long. Harvest area is from the center 3 ft (6 rows) of each plot. Weed control is usually not needed in this trial, and it is fertilized with 50 lbs/acre N prior to first cutting and after first and second cutting. These trials are planted in the spring and typically harvested three times in the seeding year. Winter survival is evaluated the following spring and yield is obtained on surviving entries.

## STATISTICS

For completed trials, yields are presented as the average annual yield for the three years after establishment. For trials not yet completed, averages are presented as the average annual yield for the years available, excluding the establishment year. Check varieties are included in most tests to provide reference points for estimation of relative differences among tests conducted in different years or sites. The relative difference among varieties is expressed as a percentage of the check variety yield. Choice of varieties used as checks is based on familiarity to most producers across a wide area of the USA. Where check varieties are not available, relative differences are expressed as a percentage of the test average.

Comparison of yields among varieties should only be made within a trial. Under these conditions, statistical tests allow accurate separation of true genetic effects from random variation attributed to field or weather conditions. Space restrictions prevent publication of the entire test results here, but statistics including Least Significant Difference (LSD) and coefficient of variation (CV) for all forage variety trials are listed in the yearly yield data reports posted on the web at Michigan State University Forage Connection http://www.forage.msu.edu.

Table 2. Planting specifications and site/use suitability of tested forage species in Michigan

| | Seeding rate (lb/acre) † | Seeds/lb (approx.) | Ease of establishment | Stand life (yr) | Acid | Wet | Drought | Cold | Heat | Pasture | Hay |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alfalfa | 12-16 | 213,000 | Easy | 3-5+ | P†† | P | VG | E | VG | VG | E |
| Red Clover | 8-12 | 262,000 | Easy | 2 | G | VG | P | E | F | VG | G |
| Brome, meadow | 15-20 | 93,000 | Fair | 5+ | G | P | VG | E | G | VG | VG |
| Brome, smooth | 12-15 | 139,000 | Slow | 5+ | G | P | E | E | E | VG | E |
| Fescue, meadow | 15-20 | 280,000 | Easy | 3-4 | VG | VG | F | E | F | E | E |
| Fescue, tall | 12-15 | 218,000 | Easy | 5+ | E | VG | E | G | E | E | E |
| Festulolium | 20-30 | 207,000 | Easy | 2-3 | G | VG | F | VG | P | E | G |
| KY bluegrass | 8-15 | 2,056,000 | Easy | 5+ | G | F | P | E | P | E | P |
| Orchardgrass | 10-15 | 536,000 | Easy | 3-5 | G | F | VG | VG | G | VG | E |
| Reed canarygrass | 6-8 | 509,000 | Slow | 5+ | VG | E | E | E | G | G | VG |
| Ryegrass, Annual/Italian | 20-30 | 209,000 | Easy | 1 | VG | VG | P | F | P | E | G |
| Ryegrass, perennial | 20-30 | 278,500 | Easy | 2-5 | VG | VG | P | F | P | E | P |
| Timothy | 6-8 | 1,119,000 | Easy | 5+ | VG | VG | P | E | G | F | E |

†Use lower end of range for drilling and higher end for broadcasting. Reduce rates proportionately when planting in mixtures.
††Suitability Rating: P = poor, F = fair, G = good, VG = very good, E = excellent, * = variety-dependent.

**Table of Contents**

Table 3. Fall dormancy (FD), winter survival index (WSI), and disease resistance ratings for alfalfa cultivars in MSU variety trials

| Variety | FD † | WSI†† | BW ‡ | PRR | AN | VW | FW | Aph 1 | Aph 2 | SN | RR | PLF | Multi | Salt | Stand | Marketer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6415 | 4 | 2 | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | NEXGROW |
| 6417 | 4 | 2 | HR | HR | HR | HR | HR | HR | HR | R | - | - | H | - | - | NEXGROW |
| 6431 | 4 | 2 | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | - | NEXGROW |
| 428RR | 4 | 1 | HR | HR | HR | HR | HR | HR | - | MR | RR | - | H | G | - | Allied Seed |
| 4A415 | 2 | 2 | HR | HR | HR | HR | HR | HR | R | HR | - | - | - | - | - | Mycogen |
| 4A421 | 4 | 2.5 | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | Mycogen |
| 4S417 | 4 | 2 | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | Mycogen |
| 430 RR LH | 4 | 2 | HR | HR | HR | HR | HR | HR | - | MR | RR | HR | H | - | - | Farm Science |
| 6200HT | 2 | 2.5 | HR | HR | HR | HR | HR | HR | - | MR | - | - | - | - | - | NEXGROW |
| 6305Q | 3 | 1 | HR | HR | HR | HR | HR | HR | - | R | - | - | H | - | - | NEXGROW |
| 6422Q | 4 | 1 | HR | HR | HR | HR | HR | HR | - | R | - | - | H | - | - | NEXGROW |
| 6424R | 4 | 2 | HR | HR | HR | HR | HR | HR | HR | R | RR | - | H | - | - | NEXGROW |
| 6475H | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | - | HR | H | - | - | NEXGROW |
| 6497R | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | RR | - | H | G | - | NEXGROW |
| 6585Q | 5 | 2 | HR | HR | HR | HR | HR | HR | - | HR | - | - | H | - | - | NEXGROW |
| 9200 RR | 4 | 1.5 | HR | HR | HR | HR | HR | HR | - | - | RR | - | - | - | - | LG Seeds |
| AFX 429 | 3 | - | HR | HR | HR | HR | HR | HR | R | R | - | - | L | - | - | Alforex Seeds |
| AFX 469 | 4 | - | HR | HR | HR | HR | HR | HR | - | HR | - | - | L | G | - | Alforex Seeds |
| AFX460 | 4 | 2 | HR | HR | HR | HR | HR | HR | R | R | - | - | - | - | - | Alforex Seeds |
| AlfaFour Supreme | 4 | 2 | HR | HR | HR | HR | HR | HR | R | R | - | - | - | - | - | CHS Seed |
| AmeriStand 403T Plus | 4 | 2 | HR | HR | HR | HR | HR | HR | R | MR | - | - | - | - | - | America's Alfalfa |
| AmeriStand 407TQ | 4 | 2 | HR | HR | HR | HR | HR | HR | - | HR | - | - | H | - | - | America's Alfalfa |
| AmeriStand 409LH | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | - | HR | - | - | - | America's Alfalfa |
| AmeriStand 455TQ RR | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | RR | - | H | G | - | America's Alfalfa |
| Armour | 4 | 2 | HR | HR | HR | HR | HR | HR | - | - | RR | - | - | - | - | Becks Hybrids |
| Caliber | 4 | 2 | HR | HR | HR | HR | HR | HR | MR | MR | - | - | - | - | - | Becks Hybrids |
| CavalryDQ | 4 | 2 | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | Becks Hybrids |
| Contender | 5 | 2 | HR | HR | HR | HR | HR | HR | - | R | - | - | - | - | - | Becks Hybrids |
| DG 3210 | 3 | 1 | HR | HR | HR | HR | HR | HR | - | R | - | - | - | - | - | Crop Production |
| DG 4210 | 4 | 1 | HR | HR | HR | HR | HR | HR | - | R | - | - | H | - | - | Crop Production |
| DKA40-51RR | 4 | 1 | HR | HR | HR | HR | HR | HR | HR | R | RR | - | - | - | - | Dekalb |
| DKA41-18RR | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | RR | - | H | - | - | Dekalb |
| DKA43-13 | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | - | - | H | - | - | Dekalb |
| DKA43-22RR | 4 | 2 | HR | HR | HR | HR | HR | HR | R | HR | RR | - | H | - | - | Dekalb |
| DKA44-16RR | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | RR | - | H | G | - | Dekalb |
| Emerald | 4 | 1 | HR | HR | HR | HR | R | HR | HR | R | - | - | - | - | - | TriCal |
| Enduro Elite | 4 | - | HR | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | Cisco Seeds |
| Evergreen 3 | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | - | - | - | - | - | NEXGROW |
| FF42.A2 | 4 | 1.9 | HR | HR | HR | HR | HR | HR | HR | HR | - | - | - | - | - | Lacrosse |
| Fierce | 4 | 2 | HR | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | Becks Hybrids |
| ForageGold | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | - | - | M | - | - | Renk Seed |
| Fortune | 4 | - | HR | HR | HR | HR | HR | HR | - | R | - | - | - | - | - | DLF International |
| FSG 329 | 3 | 2 | HR | HR | HR | HR | HR | HR | - | HR | - | - | L | - | - | Farm Science |
| FSG 400 LH | 4 | - | HR | HR | HR | HR | HR | HR | - | - | - | HR | - | - | - | Farm Science |
| FSG 403LR | 4 | 2 | HR | HR | HR | HR | HR | HR | R | R | - | - | - | - | R | Farm Science |
| FSG 415 BR | 4 | 2 | HR | HR | HR | HR | HR | HR | R | - | - | - | - | - | - | Farm Science |
| FSG 420 LH | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | - | HR | L | - | - | Farm Science |
| FSG 424 | 4 | 1 | HR | HR | HR | HR | HR | HR | HR | R | - | - | H | G | - | Farm Science |
| FSG 426 | 4 | 2 | HR | HR | HR | HR | HR | HR | HR | - | - | - | H | - | - | Farm Science |
| GA 409 | 4 | - | HR | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | Pref Alfalfa Gen |
| GA 497 HD | 5 | 2 | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | Pref Alfalfa Gen |
| Gunner | 5 | 1 | HR | HR | HR | HR | HR | HR | - | R | - | - | H | - | - | Croplan Genetics |
| Hi-Gest 360 | 3 | 1.5 | HR | HR | HR | HR | HR | HR | HR | R | - | - | M | G | - | Alforex Seeds |
| HybriForce 2400 | 4 | 1.8 | HR | HR | HR | HR | HR | HR | - | HR | - | - | - | F | - | Dairyland Seeds |
| HybriForce 3400 | 4 | 1.5 | HR | HR | HR | HR | HR | HR | MR | HR | - | - | - | - | - | Dairyland Seeds |
| HybriForce 3400QR | 4 | 1.5 | HR | HR | HR | HR | HR | HR | MR | - | - | - | - | - | - | Dairyland Seeds |
| HybriForce 3420 Wet | 4 | - | HR | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | Dairyland Seeds |
| HybriForce 3420/Wet-OB1 | 4 | - | HR | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | Osprey Biotechnics |
| HybriForce 3420/Wet-OB2 | 4 | - | HR | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | Osprey Biotechnics |
| HybriForce 3430 | 4 | - | HR | HR | HR | HR | HR | HR | R | - | - | - | - | - | - | Dairyland Seeds |

Table 3 continued next page

Table 3 continued

| Variety | FD † | WSI†† | BW ‡ | PRR | AN | VW | FW | Aph 1 | Aph 2 | SN | RR | PLF | Multi | Salt | Stand | Marketer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HybriForce 4400 | 4 | 2 | HR | HR | HR | HR | HR | HR | R | HR | - | - | - | - | - | Dairyland Seeds |
| HybriPro BR | 5 | - | HR | HR | HR | HR | HR | HR | R | HR | - | - | - | - | - | Hyland Seeds |
| Integra 8420 | 4 | - | HR | HR | HR | HR | HR | HR | HR | HR | - | - | M | - | - | Wilbur-Ellis |
| Integra 8444R | 4 | - | HR | HR | HR | HR | HR | HR | HR | HR | RR | - | M | G/F | - | Wilbur-Ellis |
| Integra 8450 | 4 | - | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | Wilbur-Ellis |
| KingFisher 4020 | 4 | - | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | Byron Seeds |
| KF406A2 | 4 | 2 | HR | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | Byron Seeds |
| KF425HD | 5 | 2 | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | Byron Seeds |
| L455HD | 4 | - | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | Legacy Seeds |
| LegenDairy 5.0 | 3 | 3 | HR | HR | HR | HR | HR | R | - | MR | - | - | H | - | - | Croplan Genetics |
| LegenDairy XHD | 3 | 2 | HR | HR | HR | HR | HR | HR | - | HR | - | - | H | G | - | Croplan Genetics |
| Magnitude | 4 | 1 | HR | HR | HR | HR | HR | HR | - | HR | - | - | H | G | - | Allied Seed |
| Magnum 7 WET | 4 | 1.6 | HR | HR | HR | HR | HR | HR | R | HR | - | - | - | - | - | Dairyland Seeds |
| Mariner IV | 4 | 2 | HR | HR | HR | HR | HR | HR | R | HR | - | - | - | - | - | Allied Seed |
| Octane | 3 | 1.4 | HR | HR | HR | HR | HR | HR | HR | - | - | - | L | - | - | Brett Young |
| Oneida VR | 3 | - | R | MR | MR | HR | HR | - | - | - | - | - | - | - | - | Public |
| PGI 459 | 4 | 2 | HR | HR | HR | HR | HR | R | R | HR | - | - | - | - | - | Alforex Seeds |
| PGI 529 | 5 | 2 | HR | HR | HR | HR | HR | - | - | R | - | - | M | - | - | Alforex Seeds |
| PGI 557 | 5 | 2 | HR | HR | HR | HR | HR | HR | - | HR | - | - | L | - | - | Alforex Seeds |
| Pioneer 54Q14 | 4 | 1 | HR | HR | HR | HR | HR | HR | R | MR | - | - | - | - | - | Pioneer |
| Pioneer 54Q32 | 4 | - | HR | HR | HR | HR | HR | HR | - | LR | - | - | - | - | - | Pioneer |
| Pioneer 55H94 | 5 | - | HR | HR | HR | HR | HR | HR | - | HR | - | HR | - | - | - | Pioneer |
| Pioneer 55Q27 | 5 | 1 | HR | HR | HR | HR | HR | HR | R | HR | - | - | - | - | - | Pioneer |
| Pioneer 55QR04 | 4 | 1 | HR | HR | HR | HR | HR | HR | - | R | RR | - | H | - | - | Pioneer |
| Pioneer 55V12 | 5 | - | R | HR | HR | HR | HR | HR | R | R | - | - | - | - | R | Pioneer |
| Pioneer 55V48 | 5 | - | HR | HR | HR | R | HR | HR | R | R | - | - | - | - | - | Pioneer |
| Pioneer 55V50 | 5 | - | HR | HR | HR | HR | R | HR | HR | R | - | - | - | - | - | Pioneer |
| Pioneer 55VR06 | 5 | 1 | HR | HR | HR | HR | R | HR | MR | MR | RR | - | - | - | - | Pioneer |
| Pioneer 55VR08 | 5 | - | HR | HR | HR | HR | HR | HR | HR | R | RR | - | - | - | - | Pioneer |
| Prolific II | 3 | 2 | HR | HR | HR | HR | HR | HR | R | HR | - | - | - | - | - | Hyland Seeds |
| Rebound 6.0 | 4 | 1 | HR | HR | HR | HR | HR | HR | HR | R | - | - | - | - | - | Croplan Genetics |
| Rebound 6XT | 4 | 1 | HR | HR | HR | HR | HR | HR | HR | - | - | - | H | - | - | CropLan Genetics |
| RR AphaTron 2XT | 4 | 1 | HR | HR | HR | HR | HR | HR | HR | - | RR | - | H | G | - | CropLan Genetics |
| RR Stratica | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | RR | - | H | G | - | Croplan Genetics |
| RR501 | 5 | 2 | HR | HR | HR | - | HR | HR | - | HR | RR | - | H | G/F | - | Channel |
| SolarGold | 4 | 2 | HR | HR | HR | HR | HR | HR | MR | MR | - | - | H | - | - | Renk Seed |
| Sonic | 4 | 1 | HR | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | Nutech Seed |
| StarGold | 5 | - | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | Renk Seed |
| Stalwart II | 5 | 1.5 | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | LG Seeds |
| SW4107 | 4 | - | HR | HR | HR | HR | HR | HR | HR | R | - | - | - | - | - | S&W Seeds |
| TriFecta | 5 | 2 | HR | HR | HR | HR | R | HR | HR | MR | - | - | - | - | - | TriCal |
| Vernal | 2 | 2 | R | S | S | S | MR | S | - | S | - | - | - | - | - | Public |
| WL 343 HQ | 4 | 1.5 | HR | HR | HR | HR | HR | HR | - | MR | - | - | H | - | - | W-L Research |
| WL 353 LH | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | - | HR | - | - | - | W-L Research |
| WL 354 HQ | 4 | 1 | HR | HR | HR | HR | HR | HR | HR | R | - | - | H | - | - | W-L Research |
| WL 356 HQ RR | 4 | 1 | HR | HR | HR | HR | HR | HR | HR | HR | RR | - | H | G | - | W-L Research |
| WL 363 HQ | 5 | 2 | HR | HR | HR | HR | HR | HR | - | HR | - | - | H | - | - | W-L Research |
| WL 365 HQ | 5 | 1 | HR | HR | HR | HR | HR | HR | - | - | - | - | - | - | - | W-L Research |
| WL 372 HQ RR | 5 | 2 | HR | HR | HR | HR | HR | HR | - | HR | RR | - | - | - | - | W-L Research |
| Yieldmaster RR | 4 | 2 | HR | HR | HR | HR | HR | HR | - | R | RR | - | H | - | - | Monsanto |

† Refer to Alfalfa Trait Ratings found in the summary for more information

†† Winter survival index : 1=superior winter survival, 2=very good, 3=good, 4=adequate, 5=low, 6=no winter survival.

‡ BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt,

APH 1 = Aphanomyces race one, APH 2 = Aphanomyces race two, SN=Stem nematode, RR = Roundup Ready® Alfalfa Variety, PLF = Potato leafhopper resistance, Multi = Multifoliate leaf expression (H-High, M-Medium, L-Low), Salt = Salt tolerance (G = germination, F = Forage), Stand = Standability or lodging resistance.

Table 4. Long-term yield averages (dry matter tons/acre) from MSU Alfalfa Variety Trials seeded in East Lansing, Michigan from 2010 to 2018

| | | Three-year average ‡ | | | | | | | 2-year average | 1-year total | (Trials) † |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | % |
| Variety | Marketer | (2011-13) | (2012-14) | (2013-15) | (2014-16) | (2015-17) | (2016-18) | (2017-19) | (2018-19) | (2019) | Vernal †† |
| | | dry matter tons/acre | | | | | | | | | |
| 4S417 | Mycogen Seeds | 6.38 | - | - | - | - | - | - | - | - | (1)115 |
| 6417 | NEXGROW | 6.36 | - | - | - | - | - | - | - | - | (1)115 |
| 6422Q | NEXGROW | - | 6.19 | - | - | - | - | - | - | - | (1)109 |
| 6585Q | NEXGROW | - | - | - | 6.13 | - | - | - | - | - | (1)117 |
| AFX 429 | Alforex Seeds | - | - | - | - | - | - | - | 4.73 | - | (1)100 |
| AFX 469 | Alforex Seeds | - | - | - | - | - | - | - | 4.90 | - | (1)104 |
| AFX 460 | Alforex Seeds | - | - | - | - | - | - | - | 5.05 | 4.67 | (1)107 |
| AlfaFour Supreme | CHS Seed | - | 6.79 | - | - | - | - | - | - | - | (1)120 |
| Ameristand 407TQ | America's Alfalfa | - | 6.28 | - | - | - | - | - | - | - | (1)111 |
| Caliber | Becks Hybrids | - | - | - | - | 5.81 | 4.33 | - | - | - | (2)110 |
| CavalryDQ | Becks Hybrids | - | - | - | - | - | 5.02 | - | 4.98 | - | (2) 117 |
| Contender | Becks Hybrids | - | - | 6.21 | - | 5.80 | 4.64 | - | - | - | (3)112 |
| DG 4210 | Crop Production | 6.56 | 6.23 | - | 6.16 | - | - | - | - | - | (3)115 |
| DKA43-13 | Dekalb | 6.31 | - | - | - | - | - | - | - | - | (1)114 |
| Emerald | TriCal | - | - | - | - | - | - | - | - | 5.10 | - |
| Enduro Elite | Cisco Seeds | - | - | - | - | 5.73 | - | - | - | - | (1)109 |
| FF42.A2 | Lacrosse Seeds | - | - | - | - | - | 5.05 | - | - | - | (1)129 |
| Fierce | Becks Hybrids | - | - | - | - | 5.86 | 4.94 | - | 4.75 | - | (3)113 |
| ForageGold | Renk Seed | - | - | 5.79 | - | - | - | - | - | - | (1)100 |
| Fortune | DLF International | - | - | - | - | - | - | 5.34 | - | - | (1)120 |
| FSG 415 BR | Farm Science | - | - | - | - | - | 5.33 | - | - | - | (1)136 |
| FSG 403LR | Farm Science | - | - | - | 6.04 | - | - | - | - | - | (1)115 |
| FSG 424 | Farm Science | - | - | - | 6.30 | - | - | - | - | - | (1)120 |
| FSG 426 | Farm Science | - | - | - | - | - | 4.74 | - | - | - | (1)121 |
| GA 409 | Preferred Alfalfa Gen | - | - | - | - | 5.79 | - | - | - | - | (1)110 |
| GA-497HD | Preferred Alfalfa Gen | - | - | - | - | - | - | 5.23 | - | - | (1)118 |
| Gunner | Croplan Genetics | - | 5.83 | - | - | - | - | - | - | - | (1)103 |
| HybriForce 2400 | Dairyland Seed | 6.27 | - | - | - | - | - | - | - | - | (1)113 |
| HybriForce 3400 | Dairyland Seed | - | 6.50 | 7.00 | 6.43 | - | 4.73 | - | - | - | (4)120 |
| HybriForce 3400 QR | Dairyland Seed | - | - | 6.63 | - | - | - | - | - | - | (1)114 |
| HybriForce 3420 Wet | Dairyland Seed | - | - | - | - | - | - | 5.41 | - | - | (1)122 |
| HybriForce 3420/Wet-OB1 | Osprey Biotechnics | - | - | - | - | - | - | 5.46 | - | - | (1)123 |
| HybriForce 3420/Wet-OB2 | Osprey Biotechnics | - | - | - | - | - | - | 5.83 | - | - | (1)131 |
| HybriForce 3430 | Dairyland Seed | - | - | - | - | - | - | 5.49 | - | - | (1)123 |
| HybriForce 4400 | Dairyland Seed | - | - | - | - | - | 4.94 | 5.48 | 5.41 | 5.61 | (3)121 |
| HybriForce 4400-OBT2002 | Osprey Biotechnics | - | - | - | - | - | - | - | - | 5.45 | - |
| HybriForce 4400-OBT2013 | Osprey Biotechnics | - | - | - | - | - | - | - | - | 5.40 | - |
| HybriPro BR | Hyland Seeds | - | - | - | - | 5.68 | - | - | - | - | (1)108 |
| Integra 8420 | Wilbur-Ellis | - | - | - | - | - | - | 5.47 | - | - | (1)123 |
| Integra 8450 | Wilbur-Ellis | - | - | - | - | - | - | 5.54 | - | - | (1)124 |
| KingFisher 4020 | Byron Seed | 6.32 | - | - | - | - | - | - | - | - | (1)114 |
| KF406A2 | Byron Seed | - | - | - | - | - | - | 5.31 | - | - | (1)119 |
| KF425HD | Byron Seed | - | - | - | - | - | - | 5.37 | - | - | (1)121 |
| L455HD | Legacy Seeds | - | - | - | 5.98 | - | - | - | - | - | (1)114 |
| LegenDairy 5.0 | Croplan Genetics | - | 6.12 | - | - | - | - | - | - | - | (1)108 |
| LegenDairy XHD | Croplan Genetics | - | - | - | 6.20 | - | - | - | - | - | (1)119 |
| Magnitude | Allied Seed | - | - | 6.49 | - | - | - | - | - | - | (1)112 |
| Mariner IV | Allied Seed | - | - | 6.31 | - | - | - | - | - | - | (1)109 |
| Oneida VR | public | - | 5.56 | - | 5.53 | 5.33 | - | 4.68 | - | - | (4)103 |
| PGI 529 | Alforex | - | - | - | 6.66 | - | - | - | - | - | (1)127 |
| PGI 557 | Alforex | - | 6.11 | - | - | - | - | - | - | - | (1)108 |
| Pioneer 54Q14 | Pioneer | - | - | - | - | 5.54 | - | - | - | - | (1)106 |
| Pioneer 54Q32 | Pioneer | - | 6.03 | - | - | - | - | - | - | - | (1)106 |
| Pioneer 54QR04 | Pioneer | - | - | - | 5.95 | - | - | - | - | - | (1)114 |
| Pioneer 55Q27 | Pioneer | - | - | - | 6.38 | 6.13 | 4.96 | 5.22 | - | - | (4)121 |
| Pioneer 55V12 | Pioneer | - | 6.23 | 6.08 | - | - | - | - | - | - | (2)107 |
| Pioneer 55V50 | Pioneer | - | 6.85 | 6.95 | 6.59 | - | - | - | - | - | (3)122 |
| Prolific II | Hyland Seeds | - | 6.54 | - | - | 5.64 | - | - | - | - | (2)111 |
| Rebound 6.0 | Croplan Genetics | - | 6.01 | - | - | - | - | - | - | - | (1)106 |
| Rebound 6XT | Croplan Genetics | - | - | - | - | - | - | 5.10 | - | - | (1)115 |
| SolarGold | Renk Seed | - | 6.39 | 6.31 | - | - | - | - | - | - | (2)111 |
| Sonic | Nutech Seed | - | 6.21 | - | - | - | - | - | - | - | (1)110 |
| Stalwart II | LG Seeds | - | - | - | - | - | - | 5.14 | - | - | (1)116 |
| StarGold | Renk Seed | - | - | - | - | 6.17 | - | - | - | - | (1)118 |
| SW 4107 | S & W Seed Company | - | - | - | - | - | - | - | 5.14 | 5.39 | (1)109 |
| SW 5213 | S & W Seed Company | | | | | | | 5.51 | - | | (1)124 |
| TriFecta | TriCal | - | - | - | - | - | - | 5.52 | - | 5.64 | (1)124 |
| Vernal | public | 5.53 | 5.67 | 5.80 | 5.23 | 5.25 | 3.93 | 4.45 | 4.71 | 4.47 | (8)100 |
| WL343HQ | W-L Research | 5.81 | - | - | - | - | - | - | - | - | (1)105 |
| WL354HQ | W-L Research | - | 5.97 | - | - | - | - | - | - | - | (1)105 |
| WL363HQ | W-L Research | 6.26 | - | - | - | - | - | - | - | - | (1)113 |
| WL365HQ | W-L Research | - | - | - | - | - | - | 5.32 | - | - | (1)120 |
| **Mean** | | **6.20** | **6.20** | **6.36** | **6.12** | **5.73** | **4.78** | **5.31** | **4.96** | **5.22** | **114** |

† Number of 3-year trials with at least 2 years of data after the seeding year.
†† Average % Vernal of varieties with more than 2 full years of yield data

Table 5. Long-term yield averages (dry matter tons/acre) from MSU Alfalfa Variety Trials seeded in Lake City, Michigan from 2010 to 2016.

| Variety | Marketer | Three-year average ‡ 2010 (2011-13) | 2011 (2012-14) | 2012 (2013-15) | 2013 (2014-16) | 2014 (2015-17) | 2015 (2016-18) | 2016 (2017-19) | (Trials) † % Vernal †† |
|---|---|---|---|---|---|---|---|---|---|
| | | ---------- dry matter tons/acre ---------- | | | | | | | |
| 6417 | NEXGROW | 4.90 | - | - | - | - | - | - | (1)114 |
| 4A415 | Mycogen Seeds | 5.19 | - | - | - | - | - | - | (1)120 |
| 4S417 | Mycogen Seeds | 5.18 | - | - | - | - | - | - | (1)120 |
| 6305Q | NEXGROW | 4.91 | - | - | - | - | - | - | (1)114 |
| AmeriStand 403T Plus | America's Alfalfa | - | - | - | - | 3.18 | 4.36 | - | (2)96 |
| AmeriStand 407TQ | America's Alfalfa | - | 4.65 | - | - | - | - | - | (1)101 |
| DG 3210 | Crop Production | 4.62 | - | - | - | - | - | - | (1)107 |
| DG 4210 | Crop Production | 4.87 | 4.63 | - | 2.58 | 3.35 | 4.53 | - | (5)103 |
| ForageGold | Renk Seed | - | - | 3.89 | - | - | - | - | (1) 95 |
| HybriForce 2400 | Dairyland Seed | 4.87 | - | - | - | - | - | - | (1)113 |
| HybriForce 3400 | Dairyland Seed | - | - | 4.31 | - | 3.65 | 4.91 | - | (3)108 |
| Hi-Gest 360 | Alforex | - | - | - | - | 3.40 | - | - | (1) 97 |
| Integra 8420 | Wilbur-Ellis | - | - | - | - | - | - | 3.48 | (1)103 |
| Integra 8450 | Wilbur-Ellis | - | - | - | - | - | - | 3.44 | (1)102 |
| L455HD | Legacy Seeds | - | - | - | 2.77 | 3.83 | 4.48 | - | (3)107 |
| Magnum 7 WET | Dairyland Seed | - | - | - | - | 3.62 | 4.67 | - | (2)105 |
| Mariner IV | Allied Seed | - | - | - | - | 3.81 | 4.76 | - | (2)109 |
| Oneida VR | public | - | - | - | 2.61 | 3.62 | 4.63 | - | (3)104 |
| Octane | Brett Young | - | - | - | - | 3.46 | - | - | (1) 99 |
| Pioneer 54Q32 | Pioneer | - | 4.59 | 3.99 | - | - | - | - | (2) 99 |
| Pioneer 54Q14 | Pioneer | - | - | - | - | 3.20 | 4.45 | - | (2) 97 |
| Pioneer 54QR04 | Pioneer | - | - | - | 2.56 | - | - | - | (1)100 |
| Pioneer 55H94 | Pioneer | - | 4.39 | - | - | - | - | - | (1) 95 |
| Pioneer 55Q27 | Pioneer | - | - | - | 2.59 | 3.81 | 4.48 | 3.39 | (4)104 |
| Pioneer 55V12 | Pioneer | - | 4.36 | 3.98 | - | - | - | - | (2) 96 |
| Pioneer 55V50 | Pioneer | - | 4.80 | 4.09 | 2.73 | 3.79 | 4.83 | - | (5)106 |
| Prolific II | Hyland Seed | - | - | - | - | 3.81 | 4.72 | - | (2)109 |
| SolarGold | Renk Seed | - | - | 3.90 | - | - | - | - | (1) 96 |
| Sonic | Nutech Seed | - | 4.52 | - | - | - | - | - | (1) 98 |
| StarGold | Renk Seed | - | - | - | - | 3.48 | - | - | (1)100 |
| Vernal | public | 4.31 | 4.61 | 4.08 | 2.55 | 3.49 | 4.36 | 3.37 | (7)100 |
| WL 354HQ | W-L Research | - | - | - | - | 3.11 | - | - | (1) 89 |
| **Mean** | | **4.86** | **4.57** | **4.03** | **2.63** | **3.54** | **4.60** | **3.42** | **103** |

† Number of 3-year trials with at least 2 years of data after the seeding year.

†† Average % Vernal of varieties with more than 2 full years of yield data

Table 6. Long-term yield averages (dry matter tons/acre) from MSU Alfalfa Variety Trials seeded in Chatham, Michigan between 2012 and 2018.

| | | 3-year average ‡ | | | 1-year | (Number) † |
|---|---|---|---|---|---|---|
| | | 2012 | 2013 | 2015 | 2018 | % |
| Variety | Marketer | (2013-15) | (2014-16) | (2016-18) | (2019) | Vernal †† |
| | | ---------- dry matter tons/acre ---------- | | | | |
| DG 4210 | Crop Production | - | 3.74 | 3.28 | - | (2)102 |
| ForageGold | Renk Seed | 3.13 | - | - | - | (1) 98 |
| HybriForce 3400 | Dairyland | - | - | 3.45 | 2.73 | (1)110 |
| HybriForce 4400 | Dairyland | - | - | - | 2.86 | - |
| Integra 8420 | Wilbur-Ellis | - | - | - | 2.77 | - |
| Integra 8450 | Wilbur-Ellis | - | - | - | 2.68 | - |
| L455HD | Legacy | - | - | 3.20 | - | (1)102 |
| Magnum 7 WET | Dairyland | - | - | 3.13 | - | (1)100 |
| Mariner IV | Allied Seed | 3.13 | - | 3.14 | - | (2) 99 |
| Oneida VR | Public | - | - | 3.13 | - | (1)100 |
| Pioneer 55Q27 | Pioneer | - | - | 3.31 | - | (1)105 |
| Pioneer 55V12 | Pioneer | 3.31 | - | - | - | (1)100 |
| Pioneer 55V50 | Pioneer | 3.56 | 3.66 | - | - | (2)108 |
| Prolific II | Hyland Seeds | - | - | 3.28 | - | (1)104 |
| SolarGold | Renk Seed | 3.61 | - | - | - | (1)113 |
| StarGold | Renk Seed | - | - | 3.27 | - | (1)104 |
| SW4107 | S & W Seed Company | - | - | - | 2.60 | - |
| Trifecta | TriCal | | | | 2.85 | - |
| Vernal | Public | 3.19 | 3.53 | 3.14 | 2.83 | (4)100 |
| WL354HQ | W-L Research | - | - | 3.08 | - | (1) 98 |
| **Mean** | | **3.32** | **3.64** | **3.23** | **2.76** | **103** |

† Number of 3-year trials with at least 2 years of data after the seeding year.

†† Average % Vernal of varieties with more than 2 full years of yield data

‡ Seeding year and (the years the trial was harvested to obtain the average yield)

Table 7. Yields of Roundup Ready® Alfalfa Varieties (dry matter tons/acre) seeded from 2013 to 2018 at East Lansing, Lake City, and Chatham, Michigan .

| | | East Lansing | | | | | | Lake City | | | | | Chatham | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Three-year average ‡ | | | | 2-year avg | (Number) % | Three-year average ‡ | | | | (Number) % | Three-year average ‡ | | 1-year total | (Number) % |
| Variety | Marketer | 2013 2014-16 | 2014 † 2015-17 | 2015 2016-18 | 2016 2017-19 | 2017 2018-19 | Mean †† | 2013 2014-16 | 2014 2015-17 | 2015 2016-18 | 2016 2017-19 | Mean †† | 2013 2014-16 | 2015 2016-18 | 2018 2019 | Mean †† |
| | | ---------- dm tons/acre ---------- | | | | | | ---------- dm tons/acre ---------- | | | | | ---- dm tons/acre ---- | | | |
| 428RR | Allied Seed | 6.01 | - | - | - | - | (1)102 | - | - | - | - | - | - | - | - | - |
| 430RRLH | Allied Seed | - | - | 4.16 | - | - | (1) 89 | - | - | - | - | - | - | - | - | - |
| 6424R | NEXGROW | - | - | - | - | 4.67 | (1) 96 | - | - | - | - | - | - | - | 2.36 | - |
| 6497R | NEXGROW | 5.94 | - | - | - | - | (1)101 | - | - | - | - | - | - | - | - | - |
| 9200RR | LG Seeds | - | - | - | 4.79 | - | (1)101 | - | - | - | - | - | - | - | - | - |
| AmeriStand 455TQ RR | America's Alfalfa | 5.81 | - | - | - | - | (1) 99 | - | - | - | - | - | - | - | - | - |
| Armour | Becks Hybrids | - | - | - | - | 5.08 | (1)105 | - | - | - | - | - | - | - | - | - |
| DKA40-51RR | Dekalb | - | 5.10 | 4.80 | 4.49 | - | (3) 98 | - | 2.88 | 3.59 | 3.17 | (3) 96 | - | 2.83 | 2.22 | (1) 94 |
| DKA41-18RR | Dekalb | 5.72 | - | - | - | - | (1) 97 | 2.83 | - | 3.84 | - | (2)100 | 3.66 | 3.14 | - | (2)102 |
| DKA43-22RR | Dekalb | - | 5.20 | - | - | - | (1)102 | - | 3.10 | 4.06 | - | (2)104 | - | 3.11 | - | (1)103 |
| DKA44-16RR | Dekalb | 5.99 | 5.24 | 4.52 | 4.75 | 4.81 | (5)100 | 2.85 | 3.04 | 3.87 | 3.23 | (4)101 | 3.59 | 3.09 | 2.36 | (2)101 |
| Integra 8444R | Wilbur-Ellis | - | - | - | 4.61 | - | (1) 97 | - | - | - | 3.03 | (1) 95 | - | - | 2.26 | - |
| Pioneer 54QR04 | Pioneer | 5.98 | - | - | - | - | (1)102 | 2.84 | - | - | - | (1)101 | - | - | - | - |
| Pioneer VR06 | Pioneer | - | 5.40 | 5.16 | - | - | (2)107 | - | - | 3.87 | - | (1)101 | - | - | - | - |
| Pioneer 55VR08 | Pioneer | - | - | - | 5.01 | - | (1)106 | - | - | - | 3.36 | (1)105 | - | - | - | - |
| RR AphaTron 2XT | Croplan Genetics | - | - | - | 4.81 | - | (1)101 | - | - | - | - | - | - | - | - | - |
| RR 501 | Channel | - | 5.26 | - | - | - | (1)100 | - | - | - | - | - | - | 2.93 | - | (1) 97 |
| RR Stratica | Croplan Genetics | 5.95 | - | - | - | - | (1)101 | - | - | - | - | - | - | - | - | - |
| WL 356HQ.RR | W-L Research | 5.96 | - | - | - | - | (1)101 | - | - | - | - | - | - | - | - | - |
| WL 372HQ.RR | W-L Research | 5.88 | - | - | - | - | (1)100 | - | - | - | - | - | - | - | - | - |
| Yieldmaster RR | Monsanto | 5.70 | - | - | - | - | (1) 97 | 2.75 | - | - | - | (1) 98 | 3.64 | - | - | (1)100 |
| **Mean** | | **5.89** | **5.24** | **4.66** | **4.74** | **4.85** | | **2.82** | **3.01** | **3.85** | **3.20** | | **3.63** | **3.02** | **2.30** | |

Trials usually cut 4 times per year at East Lansing, three times per year at Lake City and Chatham.

† 2014 Seeding at East Lansing was cut 3 times in 2015, 4 times in 2016, and 5 times in 2017.

†† Number of trials at each location with at least 2 full harvest years of data and % of the mean.

‡ Seeding year and (the years the trial was harvested to obtain the average yield)

Table 8. Long-term average yields (dry matter tons/acre) of perennial forage grasses seeded from 2011 to 2017 and 1-year total from 2018 at East Lansing, Michigan.

| | | | Three-year average ‡ | | | | | 2-yr average ‡ | 1-yr total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2011 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | % species |
| Sp † | Variety | Marketer | (2012-14) | (2014-16) | (2015-17) | (2016-18) | (2017-19) | (2018-19) | (2019) | mean †† |
| | | | ---------- dry matter tons/acre ---------- | | | | | | | |
| FEST | Becva (ryegrass type) | DLF Pickseed USA Inc | - | - | 2.61 | - | - | - | - | (1)106 |
| FEST | Barfest (ryegrass type) | Barenbrug Seed | - | - | 2.33 | - | - | - | - | (1) 94 |
| FEST | Hostyn (ryegrass type) | DLF Pickseed USA Inc | - | - | - | - | - | - | 6.19 | - |
| FEST | Lofa (ryegrass type) | DLF Pickseed USA Inc | - | - | - | - | - | - | 6.31 | - |
| FEST | Perun (ryegrass type) | DLF Pickseed USA Inc | - | - | - | - | - | - | 5.89 | - |
| FEST | Federo (ryegrass type) | Albert Lea Seed | - | - | - | - | - | 4.53 | - | |
| **FEST** | **SPECIES MEAN (ryegrass type)** | | - | - | **2.47** | - | - | | **6.13** | - |
| FEST | Fojtan (fescue type) | DLF Pickseed USA Inc | - | - | - | - | 3.72 | - | - | (1) 95 |
| FEST | Mahulena (fescue type) | DLF Pickseed USA Inc | - | - | - | - | 4.11 | - | - | (1)105 |
| **FEST** | **SPECIES MEAN (TF Type)** | | **-** | - | - | - | **3.92** | - | - | |
| OR | Barlegro | Barenbrug Seed | - | - | 3.42 | - | - | - | - | (1)100 |
| OR | Echelon | DLF Pickseed | 3.79 | - | 3.43 | - | 4.45 | - | - | (3)102 |
| OR | FSG506OG | Allied Seed | - | - | 3.46 | - | - | - | - | (1)101 |
| OR | Inavale | DLF Pickseed USA Inc | 3.79 | - | - | - | - | - | - | (1) 98 |
| OR | Intensiv | Barenbrug Seed | 3.79 | - | 3.48 | - | - | - | - | (2)100 |
| OR | Lyra | Hood River Seed | - | - | - | - | 4.00 | - | - | (1) 96 |
| OR | Lucharm | Albert Lea Seed | - | - | - | - | - | 4.19 | - | (1) 99 |
| OR | Lukir | Albert Lea Seed | - | - | - | - | - | 4.07 | - | (1) 96 |
| OR | Persist | Smith Seed | 4.12 | - | 3.37 | - | - | - | - | (2)103 |
| OR | Potomac | check | 3.83 | - | 3.28 | 3.37 | 4.09 | 4.44 | - | (5)100 |
| OR | Treposno | Hood River Seed | - | - | - | - | 4.09 | - | - | (1) 98 |
| **OR** | **SPECIES MEAN** | | **3.86** | - | **3.41** | **3.37** | **4.16** | **4.23** | - | |
| PR | Albion (4n) | Cisco Seed | - | - | - | 2.33 | - | - | - | (1)100 |
| PR | Bison 2 (4n) | DLF Pickseed USA Inc | - | - | - | - | 3.59 | - | 3.92 | (1)117 |
| PR | Dexter 1 (4n) | DLF Pickseed USA Inc | - | - | - | - | 2.89 | - | 4.39 | (1) 94 |
| PR | Elena (4n) | Allied Seed | - | 2.25 | - | - | - | - | - | (1)136 |
| PR | Fennema (2n) | DLF Pickseed USA Inc | 2.21 | - | - | - | - | - | - | (1) 87 |
| PR | Garbor (4n) | DLF Pickseed USA Inc | - | - | - | - | 2.69 | - | 4.82 | (1) 88 |
| PR | Kentaur (4n) | DLF Pickseed USA Inc | 2.72 | - | - | - | - | - | - | (1)108 |
| PR | Linn (2n) | check | 2.39 | 1.07 | 2.22 | 2.31 | 2.72 | 3.41 | 3.54 | (6) 88 |
| PR | Mathilda (4n) | DLF Pickseed USA Inc | 2.50. | - | - | - | - | - | - | (1) 99 |
| PR | Mara (2n) | Barenbrug Seed | - | - | 2.59 | - | - | - | - | (1) 98 |
| PR | Maximo (4n) | DLF Pickseed USA Inc | - | - | 2.54 | - | 3.48 | - | - | (2)105 |
| PR | Payday (4n) | Smith Seed | - | - | 2.96 | - | - | - | - | (1)112 |
| PR | Tomaso | Albert Lea Seed | - | - | - | - | - | 3.25 | - | (1) 90 |
| PR | Remington (4n) | Barenbrug Seed | 2.81 | - | 2.88 | - | - | 4.18 | 5.26 | (3)112 |
| **PR** | **SPECIES MEAN** | | **2.53** | **1.66** | **2.64** | **2.32** | **3.07** | **3.61** | **4.39** | |
| SB | Lincoln | Check variety | - | - | 3.71 | - | - | - | - | (1)104 |
| SB | Hakari (Alaska Brome) | Barenbrug Seed | - | - | 3.33 | - | - | - | - | (1) 93 |
| SB | MBA | DLF Pickseed USA Inc | - | - | 3.70 | - | - | - | - | (1)103 |
| **SB** | **SPECIES MEAN** | | - | - | **3.58** | - | - | - | - | |
| MdF | Cosmonaut | Barenbrug Seed | - | - | 3.25 | - | - | - | - | (1) 98 |
| MdF | Pradel | Barenbrug Seed | - | - | 3.25 | 2.41 | 2.90 | 4.34 | 5.50 | (5)101 |
| MdF | SW Minto | Albert Lea Seed | - | - | - | - | - | 4.08 | - | (1) 97 |
| MdF | Raskila | Hood River Seed | - | - | - | - | 3.14 | - | - | (1)104 |
| **MdF** | **SPECIES MEAN** | | **-** | - | **3.25** | **2.41** | **3.02** | **4.21** | **5.50** | |
| TM | Climax | check | - | - | 2.94 | 2.73 | 3.50 | 3.98 | 4.97 | (4) 89 |
| TM | Dawn | Allied Seed | - | - | - | - | 4.00 | - | - | (1)104 |
| TM | Express II | Allied Seed | - | - | 3.44 | - | - | - | - | (1)108 |
| TM | KY Early Timothy | Smith Seed | - | - | - | - | - | 5.28 | 4.87 | (1)114 |
| TM | Winnetow | DLF Pickseed USA Inc | - | - | - | - | - | - | 5.20 | - |
| TM | Zenyatta | DLF Pickseed USA Inc | - | - | - | - | 3.99 | - | - | (1)104 |
| **TM** | **SPECIES MEAN** | | **-** | - | **3.19** | **2.73** | **3.83** | **4.63** | **5.01** | |

Table 8 continued next page

Table 8 continued

| Sp † | Variety | Marketer | Three-year average ‡ 2011 (2012-14) | 2013 (2014-16) | 2014 (2015-17) | 2015 (2016-18) | 2016 (2017-19) | 2-yr average ‡ 2017 (2018-19) | 1-yr total 2018 (2019) | % species mean †† |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ---------- dry matter tons/acre ---------- | | | | | | | |
| TF | BarElite | Barenbrug Seed | - | - | 4.18 | - | - | - | 6.01 | (1) 91 |
| TF | Bariane | Barenbrug Seed | - | - | 3.72 | 3.21 | - | - | 5.41 | (2) 90 |
| TF | Dominate | Allied Seed | - | - | 4.50 | - | - | - | - | (1)106 |
| TF | Cajun II | Smith Seed | - | - | 4.21 | - | - | - | - | (1) 99 |
| TF | Flourish | Allied Seed | - | 3.38 | - | - | - | - | - | (1) 88 |
| TF | Florine | Albert Lea Seed | - | - | - | - | - | 5.65 | - | (1)101 |
| TF | FSG402TF | Allied Seed | - | - | 4.33 | - | - | | - | (1)102 |
| TF | Goliath | Cisco Seed | - | - | - | - | - | - | - | (1)101 |
| TF | Hymark | Fraser Seeds | 4.42 | - | - | - | - | - | - | (1) 99 |
| TF | Kentucky 31 plus | check | 4.75 | - | - | 3.63 | - | - | - | (2)105 |
| TF | Kentucky 31 minus | check | - | 3.45 | 4.24 | 3.58 | 4.11 | 5.92 | 6.13 | (5)100 |
| TF | Select | check | 4.47 | - | - | - | - | - | - | (1)100 |
| TF | STF 43 | Barenbrug Seed | 4.26 | - | - | - | - | - | - | (1) 95 |
| TF | STF50 | Smith Seed | - | - | - | - | - | - | 5.98 | - |
| TF | Swaj | Albert Lea Seed | - | - | - | - | - | 5.23 | - | (1) 93 |
| TF | Tower | DLF Pickseed USA Inc | - | - | 4.61 | - | 4.01 | - | - | (2)103 |
| **TF** | **SPECIES MEAN** | | **4.48** | **3.83** | **4.26** | **3.47** | **4.06** | **5.60** | **5.88** | |

† FEST=Festulolium (Ryegrass or Fescue type), OR=Orchardgrass, PR=Perennial ryegrass, SB=Smooth Bromegrass, MdF= Meadow fescue, TM=Timothy, TF= Tall fescue

†† Number of trials with at least 2 years data and % of the mean (released varieties)

‡ Seeding year and (the years the trial was harvested to obtain the average yield)

Smooth Bromegrass East Lansing

Alfalfa Plots East Lansing

Perennial Ryegrass Plots East Lansing

Timothy Plots East Lansing

Table 9. Forage Yield (dry matter tons/acre) of Perennial Forage Grasses Seeded at Lake City in Northern Lower Michigan and at Chatham in the Upper Peninsula.

| | | | Lake City ‡ | | | | Chatham ‡ | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 3-year average ‡‡‡ | | 2 year avg | % | 3-year average ‡‡‡ | | % |
| Sp † | Variety | Marketer | 2014 (2015-17) | 2015 (2016-18) | 2017 (2018-19) | species mean ‡‡ | 2014 (2015-17) | 2015 (2016-18) | species mean ‡‡ |
| | | | ------ dry matter tons/acre ------ | | | | dry matter tons/acre | | |
| OR | Echelon | DLF Pickseed USA Inc | 3.20 | - | - | (1)103 | 1.54 | - | (1) 96 |
| OR | Intensiv | Barenbrug Seed | 3.27 | 4.09 | - | (2)105 | 1.68 | - | (1)105 |
| OR | Lucharm | Albert Lea Seed | - | - | 4.18 | (1)100 | - | - | - |
| OR | Lukir | Albert Lea Seed | - | - | 3.92 | (1) 93 | - | - | - |
| OR | Persist | Smith Seed | 2.97 | 3.84 | - | (2) 97 | 1.58 | - | (1) 99 |
| OR | Potomac | check variety | 3.02 | 3.82 | 4.51 | (3)101 | 1.59 | 1.69 | (1)101 |
| **OR** | **SPECIES MEAN** | | **3.12** | **3.92** | **4.20** | | **1.57** | **1.69** | |
| PR | Albion (4n) | Cisco Seeds | - | 3.27 | - | (1)107 | - | 0.72 | (1) 88 |
| PR | Linn (2n) | check variety | - | - | 3.60 | (1) 99 | - | 0.98 | (1)120 |
| PR | Mara (2n) | Barenbrug Seed | - | 2.75 | - | (1) 90 | - | 0.80 | (1) 98 |
| PR | Payday (4n) | Smith Seed | - | 3.15 | - | (1)103 | - | - | - |
| PR | Remington (4n) | Barenbrug Seed | - | - | - | - | - | 0.78 | (1) 95 |
| PR | Tomaso | Albert Lea Seed | | - | 3.67 | (1)101 | - | - | - |
| **PR** | **SPECIES MEAN** | | **-** | **3.06** | **3.64** | | **-** | **0.82** | |
| TF | Bariane | Barenbrug Seed | 2.79 | 4.35 | | (2) 97 | 1.53 | 1.35 | (2) 84 |
| TF | Florine | Albert Lea Seed | - | - | 5.54 | (1)101 | - | - | - |
| TF | Kentucky 31 Plus | check variety | 3.08 | 4.19 | - | (2)100 | 1.89 | 1.74 | (2) 106 |
| TF | Kentucky 31 minus | check variety | 2.98 | 4.29 | 5.46 | (3)100 | 1.82 | - | (1) 101 |
| TF | Kentucky 32 | check variety | - | - | - | - | - | 1.75 | (1) 109 |
| TF | Swaj | Albert Lea Seed | - | - | 5.39 | (1) 99 | - | - | - |
| TF | Tuscany II | Forage First | 3.11 | 4.27 | - | (2)102 | 1.98 | - | (1) 109 |
| **TF** | **SPECIES MEAN** | | **2.99** | **4.28** | **5.46** | | **1.81** | **1.61** | |
| MdF | SW Minto | Albert Lea Seed | - | - | 3.54 | (1) 95 | - | - | - |
| MdF | Pradel | Barenbrug Seed | - | 3.70 | 3.89 | (1)105 | - | 1.75 | - |
| **MdF** | **SPECIES MEAN** | | - | - | **3.72** | | **-** | **1.75** | |
| TM | BarPenta | Barenbrug Seed | 3.12 | - | - | (1) 95 | 1.94 | - | (1) 92 |
| TM | Climax | check variety | 2.92 | 4.69 | 4.65 | (3) 95 | 2.03 | 1.75 | (2) 94 |
| TM | Crest | Allied Seed | 3.65 | - | - | (1)111 | 2.19 | - | (1)103 |
| TM | KY Early Timothy | Smith Seed | - | - | 4.68 | (1)100 | - | - | - |
| TM | Summit | Allied Seed | 3.46 | 4.75 | - | (2)102 | 2.33 | - | (1)110 |
| TM | Winnetow | DLF Pickseed USA Inc | - | - | - | - | - | 1.77 | (1) 94 |
| TM | Zenyatta | DLF Pickseed USA Inc | - | 5.01 | - | (1)104 | - | 2.16 | (1)114 |
| **TM** | **SPECIES MEAN** | | **3.29** | **4.82** | **4.67** | | **2.12** | **1.89** | |
| SB †† | Lincoln | check variety | - | 4.03 | | - | - | 1.38 | - |
| FEST†† | Federo | Albert Lea Seed | - | - | 4.60 | - | - | - | - |

† SB=Smooth Bromegrass, FEST=Festulolium, OR=Orchardgrass, PR=Perennial ryegrass, TF= Tall fescue, MdF= Meadow fescue, TM=Timothy

†† Only one commercially available variety of Smooth Bromegrass and Festulolium (ryegrass type) tested.

‡ Generally, three cuttings per year at Lake City. One or Two cuttings per year at Chatham.

‡‡ Number of trials with at least 2 years data and % of the mean (released varieties)

‡‡‡ Seeding year and (the years the trial was harvested to obtain the average yield)

Table 10. Michigan State University Grass Maturity Dates in First Cutting of 2019 in the Perennial Grass Variety Trials at East Lansing and Lake City.

| | Trial - Seeding Year and location | | | |
|---|---|---|---|---|
| **Fescue** | | | | |
| (Tall, Meadow, Festulolium) | **2016** | **2017** | | **2018** |
| **Variety** | **East Lansing** | **East Lansing** | **Lake City** | **East Lansing** |
| Bariane | - | - | - | May 31 |
| Barelite | - | - | - | May 30 |
| Bar FAF 17135 † | - | - | - | May 30 |
| Bar FAF 17137 † | - | - | - | May 29 |
| 7FACF82 † | - | - | - | May 31 |
| Bar FPF 17079 (Meadow) † | - | - | - | May 30 |
| Bar FPF 32 (Meadow) † | - | - | - | May 30 |
| FTF 70 † | May 30 | - | - | - |
| FTF 73 † | May 30 | - | - | - |
| FTF 96 † | May 29 | - | - | - |
| FP 16058 (Meadow) † | - | May 31 | - | - |
| Fojtan (Festulolium) | May 28 | - | - | - |
| Kentucky 31 Minus | May 28 | May 26 | June 5 | May 25 |
| Mahulena (Festulolium) | May 25 | - | - | - |
| Pradel (Meadow) | May 28 | May 30 | June 8 | May 29 |
| Raskila (Meadow) | May 30 | - | - | - |
| Tower | June 2 | - | - | - |
| Florine | - | May 26 | June 10 | - |
| STF50 | - | - | - | May 25 |
| Swaj | - | May 30 | June 9 | - |
| SW Minto (Meadow) | - | May 30 | June 11 | - |
| **Harvest Dates** | **June 8** | **June 8** | **July 3** | **June 14** |
| **Perennial Ryegrass** | | | | |
| (Hybrid, Intermediate, Festulolium) | **2016** | **2017** | | **2018** |
| **Variety** | **East Lansing** | **East Lansing** | **Lake City** | **East Lansing** |
| Bison 2 (Hybrid/Intermediate) | June 3 | - | - | May 25 |
| Dexter 1 | June 3 | - | - | June 1 |
| Garbor | June 5 | - | - | June 1 |
| Hostyn (Festulolium) | - | - | - | May 29 |
| Linn | May 26 | May 25 | June 12 | May 24 |
| Lofa (Festulolium) | - | - | - | May 30 |
| LP 16237 † | - | June 8 | - | - |
| LP 16238 † | - | May 31 | - | - |
| LP 17253 † | - | - | - | June 3 |
| Maximo (Intermediate) | June 3 | - | - | - |
| Federo (Festulolium) | - | May 30 | June 12 | - |
| Perun (Festulolium) | - | - | - | May 30 |
| Remington | - | June 7 | - | June 6 |
| RAD MFP-141 † | - | June 1 | - | - |
| ROM 99 | - | - | - | June 4 |
| Tomaso | - | June 7 | June 16 | - |
| **Harvest Dates** | **June 8** | **June 8** | **July 3** | **June 14** |

Table 10 continued next page

Table 10 continued

## Timothy

| | Trial - Seeding Year and location | | | |
|---|---|---|---|---|
| | 2016 | 2017 | | 2018 |
| **Variety** | **East Lansing** | **East Lansing** | **Lake City** | **East Lansing** |
| Climax | June 8 | June 8 | June 13 | June 10 |
| Dawn | June 1 | - | - | - |
| KY Early | - | May 29 | June 7 | May 29 |
| Winnetow | - | - | - | June 8 |
| Zenyatta | May 29 | - | - | - |
| **Harvest Dates** | **June 8** | **June 8** | **July 3** | **June 14** |

## Orchardgrass

| | 2016 | 2017 | | 2018 |
|---|---|---|---|---|
| **Variety** | **East Lansing** | **East Lansing** | **Lake City** | **East Lansing** |
| Echelon | May 29 | - | - | - |
| Lyra | May 27 | - | - | - |
| Potomac | May 25 | May 24 | June 5 | - |
| Lukir | - | June 8 | June 6 | - |
| Lucharm | - | June 8 | June 6 | - |
| Treposno | May 26 | - | - | - |
| **Harvest Dates** | **June 8** | **June 8** | **July 3** | |

Heading Date - Date when 50% of reproductive tillers have a fully emerged grass head.
An emerged head is completely clear of the flag leaf.

† Experimental Variety

Orchardgrass East Lansing

**Table 11**. Michigan State University Conventional Alfalfa Variety Trial Yields (DM tons/acre) East Lansing, Michigan. Seeded May, 2016.

| | 2019 DM Yields T/A, Four-cuts and Total | | | | | | | 2016 | |
|---|---|---|---|---|---|---|---|---|---|
| | Cut 1 | Cut 2 | Cut 3 | Cut 4 | 2019 | 2018 | 2017 | Seeding | Trial |
| Variety name | June 18 | July 15 | Aug 22 | Nov 5 | Total | Total | Total | Year | Total |
| HybriForce 3420-OB2 †† | 2.82 | 1.68 | 1.13 | 0.43 | 6.07* | 5.96* | 5.45* | 2.09* | 19.57* |
| SW4412Y † | 2.91 | 1.77 | 1.00 | 0.41 | 6.10* | 5.64* | 5.18* | 1.88 | 18.79* |
| Integra 8450 | 2.83 | 1.60 | 0.89 | 0.41 | 5.74* | 5.60* | 5.28* | 2.12* | 18.74* |
| HybriForce 3430 †† | 2.99 | 1.59 | 0.86 | 0.43 | 5.87* | 5.49* | 5.10* | 2.19* | 18.65* |
| msSunstra-143146 † | 2.92 | 1.63 | 0.88 | 0.43 | 5.85* | 5.62* | 4.98* | 2.13* | 18.58* |
| HybriForce 4400 †† | 2.95 | 1.67 | 0.87 | 0.45 | 5.94* | 5.56* | 4.93* | 2.15* | 18.58* |
| TriCal TriFecta †† | 3.05 | 1.65 | 0.93 | 0.41 | 6.03* | 5.57* | 4.97* | 1.79 | 18.36* |
| Integra 8420 | 2.68 | 1.57 | 1.04 | 0.43 | 5.72* | 5.52* | 5.18* | 1.93 | 18.35* |
| HybriForce 3420-OB1 †† | 2.73 | 1.60 | 0.97 | 0.44 | 5.73* | 5.60* | 5.05* | 1.94 | 18.32* |
| SW5213 | 2.97 | 1.68 | 0.98 | 0.41 | 6.03* | 5.45* | 5.04* | 1.72 | 18.23* |
| HybriForce 3420 †† | 2.68 | 1.64 | 0.92 | 0.43 | 5.66* | 5.41* | 5.16* | 1.98 | 18.22* |
| KF406A2 | 2.73 | 1.58 | 0.84 | 0.43 | 5.57* | 5.41* | 4.94* | 1.97 | 17.89* |
| KF425HD | 2.50 | 1.49 | 0.90 | 0.39 | 5.28* | 5.57* | 5.25* | 1.79 | 17.89* |
| Fortune | 3.00 | 1.62 | 0.88 | 0.41 | 5.90* | 5.31* | 4.81* | 1.86 | 17.88* |
| SW1314Y † | 3.03 | 1.68 | 0.86 | 0.41 | 5.97* | 5.30* | 4.69* | 1.84 | 17.79* |
| Pioneer 55Q27 | 2.68 | 1.53 | 0.80 | 0.41 | 5.41 | 5.31* | 4.94* | 1.93 | 17.58* |
| WL365HQ | 2.52 | 1.67 | 0.99 | 0.39 | 5.57* | 5.39* | 4.99* | 1.58 | 17.53 |
| GA-497HD | 2.58 | 1.56 | 0.84 | 0.39 | 5.36 | 5.30* | 5.03* | 1.77 | 17.47 |
| Stalwart II | 2.85 | 1.65 | 0.80 | 0.41 | 5.71* | 5.01 | 4.70* | 1.86 | 17.27 |
| Rebound 6XT | 2.59 | 1.70 | 0.92 | 0.41 | 5.62* | 5.03 | 4.66 | 1.78 | 17.09 |
| Oneida VR | 2.70 | 1.43 | 0.64 | 0.38 | 5.15 | 4.72 | 4.16 | 1.84 | 15.87 |
| Vernal | 2.74 | 1.30 | 0.62 | 0.32 | 4.99 | 4.51 | 3.84 | 1.96 | 15.29 |
| Trial Average | 2.81 | 1.60 | 0.89 | 0.41 | 5.71 | 5.39 | 4.95 | 1.92 | 17.96 |
| LSD 0.05 | 0.32 | 0.13 | 0.26 | 0.04 | 0.54 | 0.76 | 0.97 | 0.17 | 2.01 |
| CV% | 8.2 | 5.6 | 20.9 | 9.3 | 6.7 | 10.0 | 13.9 | 6.3 | 8.0 |

† Experimental Variety †† Released variety seeded as an experimental.
* Yield is not statistically different from the greatest value in the column.

**Table 12**. Michigan State University Roundup Ready Alfalfa Variety Trial Yields (DM tons/acre) East Lansing, Michigan. Seeded May 2016.

| | 2019 DM Yields T/A, Four-cuts and Total | | | | | | | 2016 | |
|---|---|---|---|---|---|---|---|---|---|
| | Cut 1 | Cut 2 | Cut 3 | Cut 4 | 2019 | 2018 | 2017 | Seeding | Trial |
| Variety | June 18 | July 15 | Aug 22 | Nov 5 | Total | Total | Total | Year | Total |
| Pioneer 55VR08 | 2.62 | 1.68 | 0.84 | 0.36 | 5.50* | 4.98* | 4.55 | 1.63 | 16.66* |
| 9200RR | 2.39 | 1.57 | 0.84 | 0.34 | 5.14* | 4.69* | 4.55 | 1.58 | 15.97* |
| RR AphaTron 2XT | 2.31 | 1.54 | 0.89 | 0.33 | 5.08* | 4.79* | 4.56 | 1.54 | 15.97* |
| DKA44-16RR | 2.26 | 1.50 | 0.81 | 0.35 | 4.92 | 4.64* | 4.69 | 1.55 | 15.80* |
| Integra 8444R | 2.46 | 1.59 | 0.77 | 0.33 | 5.14* | 4.46 | 4.24 | 1.61 | 15.45* |
| DKA40-51RR | 2.18 | 1.51 | 0.73 | 0.29 | 4.72 | 4.51* | 4.24 | 1.55 | 15.02 |
| Average | 2.37 | 1.57 | 0.81 | 0.33 | 5.08 | 4.68 | 4.47 | 1.58 | 15.81 |
| LSD 0.05 | 0.25 | 0.08 | 0.22 | 0.07 | 0.52 | 0.47 | 0.51 ns | 0.07 ns | 1.47 |
| CV% | 7.9 | 4.0 | 21.1 | 15.9 | 7.8 | 7.7 | 8.6 | 3.7 | 7.1 |

* Yield is not statistically different from the greatest value in the column.
ns - Total yield among varieties in this column are not statistically different.

**Table 13.** Michigan State University Conventional Alfalfa Variety Trial Yields (DM tons/acre) East Lansing, Michigan. Seeded in May 2017.

| | 2019 DM Yields T/A, Four-cuts and Total | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Variety | Cut 1 June 25 | Cut 2 July 22 | Cut 3 Aug 30 | Cut 4 Oct 26 | 2019 Total | 2018 Total | 2017 Seeding year | Trial Total |
| HybriForce 4400 †† | 2.63 | 1.52 | 1.01 | 0.60 | 5.76* | 5.05* | 1.56* | 12.37* |
| SW4107 | 2.31 | 1.57 | 1.08 | 0.56 | 5.52* | 4.75* | 1.47* | 11.74* |
| msSunstra-164106 † | 2.36 | 1.50 | 0.90 | 0.59 | 5.34* | 4.82* | 1.48* | 11.65* |
| AFX 460 †† | 2.14 | 1.49 | 1.14 | 0.60 | 5.37* | 4.73* | 1.38* | 11.48* |
| Calvary DQ | 2.30 | 1.36 | 0.93 | 0.58 | 5.16* | 4.79* | 1.49* | 11.44* |
| AFX 469 | 2.32 | 1.50 | 0.97 | 0.56 | 5.35* | 4.45* | 1.40* | 11.20* |
| Fierce | 2.10 | 1.41 | 0.94 | 0.59 | 5.05* | 4.44* | 1.56* | 11.05* |
| Vernal | 2.25 | 1.25 | 0.80 | 0.43 | 4.73 | 4.68* | 1.56* | 10.96* |
| AFX 429 | 2.13 | 1.39 | 0.94 | 0.57 | 5.04* | 4.41* | 1.43* | 10.88* |
| CW 104014 † | 2.02 | 1.40 | 0.74 | 0.54 | 4.70 | 3.88 | 1.23 | 9.82 |
| Average | 2.26 | 1.44 | 0.95 | 0.56 | 5.20 | 4.60 | 1.46 | 11.26 |
| LSD 0.05 | 0.35 | 0.19 | 0.35 | 0.05 | 0.77 | 0.76 | 0.21 | 1.56 |
| CV % | 10.6 | 9.0 | 25.3 | 6.9 | 10.2 | 11.4 | 10.1 | 9.5 |

† Experimental Variety †† Released variety seeded as an experimental.
* Yield is not statistically different from the greatest value in the column.

**Table 14**. Michigan State University Roundup Ready Alfalfa Variety Trial Yields (DM tons/acre) East Lansing, Michigan. Seeded in May 2017.

| | 2019 DM Yields T/A, Four-cuts and Total | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Variety | Cut 1 June 25 | Cut 2 July 22 | Cut 3 Aug 30 | Cut 4 Oct 26 | 2019 Total | 2018 Total | 2017 Seeding year | Trial Total |
| Armour (RR) | 2.16 | 1.46 | 1.00 | 0.63 | 5.25 | 4.90 | 1.11 | 11.26 |
| DKA 44-16 RR | 2.12 | 1.43 | 0.85 | 0.58 | 4.99 | 4.63 | 1.06 | 10.67 |
| 6424R | 1.97 | 1.38 | 0.88 | 0.61 | 4.85 | 4.48 | 1.08 | 10.41 |
| Average | 2.08 | 1.42 | 0.91 | 0.61 | 5.03 | 4.67 | 1.08 | 10.78 |
| LSD 0.05 | 0.33 | 0.24 | 0.31 | 0.05 | 0.84 ns | 0.87 ns | 0.11 ns | 1.66 ns |
| CV % | 9.1 | 9.6 | 19.8 | 4.9 | 9.6 | 10.8 | 6.0 | 8.9 |

ns - Total yield among varieties in this column are not statistically different

**Table 15.** Michigan State University Conventional Alfalfa Variety Trial Yields (DM tons/acre) Lake City, Michigan. Seeded July, 2016.

| | 2019 DM Yields T/A, Three-cuts and Total | | | | | | |
|---|---|---|---|---|---|---|---|
| Variety | Cut 1 July 3 | Cut 2 Aug 14 | Cut 3 Oct 9 | 2019 Total | 2018 Total | 2017 Total | 3-year Total |
| Integra 8420 | 1.77 | 1.36 | 0.49 | 3.62 | 3.36 | 3.45 | 10.43 |
| Integra 8450 | 1.75 | 1.36 | 0.46 | 3.57 | 3.32 | 3.42 | 10.31 |
| Pioneer 55Q27 | 1.84 | 1.24 | 0.49 | 3.57 | 3.27 | 3.34 | 10.18 |
| Vernal | 1.75 | 0.97 | 0.40 | 3.12 | 3.34 | 3.66 | 10.12 |
| Average | 1.78 | 1.23 | 0.46 | 3.47 | 3.32 | 3.47 | 10.26 |
| LSD 0.05 | 0.18 | 0.37 | 0.14 | 0.61 ns | 0.39 ns | 0.34 ns | 1.06 ns |
| CV % | 5.2 | 15.0 | 15.6 | 8.8 | 7.2 | 6.2 | 6.5 |

ns - Total yield among varieties in this column are not statistically different

**Table 16.** Michigan State University Roundup Ready Alfalfa Variety Trial Yields (DM tons/acre) Lake City, Michigan. Seeded July 2016.

| | 2019 DM Yields T/A, Three-cuts and Total | | | | | | |
|---|---|---|---|---|---|---|---|
| Variety | Cut 1 July 3 | Cut 2 Aug 14 | Cut 3 Oct 9 | 2019 Total | 2018 Total | 2017 Total | 3-year Total |
| Pioneer 55VR08 | 1.78 | 1.27 | 0.46 | 3.52 | 3.26 | 3.30 | 10.08 |
| DKA44-16RR | 1.54 | 1.20 | 0.44 | 3.18 | 3.16 | 3.34 | 9.68 |
| DKA40-51RR | 1.66 | 1.17 | 0.38 | 3.21 | 3.16 | 3.15 | 9.52 |
| Integra 8444R | 1.40 | 1.22 | 0.41 | 3.03 | 3.06 | 3.00 | 9.09 |
| Average | 1.60 | 1.22 | 0.42 | 3.24 | 3.16 | 3.20 | 9.59 |
| LSD 0.05 | 0.42 | 0.53 | 0.19 | 0.98 ns | 0.46 ns | 0.34 ns | 1.32 ns |
| CV % | 13.1 | 21.8 | 22.3 | 15.2 | 9.0 | 6.7 | 8.6 |

ns - Total yield among varieties in this column are not statistically different

**Table 17**. Michigan State University Alfalfa Variety Trial Yields (DM tons/acre), Conventional Alfalfa Varieties, East Lansing, Michigan. Seeded in July 2018.

| | 2019 DM Yields T/A, Four-cuts and Total | | | | |
|---|---|---|---|---|---|
| Variety | Cut 1 June 26 | Cut 2 July 22 | Cut 3 Aug 30 | Cut 4 Oct 25 | 2019 Total |
| msSunstra-164101 † | 2.49 | 1.74 | 0.81 | 0.83 | 5.86* |
| TriFecta | 2.49 | 1.61 | 0.81 | 0.74 | 5.64* |
| AFX164048 † | 2.36 | 1.63 | 0.80 | 0.82 | 5.62* |
| HybriForce 4400 | 2.40 | 1.62 | 0.80 | 0.79 | 5.61* |
| HybriForce-4400-OBT2002 | 2.33 | 1.57 | 0.77 | 0.78 | 5.45* |
| AFX164046 † | 2.21 | 1.57 | 0.80 | 0.84 | 5.42* |
| HybriForce-4400-OBT2013 | 2.40 | 1.55 | 0.72 | 0.73 | 5.40* |
| CW A125023 † | 2.29 | 1.62 | 0.71 | 0.77 | 5.39* |
| SW4107 | 2.26 | 1.62 | 0.79 | 0.72 | 5.39* |
| AFX164047 † | 2.17 | 1.47 | 0.66 | 0.80 | 5.10 |
| Emerald | 2.23 | 1.59 | 0.63 | 0.65 | 5.10 |
| AFX155025 † | 1.84 | 1.51 | 0.67 | 0.67 | 4.68 |
| AFX 460 †† | 1.77 | 1.47 | 0.73 | 0.69 | 4.67 |
| AFX134014 † | 1.81 | 1.41 | 0.66 | 0.71 | 4.59 |
| Vernal | 2.03 | 1.21 | 0.60 | 0.63 | 4.47 |
| Average | 2.21 | 1.54 | 0.73 | 0.74 | 5.23 |
| LSD 0.05 | 0.26 | 0.14 | 0.19 | 0.08 | 0.53 |
| CV % | 8.3 | 6.6 | 17.9 | 7.9 | 7.1 |

† Experimental Variety †† Released variety seeded as an experimental.
* Yield is not statistically different from the greatest value in the column.

**Table 18.** Michigan State University Conventional Alfalfa Variety Trial Yields (DM tons/acre) Upper Peninisula Research Station, Chatham, Michigan. Seeded July 2018.

| | 2019 DM Yields T/A, Two-cuts and Total | | |
|---|---|---|---|
| Variety | Cut 1 June 26 | Cut 2 July 31 | 2019 Total |
| HybriForce 4400 | 1.81 | 1.06 | 2.86 |
| TriFecta | 1.86 | 0.99 | 2.85 |
| Vernal | 1.85 | 0.98 | 2.83 |
| Integra 8420 | 1.72 | 1.05 | 2.77 |
| HybriForce 3400 | 1.78 | 0.95 | 2.73 |
| Integra 8450 | 1.67 | 1.01 | 2.68 |
| SW 4107 | 1.70 | 0.90 | 2.60 |
| Average | 1.78 | 1.00 | 2.77 |
| LSD 0.05 | 0.13 | 0.23 | 0.28 ns |
| CV % | 4.9 | 15.6 | 6.9 |

ns - Total yield among varieties in this column are not statistically different.

**Table 19.** Michigan State University Roundup Ready Alfalfa Variety Trial Yields (DM tons/acre) Upper Peninisula Research Station, Chatham, Michigan. Seeded July 2018.

| | 2019 DM Yields T/A, Two-cuts and Total | | |
|---|---|---|---|
| Variety | Cut 1 June 26 | Cut 2 July 31 | 2019 Total |
| DKA 44-16RR | 1.47 | 0.88 | 2.36 |
| 6424R | 1.49 | 0.87 | 2.36 |
| Integra 8444R | 1.43 | 0.83 | 2.26 |
| DKA 40-51RR | 1.38 | 0.85 | 2.22 |
| Average | 1.44 | 0.86 | 2.30 |
| LSD 0.05 | 0.10 | 0.18 | 0.25 ns |
| CV % | 4.5 | 12.7 | 6.9 |

ns - Total yield among varieties in this column are not statistically different.

**Table 20.** Michigan State University Perennial Grass Variety Trial Yields of Timothy, Orchardgrass, Ryegrass, and Fescue (Tall, Meadow, and Festulolium). Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded August 2016.

| **Fescue** | | 2019 DM yields T/A, 3-cuts and Total | | | | | | 2016 | |
|---|---|---|---|---|---|---|---|---|---|
| | Heading | Cut 1 | Cut 2 | Cut 3 | 2019 | 2018 | 2017 | Seeding | Trial |
| **Tall Fescue** | Date | June 8 | July 25 | Oct 19 | Total | Total | Total | Year | Total |
| FTF 70 | 5/30/2019 | 2.09 | 1.62 | 0.69 | 4.39* | 4.85 | 3.72 | 0.86 | 13.81 |
| FTF 96 | 5/29/2019 | 1.84 | 1.53 | 0.68 | 4.05* | 4.87 | 3.71 | 1.02* | 13.64 |
| Kentucky 31 minus | 5/26/2019 | 1.92 | 1.49 | 0.47 | 3.88 | 4.70 | 3.74 | 1.02* | 13.34 |
| FTF 73 | 5/30/2019 | 1.75 | 1.52 | 0.65 | 3.91 | 4.69 | 3.78 | 0.86* | 13.24 |
| Tower | 6/2/2019 | 1.85 | 1.52 | 0.63 | 3.99* | 4.39 | 3.65 | 0.72 | 12.74 |
| LSD 0.05 Tall fescue | | 0.37 | 0.15 | 0.12 | 0.44 | 0.50 ns | 0.44 ns | 0.23 | 1.14 ns |
| **Festulolium (Tall Fescue type)** | | June 8 | July 25 | Oct 19 | Total | 2018 | 2017 | 2016 | Total |
| Mahulena | 5/25/2019 | 2.01 | 1.53 | 0.58 | 4.12* | 4.56 | 3.66 | 1.04 | 13.39 |
| Fojtan | 5/28/2019 | 1.72 | 1.31 | 0.47 | 3.50 | 4.49 | 3.17 | 0.92 | 12.07 |
| LSD 0.05 Festulolium (TF type) | | 0.36 | 0.05 | 0.07 | 0.28 | 0.54 ns | 0.75 ns | 0.24 ns | 1.35 ns |
| **Meadow Fescue** | | June 8 | July 25 | Oct 19 | Total | 2018 | 2017 | 2016 | Total |
| Raskila | 5/30/2019 | 2.08 | 1.00 | 0.16 | 3.23 | 2.64 | 3.54 | 1.20* | 10.62 |
| Pradel | 5/28/2019 | 1.58 | 0.90 | 0.32 | 2.79 | 2.75 | 3.15 | 0.87 | 9.56 |
| LSD 0.05 Meadow Fescue | | 0.58 | 0.24 | 0.12 | 0.83 ns | 0.66 ns | 0.52 ns | 0.29 | 2.04 ns |
| Average | | 1.87 | 1.38 | 0.52 | 3.76 | 4.22 | 3.57 | 0.94 | 12.49 |
| LSD 0.05 (All Fescue) | | 0.31 | 0.13 | 0.11 | 0.37 | 0.41 | 0.37 | 0.20 | 0.32 |
| CV % | | 11.5 | 6.5 | 15.3 | 6.8 | 6.6 | 7.2 | 14.6 | 5.5 |

| | | 2019 DM yields T/A, 3-cuts and Total | | | | | | 2016 | |
|---|---|---|---|---|---|---|---|---|---|
| **Timothy** | Heading | Cut 1 | Cut 2 | Cut 3 | 2019 | 2018 | 2017 | Seeding | Trial |
| | Date | June 8 | July 25 | Oct 10 | Total | Total | Total | Year | Total |
| Dawn | 6/1/2019 | 2.73 | 1.56 | 0.28 | 4.56* | 4.18* | 3.27 | 0.89 | 12.91* |
| Zenyatta | 5/29/2019 | 2.73 | 1.53 | 0.17 | 4.43* | 4.20* | 3.33 | 0.83 | 12.79* |
| Climax | 6/8/2019 | 2.48 | 1.13 | 0.17 | 3.77 | 3.19 | 3.54 | 0.69 | 11.20 |
| Average Timothy | | 2.65 | 1.41 | 0.21 | 4.25 | 3.86 | 3.38 | 0.80 | 12.30 |
| LSD 0.05 | | 0.45 | 0.18 | 0.11 | 0.69 | 0.15 | 0.54 ns | 0.27 ns | 1.19 |
| CV % | | 9.9 | 7.3 | 29.1 | 9.4 | 2.3 | 9.1 | 19.3 | 5.6 |

| | | 2019 DM yields T/A, 3-cuts and Total | | | | | | 2016 | |
|---|---|---|---|---|---|---|---|---|---|
| **Orchardgrass** | Heading | Cut 1 | Cut 2 | Cut 3 | 2019 | 2018 | 2017 | Seeding | Trial |
| | Date | June 8 | July 25 | Oct 19 | Total | Total | Total | Year | Total |
| Echelon | 5/29/2019 | 2.14 | 1.53 | 0.62 | 4.29 | 4.36* | 4.69* | 0.94* | 14.29* |
| Potomac | 5/25/2019 | 1.90 | 1.48 | 0.51 | 3.88 | 4.14* | 4.24 | 0.86* | 13.13 |
| Treposno | 5/26/2019 | 2.10 | 1.41 | 0.52 | 4.03 | 4.05* | 4.19 | 0.83* | 13.10 |
| Lyra | 5/27/2019 | 2.23 | 1.34 | 0.44 | 4.00 | 3.77 | 4.24 | 0.66 | 12.68 |
| Average Orchardgrass | | 2.09 | 1.44 | 0.52 | 4.05 | 4.08 | 4.34 | 0.82 | 13.30 |
| LSD 0.05 | | 0.38 | 0.13 | 0.07 | 0.43 ns | 0.51 | 0.17 | 0.21 | 0.82 |
| CV % | | 11.2 | 5.9 | 9.5 | 6.6 | 7.8 | 2.4 | 16.5 | 3.9 |

Table 20 continued next page (Perennial and Hybrid ryegrasses)

Table 20 continued

| Ryegrass | Heading Date | 2019 DM yields T/A, 3-cuts and Total Cut 1 June 8 | Cut 2 July 25 | Cut 3 Oct 10 | 2019 Total | 2018 Total | 2017 Total | 2016 Seeding Year | Trial Total |
|---|---|---|---|---|---|---|---|---|---|
| Bison 2 (Hyb/Interm) | 6/3/2019 | 1.89 | 1.64 | 0.14 | 3.66* | 3.07* | 4.04* | 1.39* | 12.16* |
| Maximo (Intermediate) | 6/3/2019 | 1.83 | 1.54 | 0.11 | 3.48* | 3.01* | 3.95* | 1.08 | 11.52 |
| Dexter 1 (Perennial) | 6/3/2019 | 1.78 | 1.00 | 0.19 | 2.97 | 2.60 | 3.09 | 0.85 | 9.51 |
| Garbor (Perennial) | 6/5/2019 | 1.50 | 0.93 | 0.16 | 2.60 | 2.49 | 2.99 | 0.75 | 8.82 |
| Linn (Perennial) | 5/26/2019 | 1.98 | 0.71 | 0.13 | 2.81 | 2.46 | 2.90 | 0.52 | 8.69 |
| Average | | 1.79 | 1.16 | 0.15 | 3.10 | 2.73 | 3.39 | 0.92 | 10.14 |
| LSD 0.05 | | 0.24 | 0.16 | 0.05 | 0.32 | 0.29 | 0.28 | 0.16 | 0.56 |
| CV % | | 8.7 | 8.9 | 18.7 | 6.7 | 6.8 | 5.3 | 11.2 | 3.6 |

† Experimental Variety †† Released variety seeded as an experimental.
* Yield is not statistically different from the greatest value in the column.
ns - Total yield among varieties in this column are not statistically different
Heading Date - Date when 50% of reproductive tillers have a fully emerged grass head.
An emerged head is completely clear of the flag leaf

**Table 21.** Michigan State University Perennial Grass Variety Trial Yields of Fescue (Tall and Meadow), Perennial Ryegrass and Festulolium, Orchardgrass and Timothy. Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded May 2017.

**Fescue (Tall and Meadow)**

| Tall Fescue | Heading Date | 2019 DM yields T/A, 3-cuts and Total Cut 1 June 8 | Cut 2 July 23 | Cut 3 Oct 20 | 2019 Total | 2018 Total | Seeding Year Total | Trial Total |
|---|---|---|---|---|---|---|---|---|
| Kentucky 31 minus | 5/26/2019 | 3.12 | 1.86 | 0.62 | 5.61 | 6.22* | 0.77 | 12.60* |
| Florine | 5/26/2019 | 2.50 | 1.84 | 0.84 | 5.18 | 6.11* | 0.61 | 11.90* |
| Swaj | 5/30/2019 | 2.83 | 1.80 | 0.51 | 5.14 | 5.32 | 0.86 | 11.31 |
| LSD 0.05 (Tall Fescue) | | 0.34 | 0.30 | 0.09 | 0.66 ns | 0.70 | 0.34 ns | 0.98 |

| Meadow fescue | Heading Date | 2019 DM yields T/A, 3-cuts and Total Cut 1 June 8 | Cut 2 July 23 | Cut 3 Oct 20 | 2019 Total | 2018 Total | Seeding Year Total | Trial Total |
|---|---|---|---|---|---|---|---|---|
| FP 16058 † | 5/31/2019 | 2.76 | 1.33 | 0.58 | 4.67* | 4.30 | 0.70 | 9.67 |
| Pradel | 5/30/2019 | 2.32 | 1.26 | 0.61 | 4.18 | 4.49* | 0.80 | 9.46 |
| SW Minto | 5/30/2019 | 2.37 | 1.05 | 0.52 | 3.95 | 4.21 | 0.76 | 8.92 |
| LSD 0.05 (Meadow Fescue) | | 0.33 | 0.14 | 0.08 | 0.44 | 0.16 | 0.58 ns | 0.80 ns |
| Average | | 2.65 | 1.52 | 0.61 | 4.79 | 5.11 | 0.75 | 10.64 |
| LSD 0.05 (All Fescue) | | 0.28 | 0.18 | 0.08 | 0.47 | 0.42 | 0.40 | 0.76 |
| CV % | | 7.1 | 8.1 | 9.2 | 6.5 | 5.4 | 35.3 | 4.7 |

Table 21 continued next page

Table 21 continued

| **Perennial ryegrass** | Heading Date | 2019 DM yields T/A, 3-cuts and Total Cut 1 June 8 | Cut 2 July 23 | Cut 3 Oct 20 | 2019 Total | 2018 Total | Seeding Year Total | Trial Total |
|---|---|---|---|---|---|---|---|---|
| Federo (festulolium) | 5/30/2019 | 2.74 | 1.59 | 0.42 | 4.75* | 4.31* | 0.80* | 9.86* |
| Remington (ryegrass) | 6/7/2019 | 2.40 | 1.38 | 0.37 | 4.14 | 4.21* | 0.44* | 8.80 |
| RAD MFP-141 (ryegrass)† | 6/1/2019 | 2.57 | 1.21 | 0.30 | 4.09 | 3.93* | 0.40* | 8.41 |
| LP 16237 (ryegrass) † | 6/8/2019 | 2.21 | 1.19 | 0.37 | 3.78 | 3.84* | 0.37 | 7.97 |
| Linn (ryegrass) | 5/25/2019 | 2.28 | 0.77 | 0.23 | 3.28 | 3.53 | 0.24 | 7.06 |
| LP 16238 (ryegrass) † | 5/31/2019 | 2.18 | 0.79 | 0.31 | 3.28 | 3.34 | 0.32 | 6.94 |
| Tomaso (ryegrass) | 6/7/2019 | 1.77 | 1.15 | 0.38 | 3.30 | 3.20 | 0.34 | 6.84 |
| Average | | 2.31 | 1.15 | 0.34 | 3.80 | 3.77 | 0.42 | 7.98 |
| LSD 0.05 | | 0.22 | 0.15 | 0.11 | 0.27 | 0.51 | 0.16 | 0.73 |
| CV % | | 6.4 | 8.6 | 21.8 | 4.7 | 9.1 | 25.5 | 6.2 |

| **Orchardgrass** | Heading Date | 2019 DM yields T/A, 3-cuts and Total Cut 1 June 8 | Cut 2 July 23 | Cut 3 Oct 20 | 2019 Total | 2018 Total | Seeding Year Total | Trial Total |
|---|---|---|---|---|---|---|---|---|
| Potomac | 5/24/2019 | 2.44 | 1.55 | 0.46 | 4.45* | 4.43* | 0.53 | 9.41 |
| Lucharm | 6/8/2019 | 1.47 | 1.51 | 0.63 | 3.62 | 4.76* | 0.70 | 9.08 |
| Lukir | 6/8/2019 | 1.66 | 1.66 | 0.66 | 3.98* | 4.16 | 0.61 | 8.75 |
| Average Orchardgrass | | 1.86 | 1.57 | 0.58 | 4.02 | 4.45 | 0.61 | 9.08 |
| LSD 0.05 | | 0.41 | 0.22 | 0.12 | 0.48 | 0.65 | 0.29 ns | 0.74 ns |
| CV % | | 12.7 | 8.0 | 11.8 | 6.9 | 8.4 | 27.2 | 4.7 |

| **Timothy** | Heading Date | 2019 DM yields T/A, 3-cuts and Total Cut 1 June 8 | Cut 2 July 23 | Cut 3 Oct 20 | 2019 Total | 2018 Total | Seeding Year Total | Trial Total |
|---|---|---|---|---|---|---|---|---|
| KY Early Timothy | 5/29/2019 | 3.48 | 1.65 | 0.36 | 5.49* | 5.07* | 0.56 | 11.12* |
| Climax | 6/8/2019 | 3.26 | 1.28 | 0.25 | 4.79 | 3.16 | 0.56 | 8.51 |
| Average Timothy | | 3.37 | 1.47 | 0.31 | 5.14 | 4.12 | 0.56 | 9.82 |
| LSD 0.05 | | 0.20 | 0.44 | 0.10 | 0.64 | 0.68 | 0.64 ns | 0.83 |
| CV % | | 2.6 | 13.4 | 15.4 | 5.6 | 7.3 | 50.7 | 3.8 |

† Experimental Variety

* Yield is not statistically different from the greatest value in the column.

ns - Total yield among varieties in this column are not statistically different.

Heading Date - Date when 50% of reproductive tillers have a fully emerged grass head.
An emerged head is completely clear of the flag leaf

**Table 22.** Michigan State University Perennial Grass Variety Trial Yields of Ryegrass (Perennial, Hybrid/Intermediate, Festulolium), Timothy, and Fescue (Tall and Meadow). Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded in late July 2018.

**Ryegrass (Perennial, Intermediate,Hybrid, and Festulolium)**

| | | 2019 DM yields T/A, Three-cuts and Total | | | | 2018 | |
|---|---|---|---|---|---|---|---|
| **Perennial** | Heading Date | Cut 1 June 14 | Cut 2 July 23 | Cut 3 Oct 20 | 2019 Total | Seeding Year | Trial Total |
| ROM 99 † (perennial) | 6/4/2019 | 3.49 | 1.68 | 0.23 | 5.40* | 1.38* | 6.79* |
| Remington (perennial) | 6/6/2019 | 3.25 | 1.76 | 0.25 | 5.26* | 1.29 | 6.55* |
| Garbor (perennial) | 6/1/2019 | 3.20 | 1.37 | 0.25 | 4.82 | 1.51* | 6.32 |
| Dexter 1 (perennial) | 6/1/2019 | 3.00 | 1.13 | 0.26 | 4.39 | 1.31 | 5.69 |
| LP 17253 † (perennial) | 6/3/2019 | 2.81 | 1.35 | 0.28 | 4.45 | 0.93 | 5.38 |
| Bison 2 (Hybrid/Inter) | 5/25/2019 | 2.62 | 1.31 | 0.00 | 3.92 | 0.80 | 4.72 |
| Linn (perennial) | 5/24/2019 | 2.29 | 1.01 | 0.24 | 3.54 | 0.59 | 4.13 |
| LSD 0.05 (Ryegrass) | | 0.34 | 0.24 | 0.05 | 0.42 | 0.19 | 0.43 |
| **Festulolium** | Date | June 14 | July 23 | Oct 20 | Total | Year | Total |
| Hostyn | 5/29/2019 | 3.31 | 2.58 | 0.29 | 6.19 | 1.32* | 7.51 |
| Lofa | 5/30/2019 | 3.46 | 2.69 | 0.16 | 6.31 | 0.82 | 7.13 |
| Perun | 5/30/2019 | 3.12 | 2.57 | 0.20 | 5.89 | 1.11* | 7.00 |
| LSD 0.05 (Festulolium) | | 0.79 | 0.38 | 0.11 | 0.62 ns | 0.25 | 0.79 ns |
| Average | | 3.06 | 1.75 | 0.22 | 5.02 | 1.11 | 6.12 |
| LSD 0.05 (All Ryegrasses) | | 0.44 | 0.27 | 0.06 | 0.45 | 0.18 | 0.49 |
| CV % | | 9.8 | 10.5 | 20.6 | 6.2 | 11.6 | 5.6 |

| | | 2019 DM yields T/A, Three-cuts and Total | | | |
|---|---|---|---|---|---|
| **Timothy** | Heading Date | Cut 1 June 14 | Cut 2 July 23 | Cut 3 Oct 20 | 2019 Total |
| Winnetow | 6/8/2019 | 3.59 | 1.36 | 0.25 | 5.20 |
| Climax | 6/10/2019 | 3.24 | 1.46 | 0.27 | 4.97 |
| KY Early | 5/29/2019 | 2.36 | 2.01 | 0.5 | 4.87 |
| Average | | 3.06 | 1.61 | 0.34 | 5.01 |
| LSD 0.05 | | 0.57 | 0.34 | 0.13 | 0.51 ns |
| CV % | | 10.8 | 12.3 | 23.5 | 5.8 |

Table 22 continued next page

Table 22 continued

| **Fescue (Tall and Meadow)** | | 2019 DM yields T/A, Three-cuts and Total | | | |
|---|---|---|---|---|---|
| | Heading | Cut 1 | Cut 2 | Cut 3 | 2019 |
| **Tall Fescue** | Date | June 14 | July 23 | Oct 20 | Total |
| BAR FAF 17137 † | 5/29/2019 | 3.20 | 2.02 | 1.18 | 6.40* |
| Kentucky 31 minus | 5/25/2019 | 3.00 | 2.21 | 0.91 | 6.13* |
| Barelite | 5/30/2019 | 3.06 | 1.83 | 1.12 | 6.01* |
| STF 50 | 5/25/2019 | 2.79 | 2.13 | 1.07 | 5.98* |
| BAR FAF 17135 † | 5/30/2019 | 2.90 | 1.85 | 1.05 | 5.80* |
| 7FACF82 † | 5/31/2019 | 2.88 | 1.74 | 1.05 | 5.67 |
| Bariane | 5/31/2019 | 2.56 | 1.80 | 1.04 | 5.41 |
| LSD 0.05 (Tall Fescue) | | 0.53 | 0.17 | 0.17 | 0.63 |
| **Meadow Fescue** | Date | June 14 | July 23 | Oct 20 | Total |
| Pradel | 5/29/2019 | 3.20 | 1.58 | 0.72 | 5.50 |
| Bar FPF 17079 † | 5/30/2019 | 3.07 | 1.54 | 0.65 | 5.27 |
| Bar FPF 32 † | 5/30/2019 | 2.82 | 1.68 | 0.70 | 5.20 |
| LSD 0.05 (Meadow Fescue) | | 0.46 | 0.19 | 0.14 | 0.60 ns |
| Average | | 2.95 | 1.84 | 0.95 | 5.74 |
| LSD 0.05 (All Fescue) | | 0.51 | 0.16 | 0.15 | 0.58 |
| CV% | | 11.9 | 6.2 | 11.0 | 7.0 |

† Experimental Variety

* Yield is not statistically different from the greatest value in the column.

ns - Total yield among varieties in this column are not statistically different.

Heading date - Date when 50% of reproductive tillers have a fully emerged grass head.
An emerged head is completely clear of the flag leaf

**Table 23**. Michigan State University Perennial Grass Variety Trial Yields of Fescue (Tall and Meadow), Orchardgrass, Ryegrass (Perennial and Festulolium), and Timothy. Seeded in July 2017 at the Lake City Research Station, Lake City, Michigan

| | | 2019 DM Yields T/A, Three-cuts and Total | | | | | |
|---|---|---|---|---|---|---|---|
| **Orchardgrass** | Heading | Cut 1 | Cut 2 | Cut 3 | 2019 | 2018 | Trial |
| | Date | July 3 | Aug 14 | Oct 9 | Total | Total | Total |
| Potomac | 6/5/2019 | 2.62 | 1.05 | 1.31 | 4.98* | 4.04* | 9.02* |
| Lucharm | 6/6/2019 | 2.45 | 0.93 | 1.33 | 4.71* | 3.65 | 8.36* |
| Lukir | 6/6/2019 | 2.30 | 0.90 | 1.18 | 4.38 | 3.46 | 7.85 |
| Average | | 2.46 | 0.96 | 1.27 | 4.69 | 3.72 | 8.41 |
| LSD 0.05 | | 0.23 | 0.16 | 0.33 | 0.58 | 0.33 | 0.88 |
| CV % | | 5.5 | 9.9 | 14.7 | 7.1 | 5.2 | 6.0 |

Table 23 continued next page

Table 23 continued

**Fescue (Tall and Meadow)**

| | | 2019 DM Yields T/A, Three-cuts and Total | | | | | |
|---|---|---|---|---|---|---|---|
| **Tall Fescue** | Heading Date | Cut 1 July 3 | Cut 2 Aug 14 | Cut 3 Oct 9 | 2019 Total | 2018 Total | Trial Total |
| Florine | 6/10/2019 | 3.78 | 1.04 | 1.39 | 6.22 | 4.85 | 11.07 |
| Kentucky 31 minus | 6/5/2019 | 3.88 | 0.99 | 1.12 | 5.98 | 4.94 | 10.93 |
| Swaj | 6/9/2019 | 3.87 | 0.92 | 1.17 | 5.95 | 4.83 | 10.78 |
| LSD 0.05 (Tall Fescue) | | 0.81 | 0.35 | 0.20 | 1.23 ns | 0.45 ns | 1.45 ns |
| **Meadow Fescue** | Date | July 3 | Aug 14 | Oct 9 | 2019 | 2018 | Total |
| Pradel | 6/8/2019 | 2.30 | 0.52 | 0.86 | 3.68 | 4.09* | 7.77* |
| SW Minto | 6/11/2019 | 2.50 | 0.51 | 0.70 | 3.71 | 3.37 | 7.07 |
| LSD 0.05 (Meadow Fescue) | | 0.51 | 0.23 | 0.21 | 0.60 ns | 0.26 | 0.53 |
| Average | | 3.27 | 0.80 | 1.05 | 5.11 | 4.42 | 9.52 |
| LSD 0.05 (All Fescue) | | 0.54 | 0.25 | 0.51 | 0.81 | 0.31 | 0.93 |
| CV % | | 10.8 | 20.3 | 9.9 | 10.3 | 4.6 | 6.3 |

| | | 2019 DM Yields T/A, Three-cuts and Total | | | | | |
|---|---|---|---|---|---|---|---|
| **Perennial Ryegrass** | Heading Date | Cut 1 July 3 | Cut 2 Aug 14 | Cut 3 Oct 9 | 2019 Total | 2018 Total | Trial Total |
| Federo (Festulolium) | 6/12/2019 | 2.74 | 0.88 | 1.76 | 5.38* | 3.81* | 9.18* |
| Tomaso (Ryegrass) | 6/16/2019 | 1.91 | 0.54 | 1.42 | 3.87 | 3.46 | 7.33 |
| Linn (Ryegrass) | 6/12/2019 | 2.16 | 0.54 | 1.51 | 4.21 | 2.98 | 7.19 |
| Average Ryegrass | | 2.27 | 0.65 | 1.56 | 4.49 | 3.42 | 7.90 |
| LSD 0.05 | | 0.28 | 0.21 | 0.61 | 0.62 | 0.20 | 0.67 |
| CV % | | 7.2 | 18.7 | 22.6 | 7.9 | 3.4 | 4.9 |

| | | 2019 DM Yields T/A, Three-cuts and Total | | | | | |
|---|---|---|---|---|---|---|---|
| **Timothy** | Heading Date | Cut 1 July 3 | Cut 2 Aug 14 | Cut 3 Oct 9 | 2019 Total | 2018 Total | Trial Total |
| KY Early Timothy | 6/7/2019 | 3.40 | 0.87 | 1.03 | 5.30 | 4.05 | 9.34 |
| Climax | 6/13/2019 | 3.89 | 0.56 | 0.73 | 5.17 | 4.12 | 9.30 |
| Average | | 3.65 | 0.72 | 0.88 | 5.24 | 4.09 | 9.32 |
| LSD 0.05 | | 0.45 | 0.18 | 0.16 | 0.56 ns | 0.34 ns | 0.74 ns |
| CV % | | 7.0 | 13.8 | 10.1 | 6.1 | 4.8 | 4.5 |

* Yield is not statistically different from the greatest value in the column.
ns - Total yield among varieties in this column are not statistically different
Heading date - Date when 50% of reproductive tillers have a fully emerged grass head.
An emerged head is completely clear of the flag leaf

**Table 24.** Michigan State University Red Clover Variety Trial Yields (DM tons/acre) East Lansing, Michigan. Seeded in May 2017.

| | 2019 DM Yields T/A, Three-cuts and Total | | | | | Seeding | |
|---|---|---|---|---|---|---|---|
| Variety | Cut 1 June 25 | Cut 2 July 22 | Cut 3 Oct 25 | 2019 Total | 2018 Total | year Total | Trial Total |
| RC0705 | 2.54 | 0.92 | 0.38 | 3.84* | 4.97 | 1.31* | 10.13* |
| Redkin | 2.81 | 0.86 | 0.34 | 4.01* | 4.66 | 1.14* | 9.81* |
| Evolve | 2.73 | 0.75 | 0.27 | 3.75* | 4.94 | 1.08 | 9.76* |
| LS9703 | 2.83 | 0.84 | 0.31 | 3.98* | 4.52 | 1.08 | 9.58* |
| Common | 2.76 | 0.34 | 0.00 | 3.11 | 5.07 | 0.94 | 9.11 |
| Average | 2.74 | 0.74 | 0.26 | 3.74 | 4.83 | 1.11 | 9.68 |
| LSD 0.05 | 0.28 | 0.09 | 0.08 | 0.32 | 0.62 ns | 0.18 | 0.70 |
| CV % | 8.6 | 9.8 | 20.1 | 7.2 | 10.7 | 13.8 | 6.0 |

Notes - Common variety of red clover dead after 2nd cut in 2019.
† Experimental Variety
* Yield is not statistically different from the greatest value in the column.
ns - Total yield among varieties in this column are not statistically different.

**Table 25.** Michigan State University Red Clover 2019 First-Year Variety Trial Yields (DM tons/acre) East Lansing, Michigan. Seeded in July 2018.

| | 2019 DM Yields T/A, Four-cuts and Total | | | | |
|---|---|---|---|---|---|
| Variety | Cut 1 June 26 | Cut 2 July 22 | Cut 3 Aug 30 | Cut 4 Oct 25 | 2019 Total |
| DFRC15 † | 2.98 | 0.88 | 0.87 | 0.55 | 5.28* |
| DFRC12 † | 2.96 | 0.86 | 0.84 | 0.55 | 5.21* |
| DFRC13 † | 2.81 | 1.06 | 0.77 | 0.51 | 5.16* |
| DFRC11 † | 2.88 | 0.92 | 0.79 | 0.49 | 5.08* |
| DFRC14 † | 2.85 | 0.89 | 0.72 | 0.50 | 4.96* |
| Marathon | 2.67 | 0.73 | 0.79 | 0.42 | 4.61* |
| Starfire II | 2.41 | 0.80 | 0.82 | 0.53 | 4.56 |
| Cinnamon Plus | 2.41 | 0.67 | 0.83 | 0.52 | 4.44 |
| Common | 2.46 | 0.40 | 0.40 | 0.00 | 3.26 |
| Average | 2.71 | 0.80 | 0.76 | 0.45 | 4.73 |
| LSD 0.05 | 0.45 | 0.15 | 0.20 | 0.12 | 0.68 |
| CV % | 11.4 | 12.4 | 18.0 | 16.1 | 9.9 |

Notes - Common variety of red clover dead after 3rd cut in 2019.
† Experimental Variety
* Yield is not statistically different from the greatest value in the column.
ns - Total yield among varieties in this column are not statistically different.

**Table 26.** Michigan State University Alfalfa Variety Trial Seeding-Year Yields (DM tons/acre) East Lansing, Michigan. Seeded in July 2019.

| **2019 Alfalfa** | 2019 Seeding Year | | |
|---|---|---|---|
| Variety | Cut 1 Aug 28 | Cut 2 Oct 25 | Seeding Year |
| msSunstra-184104 † | 0.71 | 0.53 | 1.25 |
| Triad | 0.65 | 0.57 | 1.23 |
| msSunstra-184101 † | 0.72 | 0.50 | 1.22 |
| Vernal | 0.74 | 0.49 | 1.22 |
| OBT 154-ANS † | 0.74 | 0.47 | 1.20 |
| OBT 154-FL-2 † | 0.74 | 0.45 | 1.19 |
| OBT 3510-FL-2 † | 0.69 | 0.49 | 1.17 |
| OBT 154-FL-1 † | 0.69 | 0.47 | 1.15 |
| Finch | 0.66 | 0.48 | 1.14 |
| 1041-2 | 0.67 | 0.46 | 1.13 |
| OBT 3510-ANS † | 0.64 | 0.50 | 1.13 |
| OBT 3510-FL-1 † | 0.64 | 0.49 | 1.13 |
| SW3407 | 0.69 | 0.42 | 1.11 |
| HybriForce 4400 | 0.60 | 0.47 | 1.09 |
| SW4107 | 0.69 | 0.38 | 1.07 |
| msSunstra-184108 † | 0.58 | 0.49 | 1.07 |
| WL349HQ | 0.64 | 0.43 | 1.07 |
| Quail | 0.59 | 0.46 | 1.05 |
| 9401 | 0.60 | 0.42 | 1.03 |
| SW5511 | 0.59 | 0.36 | 0.95 |
| Average | 0.66 | 0.47 | 1.13 |
| LSD 0.05 | 0.15 | 0.04 | 0.17 |
| CV % | 16.2 | 6.7 | 10.8 |

† Experimental variety

**Tables 27 and 28.** Michigan State University Grass Variety Trial Seeding-Year Yields (DM tons/acre). East Lansing, Michigan. Seeded in August 2019.

**Table 27. 2019 Perennial Grass**

| Variety | Ryegrass | Cut 1 Oct 19 |
|---|---|---|
| PST LP-A1703 † | Perennial | 1.05 |
| Remington | Perennial | 0.98 |
| DSV LP-A1901 † | Perennial | 0.93 |
| DSV LP-A1902 † | Perennial | 0.91 |
| Average | | 0.97 |
| LSD 0.05 | | 0.18 |
| CV% | | 9.1 |

**Table 28. 2019 Annual Grass**

| Variety | Ryegrass | Cut 1 Oct 19 |
|---|---|---|
| Firkin | Italian | 1.49 |
| DSV LM-A1904 † | Italian | 1.48 |
| DSV LM-A1716 † | Italian | 1.40 |
| Marshall | Annual | 1.22 |
| Fox | Italian | 1.16 |
| PST LM-A1712 † | Italian | 1.13 |
| DSV LM-A1903 † | Italian | 1.07 |
| Average | | 1.28 |
| LSD 0.05 | | 0.16 |
| CV% | | 8.3 |

† Experimental variety

Red Clover East Lansing

| Marketers | Phone | Web Addresses |
|---|---|---|
| AgResearch Ltd | 828-645-3872 | www.agresearchusa.com |
| Albert Lea Seed | 800-352-5247 | www.alseed.com |
| Alforex Seeds | 877-560-5181 | www.alforexseeds.com |
| Allied Seed | 866-325-6671 | www.alliedseed.com |
| Amer. Grass Seed Prod. | 800-247-7815 | www.agsp.us |
| America's Alfalfa | 800-873-2532 | www.americasalfalfa.com |
| Ampac Seed Co. | 866-530-7333 | www.ampacseed.com |
| Barenbrug USA | 800-547-4101 | www.barusa.com |
| Blue River Hybrids | 800-370-7979 | www.blueriverorgseed.com |
| Brett Young Seeds | 800-665-5015 | www.brettyoung.ca |
| Byron Seed | 618-599-8369 | www.byronseeds.net |
| CHS Seeds | 541-928-2393 | www.chsseedresources.com |
| CISCO Seed | 800-888-2986 | www.ciscoseeds.com |
| Channel | 314-694-2723 | www.channel.com |
| Columbia Seed | 541-757-1468 | www.columbiaseeds.com |
| Crop Production Services | 970-685-3300 | www.cpsagu.com |
| Croplan Genetics | 888-295-3011 | www.croplangenetics.com |
| Cropmark Seeds (New Zeeland) | +64-3-347-7950 | www.cropmarkseeds.com |
| Dahlco Seeds | 888-324-5261 | www.agreliantgenetics.com |
| Dairyland Seed Co. | 800-236-0163 | www.dairylandseed.com/ |
| Dekalb | 314-694-2723 | www.asgrowanddekalb.com |
| DLF-International Seeds | 800-445-2251 | www.dlfis.com |
| Farm Science | 888-252-7573 | www.farmsciencegenetics.com |
| Hood River Seeds | 855-406-2696 | www.hoodriverseed.com |
| Lacrosse Forage and Turf | 800-647-8873 | www.lacrosseseed.com |
| Legacy Seed | 866-791-6390 | www.legacyseeds.com |
| Lewis Seed Co. | 541-491-3700 | www.lewisseed.com |
| LG Seeds | 989-834-2251 | ww.lgseeds.com |
| Monsanto | 800-768-6387 | www.monsanto.com |
| Mycogen Seeds | 800-692-6432 | www.mycogen.com |
| Nexgrow | 855-463-9476 | www.plantnexgrow.com |
| Nutech Seed | 800-942-6748 | www.nutechseed.com |
| Pioneer | 800-247-6803 | www.pioneer.com |
| Producers Choice | 877-560-5181 | www.producerschoiceseed.com |
| ProSeeds Marketing | 541-928-9999 | www.proseedsmarketing.com |
| Renk Seed | 800-289-7365 | www.renkseed.com |
| Seed Research of Oregon | 800-253-5766 | www.sroseed.com |
| Smith Seed Services | 888-550-2930 | www.smithseed.com |
| S&W Seeds | 916-554-5480 | www.swseedco.com |
| TriCal | 843-817-2484 | www.tricalforage.com |
| Wilbur-Ellis Seeds | 989-323-7701 | http://ag.wilburellis.com/ |
| Winfield Solutions | 989-845-2093 | www.winfield.com |
| W-L Research | 800-406-7662 | www.wlresearch.com |

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