2023 Michigan Forage Variety Test Report

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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 add eye appeal to landscapes. Competition from row crops for land use continues to squeeze forage production acres while equipment, land, and labor costs increase. According to USDA information, Michigan hay prices in November 2023 were higher than a year ago. A one-ton yield increase of good to premium quality alfalfa hay was worth $200 to $225/acre. Under these market conditions, the importance of improving yield through the use of better forage varieties continues to be an important component of profitability. This report contains yield data from trials harvested in 2023 and multi-year averages from previous trials. Yield data for individual cuttings from previous years are in the variety test report archives on the MSU Forage Connection website at http://www.forage.msu.edu/publications.

2023 Conditions

Annual rainfall total and 30-year averages for April through October in East Lansing in southern Lower Michigan and Chatham in the Upper Peninsula are in **Table 1**. Precipitation in the East Lansing area was near average in April but combined May and June rainfall was only two inches, almost 5 inches below the average. The dry weather in the spring resulted in lower first-cut yields in much of the state. The weather pattern changed in July and August as the totals for each month were more than twice the 30-year average. Some of the rain in August was combined with heavy wind. Wet conditions made harvesting dry hay a challenge in July and August. At Chatham, snow continued to fall through April into the first week of May and warmer temperatures arrived in mid-May. The last freeze was a few days before Memorial Day. Total rainfall at Chatham was above average in April, May, and July but below average in June, August, and September.

Methods

Plots are managed to provide optimum fertility and pest control. These tests are planted into prepared seedbeds using a research cone planter. Alfalfa and red clover plots are 3 feet wide and 20-23 feet long. Grass plots are generally 20-23 feet long and 5 feet wide and only the center 3 ft isharvested for yield. Phosphorus, potassium and sulfur are applied according to soil test and Michigan State University Extension recommendations for the species. Perennial and annual grass plots receive 50 lb of N in spring and again after first cutting. Winter small grain plots receive 50 lb N at planting and 100 lb in spring. Weeds and insects are controlled as needed. Plots may be irrigated if needed to aid in establishment but are usually not irrigated during production years in order to provide information about variety resilience to variation in precipitation.

The number of harvests per year depends on species, location, and weather. Intensive five-cut alfalfa systems are possible in southern Michigan counties, but it is rarely practical to get more than three alfalfa cuts in the Upper Peninsula. Grasses regrow more slowly and provide fewer cuttings than alfalfa. Harvest targets are late bud for alfalfa, early bloom for red clover and grasses, and flag leaf for small grains. Tests are harvested using a forage plot flail harvester set at a 3- or 4-inch stubble height, depending on the crop. **Test varieties** are provided by breeders, seed marketers, or others with an interest in variety performance. Both released and experimental varieties may be entered. ***Check varieties,*** when available, are included in most tests. Check varieties are chosen for suitability across a wide area of the USA. These provide reference points for estimation of relative differences among tests conducted across different years and locations The relative difference among varieties is expressed as a **percent of the trial average**. The reliability of variety rankings increases with the number of environments (i.e. the number of tests) in which the variety has been tested.

Statistical comparisons allow accurate separation of true genetic effects from random variation attributed to field or weather conditions within an individual test. Comparison of yields among varieties should only be made within a trial. The **Least Significant Difference (LSD)** is the key statistic for comparing two varieties. When the difference in average yield between two varieties is greater than or equal to the LSD value, the varieties are likely to be truly different.

Alfalfa Variety Trials

Long-term yield summaries for alfalfa varieties planted at multiple locations in Michigan variety trials from 2015 to 2022 are listed in **Tables 4 and 5**. Relative yield comparisons of the long-term yields at both East Lansing and Chatham are no longer ranked as a percent of 'Vernal' yield but instead as a percent of the trial average. This is because certified seed of Vernal alfalfa is no longer readily available and recent trials seeded in 2021 and 2022 do not have Vernal included as a check variety. Yields for individual cuttings in 2023 at East Lansing and Chatham are reported in **Tables 9 to 13**. Previous years yield data may be found at the MSU Forage Connection Website at http://www.forage.msu.edu/publications.

In 2023, alfalfa variety trials were cut four times at East Lansing and three times at Chatham. First cutting was removed at early to mid bloom at both locations in 2023. Alfalfa trial cutting dates at East Lansing were June 3, July 7, August 4, and September 30. Cutting dates at Chatham were on June 22, July 31, and September 20. In East Lansing, the average total yield in the established trials were 30 to 40 percent higher than last year. Alfalfa varieties seeded in 2020 averaged 7.56 and ranged from 6.50 to 8.24 tons per acre. Second-year total yield from the 2021 seeding averaged 6.52 and ranged from 5.59 to 7.14 tons per acre. First year total yield from a 15-variety trial established at East Lansing in May 2022 averaged 6.19 and ranged from 5.68 to 6.74 tons/acre. First cutting of alfalfa

at Chatham was a little earlier than last year and about the same as two years ago. Second cutting was five weeks after first and the third and final cutting was in late September. Yields of alfalfa in 2022 and 2023 at Chatham were higher than previous years. Average total yield of eight varieties seeded in 2021 was 4.78 and ranged from 4.42 to 4.92 tons per acre. First-year total yield of a trial seeded at Chatham in August 2022 was 4.63 and ranged from 4.36 to 4.80 tons per acre.

Perennial Cool-Season Grass Variety Trials

Cool-season grass trials were harvested two or three times at East Lansing and one or two times at Chatham in 2023. A brief description of grass species with a summary of management recommendations is in **Table 2**. Long-term yield summaries for grass varieties seeded in Michigan trials the past several years is reported in **Tables 6 and 7**. Yields for individual cuttings in 2023 at East Lansing and Chatham are in **Tables 16 to 19**. Previous years yield data may be found at the MSU Forage Connection Website at http://www.forage.msu.edu/publications

In 2023, we evaluated perennial grasses in trials seeded in 2020, 2021 and 2022 at East Lansing and seeded in 2020 at Chatham. First cutting of the grass trials at both locations was dependent date of maturity. In general, date of first cutting will be earliest with bromegrass and latest with the timothy varieties. First cutting of individual trials were a few days ahead of alfalfa at East Lansing and within one day at Chatham. Cutting dates in the 2020 and 2022 seeding years at East Lansing were: cut 1 – May 27-28, cut 2 – July 18 to August 5, and the final cut was Oct 1 in the 2022 seeding and November 13 in the 2020 seeding. The 2021 seeding at East Lansing was harvested two times in 2023, on May 28 and October 4. At Chatham, first cut of bromegrass (smooth and meadow), fescue (tall and meadow) and orchardgrass was on June 21 and timothy was on July 13, much later than the other grass species. Second cutting of grass at Chatham was on September 21.

Orchardgrass, tall fescue, meadow fescue, timothy, smooth bromegrass, meadow bromegrass, and perennial ryegrass were evaluated in tests at both East Lansing and Chatham. Depending on the species, yields at East Lansing were anywhere from one-third to one-half as much as in 2021 and about the same as in 2022. Above average rain in 2021, below average rain in 2022, and the variable distribution of rain in 2023 likely contributed to the year-to-year differences. More than half of the total yield in 2023 at East Lansing trials was in the first cutting. In the 2021 seeding, more 65 percent of the total yield was in the first cutting. In the 2020 and 2022 seedings, regardless of species, the first cut accounted for between 50 and 60 percent of the total yield. At Chatham, between 65 and 75 percent of the total yield was in the first cutting. In the 2020 seeding at East Lansing, dry matter yield of orchardgrass averaged 3.51 and ranged from 3.21 to 3.89, tall fescue yields averaged 2.99 and ranged from 2.15 to 3.55, meadow fescue yields averaged 2.60 and ranged from 2.23 to 2.86, and the perennial ryegrass average yield was 1.93 and ranged from 1.63 to 2.29 tons/acre, respectively. Yields of meadow and smooth bromegrass, respectively, averaged 3.74 and 3.16 tons per acre. The three varieties of timothy averaged 1.88 tons/acre with one cutting in 2023. In the 2021 seeding with two cuttings, tall fescue was the only species to yield more than last year. Second-year yields of tall fescue averaged 3.37 and ranged from 3.05 to 3.69, perennial ryegrass yields averaged 1.33 and ranged from 1.17 to 1.48, and timothy yields averaged 2.89 and ranged from 2.32 to 3.23 tons/acre, respectively. Yields were a little higher in the varieties seeded in the 2022 variety trial than the 2020 and 2021 trials at East Lansing. The soil type of the 2022 trial has a little better water holding capacity resulting in higher yields during the dry periods. The first-year yields of orchardgrass averaged 5.82 and ranged from 5.88 to 6.47, perennial ryegrass yields averaged 4.87 and ranged from 4.44 to 5.20, and timothy yields averaged 5.40 and ranged from 4.76 to 5.73 tons per acre, respectively.

At Chatham in 2023, orchardgrass was the only grass species to yield more than last year. The average yield of orchardgrass varieties was 1.78 and ranged from 1.46 to 2.04 tons/acre. Of the other species, respectively, tall fescue averaged 1.57 and ranged from 1.32 to 2.01, meadow fescue average yield was 1.57 and ranged from 1.51 to 1.65, timothy with one cutting averaged 2.59 and ranged from 2.45 to 2.68 tons per acre.

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 dates for first cutting in 2023 are reported in **Table 8**. The date of maturity is determined to be when 50% of the flowering tillers have a head that has cleared the flag leaf. A variety that does not reach 50% heading on or before the harvest date is listed as vegetative.

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. Red clover trials are conducted using the same methods as the alfalfa tests, but for a shorter time period. New red clover varieties have been persisting longer than the 'common' varieties and in some instances are productive in the third year. Two established red clover trials were evaluated for yield in 2023. The cutting dates were: June 2, July 19, and August 31. Dy matter yields of red clover varieties in the 2021 seeding averaged 4.16 and ranged from 3.03 to 4.80 tons per acre. In the 2022 seeding, yields averaged 5.74 and ranged from 4.27 to 6.29 tons per acre. Dry matter yields, per cut and total, of the varieties in the two red clover trials in 2023 are listed in **Tables 14 and 15.**

Annual Forage Trials

Ryegrass – Annual, Italian, and Intermediate

Annual grass trials were established in 2022 and 2023 at East Lansing. These trials are planted in plots 5 ft wide by at least 20 ft long. Harvest area is from the center 3 ft (6 rows) of each plot. Weed control with an herbicide was not needed in these trials. Plots were fertilized with 50 lbs/acre N prior to first cutting and after each cutting. It is common to harvest the annual ryegrass trials two to three times in the seeding year and usually two times in the second year. Eight varieties of ryegrass (annual, Italian, or intermediate) were seeded in 2022 and harvested three times in the seeding year. Winter survival was evaluated in the spring of 2023. All of the varieties were cut three times in 2023, the second year. Two varieties of annual ryegrass, including the check variety, did not regrow after the third cut in 2023, but six varieties did regrow and were cut a fourth time in early November. Above average rain in July and August 2023 likely attributed to the unusually good regrowth after the second cut. Total yield in 2023, the second year, averaged 3.77 and ranged from 2.76 to 4.32 tons per acre. A new trial of five ryegrass varieties (annual or Italian) was seeded in May and harvested three times in 2023. Dy matter yields averaged 3.79 and ranged from 3.34 to 4.03 tons per acre. These varieties will be evaluated for winter survival in the spring of 2024 and the surviving varieties will be harvested for yield. Yields, per cut and total, of the varieties in the two trials are in **Tables 20 and 21.**

Sorghum-Sudangrass, Sudangrass and Forage Sorghum

Two separate trials of sudangrass and forage sorghums were established in 2023. Nine varieties of either sorghum-sudangrass or sudangrass were planted in a multi-cut trial and four varieties of either sorghum-sudangrass or forage sorghum were planted in a single-harvest trial. The varieties of sorghum-sudangrass and sudangrass were seeded at 30 pounds and the forage sorghum was seeded at 10 pounds per acre. All varieties were planted in 6-inch rows using a research cone planter. Both trials were planted on June 17 at East Lansing. Rain and wet soil conditions delayed the harvest date of the multi-cut trial by about two weeks in August. Multiple heavy rain and wind events in August caused lodging in a few of the entries. The multi-cut trial was harvested on September 1 and on October 23. The second cutting was the day of the first killing frost. The single-cut trial was harvested on September 29. Maturity notes, plant height, lodging, yield, and harvest dry matter percent of the multi-cut and single-cut trials are in **Tables 22 and 23**.

Winter Small Grain Forage

Winter small grain variety trials of rye, hybrid rye and triticale have been conducted at East Lansing for the past 5 years. A trial was seeded in September 2022. Seeding rates of small grains were determined by number of seeds per pound of seed. Hybrid rye and triticale, respectively, were seeded at 800,000 and 1.2 million seeds per acre. All of the varieties tested had excellent winter survival going

into the spring. The ideal harvest timing of the hybrid rye and triticale for forage is prior to heading. The goal in 2023 was to harvest when the majority of varieties were at or near Feekes stage 10.0 to 10.1, just before the head emerges. First cutting of the hybrid rye was on May 17 and the triticale varieties was on May 24 and a second cutting of all varieties was on July 1. Yields of the hybrid rye and triticale in the first cut, respectively, averaged 2.38 and 2.70 tons/acre. Typically, the winter small grains are only cut one time. In 2023 there was adequate regrowth to harvest a second time. The second cutting was much more mature (Feekes stage > 10.5) than the first cutting and there was more second cut growth with the hybrid rye than the triticale. The average yield of hybrid rye was 1.46 and triticale was 0.57 tons per acre in cut two. Maturity and height at first cut, yield with two cuttings, and total yield in 2023 are listed in **Table 24**.

Forage Species Information

A summary of characteristics and management recommendations for tested forage species are included in **Table 2.** Appropriate species and variety selection depends on location, desired stand life, cutting management, yield goal, and forage quality goal. When selecting a forage to plant on a particular site, 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. For more details on individual forage species, see MSUE Bulletin E-3309, *Recommended Hay and Pasture Species for Michigan*.

Alfalfa

Michigan State University has evaluated more than 80 commercially available alfalfa varieties in its alfalfa variety trials since 2015. 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.

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 spring and later in fall, grow back faster at every cutting, mature a few days earlier, and usually 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 UP test location 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. High resistance (HR), for example, means that more than 50% of the established plants are resistant, leaving 50% susceptible. Therefore, a variety classified as resistant may still suffer damage from a disease, especially in the seedling stage. Moderate resistance (MR, 15 to 30% of plant resistant) is generally considered adequate for good alfalfa production in Michigan. 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. Most of the varieties tested in Michigan since 2015 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* fungicides may further reduce disease when planting resistant varieties. Treating a susceptible variety with a seed fungicide is unlikely to compensate for susceptibility. Most of the highest yielding varieties entered in our tests are highly 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 five-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 3) 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.

Perennial Cool-Season Grasses

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 two locations. More than 50 varieties have been evaluated at East Lansing and more than 20 varieties have been planted at Chatham. Nitrogen fertilizer is applied at green-up in the spring 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 well-drained soil types. Smooth bromegrass has poor regrowth potential, producing most of its yield in the first cutting, and it should not be grazed to prevent a reduction in tillering during the rest of the growing season. **Meadow brome** has better regrowth potential and heat tolerance than smooth brome. Crosses between smooth and meadow brome, sometimes called **Intermediate Brome**, are intended to 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 and earlier maturity.

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 and these are the varieties recommended for Michigan. **Meadow fescue** has better cold tolerance, forage quality, and palatability than tall fescue and does not contain toxic endophytes. Meadow fescue consistently yields about 22% less than tall fescue at East Lansing but yields of the two fescue species are similar at Chatham.

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 does not. Italian and annual ryegrasses are generally similar to perennial ryegrass in adaptation and use characteristics, except that many varieties are not winterhardy in Michigan. It is important to choose varieties that have been tested under northern conditions.

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.

Table 1. Actual and 30-year average precipitation (inches) from April through October, 2015 to 2023 at East Lansing and Chatham, Michigan.

	2015	2016	2017	2018	2019	2020	2021	2022	2023	Avg ††
	East Lansing †									
Apr	1.10	1.22	5.17	2.18	2.29	2.78	1.49	3.01	3.41	**3.26**
May	4.83	2.97	2.47	4.96	3.80	4.99	0.94	2.62	1.17	**3.66**
June	7.23	0.97	2.30	1.60	7.52	2.46	8.40	2.24	0.83	**3.76**
July	2.89	3.76	2.30	2.18	2.55	2.90	4.72	2.04	6.87	**2.94**
Aug	6.15	6.83	1.99	4.21	1.16	2.69	6.68	3.97	6.17	**3.48**
Sept	4.34	3.47	1.26	3.48	3.60	4.09	3.74	2.39	1.83	**2.81**
Oct	1.92	3.70	8.15	5.66	6.03	2.77	4.99	1.87	5.38	**3.16**
Total	**28.46**	**22.92**	**23.64**	**24.27**	**26.95**	**22.68**	**30.96**	**18.14**	**25.66**	**23.07**
	Chatham †									
Apr	2.03	3.21	5.25	2.02	2.56	1.91	3.46	5.04	3.83	**2.44**
May	5.60	3.45	4.99	1.36	5.53	1.60	1.06	2.51	5.56	**3.27**
June	2.67	2.34	7.36	4.48	2.52	5.11	4.87	3.94	1.88	**3.37**
July	2.15	3.44	1.74	5.08	1.42	7.65	2.43	1.99	3.95	**3.58**
Aug	1.86	3.67	5.50	4.32	2.70	3.82	1.75	4.39	2.26	**3.03**
Sept	2.41	4.78	3.26	5.40	5.08	3.53	3.22	3.77	1.70	**4.25**
Oct	4.25	6.90	7.82	8.02	7.25	5.29	2.53	4.25	5.44	**4.74**
Total	**20.97**	**27.79**	**35.92**	**30.68**	**27.06**	**28.91**	**19.32**	**25.89**	**24.62**	**24.68**

† Rainfall from the Michigan University Plant Soil and Microbial Sciences Agronomy Farm in East Lansing and the Michigan State University Upper Peninsula Experiment Station in Chatham.

†† Thirty year (1991 to 2020) averages in the Lansing Michigan area and from the Experiment Station in Chatham. https/www.weather.gov

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Table 2. Planting specifications and adaptation of tested forage species in Michigan.

	Seeding rate (lb/acre) †	Seeds/lb (approx)	Minimum Soil pH	Stand life (years)	Yield potential dm tons/acre per year	Recommended Uses			Suitability rating ††						
						hay	Silage/Baleage	pasture	Ease of establishment	Competitiveness in mixes	Tolerates low fertility	Tolerates wet soil	Tolerates drought	Tolerates heat	Tolerates cold
PERENNIAL LEGUMES															
Alfalfa	12-16	213,000	6.8	3-5+	2-8	X	X	X	1	3	5	5	2	2	1
Red clover	8-12	262,000	6.2	2	1-4	X	X	X	1	3	3	2	4	3	1
Birdsfoot Trefoil	6-10	371,000	6.0	2-3	1-4	X	X	X	3	4	2	2	2	3	2
PERENNIAL COOL-SEASON GRASSES															
Brome, meadow	15-20	93,000	6.0	5+	3-4	X	X	X	5	4	5	5	2	-	1
Brome, smooth	12-15	139,000	5.8	5+	3-4	X	X	X	5	3	4	5	2	2	1
Meadow Fescue	15-20	280,000	5.5	3-4	2-4	X	X	X	1	5	5	2	4	4	1
Tall fescue	12-15	218,000	5.0	5+	3-5	X	X	X	1	3	1	2	1	1	3
Festulolium	20-30	207,000	6.0	2-3	2-4	X	X	X	1	4	5	2	3	5	2
Kentucky bluegrass	8-15	2,056,000	5.8	5+	2-3			X	3	2	4	3	5	5	1
Orchardgrass	10-12	536,000	5.8	3-5	3-5	X	X	X	1	2	3	3	2	3	2
Reed canarygrass	6-8	509,000	5.5	5+	3-4	X	X	X	5	1	1	1	1	3	1
Ryegrass, perennial	20-30	278,500	5.6	2-5	2-4		X	X	1	3	5	2	5	5	4
Timothy	6-8	1,119,000	5.4	5+	3-5	X	X	X	1	3	4	2	5	3	1
ANNUAL COOL-SEASON FORAGE															
Berseem clover	8-25	207,000	6.0	1-2	3	X	X	X	2	3	4	2	1	1	5
Ryegrass, annual	20-30	209,000	5.6	1	1-3	X	X	X	1	3	4	2	5	5	4*
Ryegrass, Italian	20-30	209,000	6.0	1-2	1-3	X	X	X	1	3	5	2	5	5	4*
Barley (spring, winter)	75-120	14,000	6.0	1	1	X	X	X	1	3	1	3	2	4	4
Oats (spring)	64-80	17,800	4.5	1	1	X	X	X	1	3	2	3	4	4	4
Cereal Rye (winter)	60-120	17,000	5.0	1	1	X	X	X	1	3	1	3	2	4	1
Hybrid rye (winter)	40-80	15,000	5.5	1	1	X	X	X	1	3	2	3	2	4	1
Triticale (spring, winter)	50-120	16,000	5.2	1	1	X	X	X	1	3	1	3	2	4	2
ANNUAL WARM-SEASON GRASSES															
Crabgrass	3-5	800,000	5.5	1	3	X	X	X	1	5	3	4	2	1	5
Teffgrass	6-10	1,226,000	5.5	1	3	X	X	X	5	5	3	2	1	2	5
Sudangrass	20-30	49,000	6.0	1	2-5	X	X	X	1	2	2	5	1	1	5
Sudex (sorghum x sudangrass)	30-60	24,000	6.0	1	2-6	X	X	X	1	2	2	5	1	1	5
Forage Sorghum	10-15	26,000	6.0	1	2-5.5	X	X	X	1	2	2	5	1	1	5

†Use lower end of range for drilling and higher end for broadcasting. Reduce rates proportionately when planting in mixtures.

††Suitability Rating: 1=excellent, 2=very good, 3=average, 4=fair, 5=poor, * = variety-dependent.

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	Marketer
1041-2	4	2	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	Albert Lea
430 RR LH	4	2	HR	HR	HR	HR	HR	HR	-	MR	RR	HR	H	-	Farm Science
6424R	4	2	HR	HR	HR	HR	HR	HR	HR	R	RR	-	H	-	NEXGROW
9200 RR	4	1.5	HR	HR	HR	HR	HR	HR	-	-	RR	-	-	-	LG Seeds
9401	4	2	HR	HR	HR	HR	HR	HR	-	R	-	-	-	-	Albert Lea
Ace	4	1.5	HR	HR	HR	HR	HR	HR	R	HR	-	-	-	-	Brett Young
AFX 429	3	-	HR	HR	HR	HR	HR	HR	R	R	-	-	L	-	Alforex Seeds
AFX 460	4	2	HR	HR	HR	HR	HR	HR	R	R	-	-	-	-	Alforex Seeds
AFX 469	4	-	HR	HR	HR	HR	HR	HR	-	HR	-	-	L	G	Alforex Seeds
AFX 479	4	2	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	Alforex Seeds
AmeriStand 403T Plus	4	2	HR	HR	HR	HR	HR	HR	R	MR	-	-	-	-	America's Alfalfa
Armour	4	2	HR	HR	HR	HR	HR	HR	-	-	RR	-	-	-	Becks Hybrids
Bison	4	2	R	R	R	R	R	R	-	-	-	-	-	-	Thomas Ag Services
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 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
DKA44-16RR	4	2	HR	HR	HR	HR	HR	HR	-	R	RR	-	H	G	Dekalb
DKA43-22RR	4	2	HR	HR	HR	HR	HR	HR	R	HR	RR	-	H	-	Dekalb
Emerald	4	1	HR	HR	HR	HR	R	HR	HR	R	-	-	-	-	TriCal
FF42.A2	4	1.9	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	La Crosse
FF42.A3	4	2	HR	HR	HR	HR	HR	HR	HR	R	-	-	H	-	DLF USA
Finch	5	2	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	Blue River Organics
Fierce	4	2	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Becks Hybrids
Fortune	4	-	HR	HR	HR	HR	HR	HR	-	R	-	-	-	-	DLF USA
FSG 415 BR	4	2	HR	HR	HR	HR	HR	HR	R	-	-	-	-	-	Farm Science
FSG 420 BR	3	2	HR	HR	HR	HR	HR	HR	R	-	-	-	-	-	Farm Science
FSG 426	4	2	HR	HR	HR	HR	HR	HR	HR	-	-	-	H	-	Farm Science
GA 497 HD	5	2	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	Pref Alfalfa Gen
Hi-Gest 360	3	1.5	HR	HR	HR	HR	HR	HR	HR	R	-	-	M	G	Alforex Seeds
HybriForce 3400	4	1.5	HR	HR	HR	HR	HR	HR	MR	HR	-	-	-	-	Dairyland Seeds
HybriForce 3420/Wet	4	-	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Dairyland Seeds
HybriForce 3430	4	-	HR	HR	HR	HR	HR	HR	R	-	-	-	-	-	Dairyland Seeds
HybriForce 4400	4	2	HR	HR	HR	HR	HR	HR	R	HR	-	-	-	-	Dairyland Seeds
HybriForce 4420/Wet	4	2	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Dairyland Seeds
Integra 8420	4	-	HR	HR	HR	HR	HR	HR	HR	HR	-	-	M	-	Wilbur-Ellis
Integra 8450	4	-	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	Wilbur-Ellis
Integra 8444R	4	-	HR	HR	HR	HR	HR	HR	HR	HR	RR	-	M	G/F	Wilbur-Ellis
KF406A2	4	2	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Byron Seeds
KF425HD	5	2	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	Byron Seeds
L-455HD	4	-	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	Legacy Seeds
L-451APH2+	4	2	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	Legacy Seeds
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
Mariner V	4	2	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	Growmark
Octane	3	1.4	HR	HR	HR	HR	HR	HR	HR	-	-	-	L	-	Brett Young
Oneida VR	3	-	R	MR	MR	HR	HR	-	-	-	-	-	-	-	Public
54Q16	4	-	HR	HR	HR	HR	HR	HR	R	HR	-	-	-	-	Pioneer
54Q29	4	2	HR	HR	HR	HR	R	HR	HR	HR	-	-	-	-	Pioneer
55Q27	5	1	HR	HR	HR	HR	HR	HR	R	HR	-	-	-	-	Pioneer
54VQ52	3	-	HR	HR	HR	HR	R	HR	HR	R	-	-	-	-	Pioneer
55H96	5	-	HR	HR	HR	R	HR	HR	HR	-	-	HR	-	-	Pioneer
55V50	5	-	HR	HR	HR	HR	R	HR	HR	R	-	-	-	-	Pioneer

Table 3 continued next page

Table 3 continued

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	Marketer
55VR06	5	1	HR	HR	HR	HR	R	HR	MR	MR	RR	-	-	-	Pioneer
55VR08	5	-	HR	HR	HR	HR	HR	HR	HR	R	RR	-	-	-	Pioneer
54VR10	4	-	HR	HR	HR	HR	R	HR	HR	R	RR	-	-	-	Pioneer
Quail	5	2	HR	HR	HR	HR	HR	HR	-	R	-	-	-	-	Blue River Organics
QuickGold	5	-	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	Renk Seed
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
Signature	4	2	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	Growmark
Stalwart II	5	1.5	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	LG Seeds
Swift	4	2	HR	HR	HR	HR	R	R	MR	HR	-	-	-	-	Blue River Organics
SW 3407	3	2	HR	HR	HR	HR	HR	HR	HR	R	-	-	-	-	S&W Seeds
SW 4107	4	-	HR	HR	HR	HR	HR	HR	HR	R	-	-	-	-	S&W Seeds
SW 4412Y	4	2	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	S&W Seeds
SW 4506	4	2	HR	HR	HR	HR	HR	HR	HR	R	-	-	-	-	S&W Seeds
SW 5213	5	-	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	S&W Seeds
SW 5509	5	1	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	S&W Seeds
SW 5511	5	1	HR	HR	HR	HR	HR	HR	HR	R	-	-	-	-	S&W Seeds
SW 5615	5	1	HR	HR	HR	HR	HR	HR	HR	R	-	-	-	-	Mountain View Seed
TriFecta	5	2	HR	HR	HR	HR	R	HR	HR	MR	-	-	-	-	TriCal
Trifecta III	4	2	HR	HR	HR	HR	HR	HR	R	R	-	-	-	-	Seed Logic
Triad	5	2.5	HR	HR	HR	HR	HR	HR	-	R	-	-	-	-	Albert Lea
Vernal	2	2	R	S	S	S	MR	S	-	S	-	-	-	-	Public
Viking 374HD	4	2	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Albert Lea
Viking 394AP	4	2	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Albert Lea
WL 349 HQ	4	2	HR	HR	HR	HR	HR	HR	HR	R	-	-	-	-	W-L Research
WL 354 HQ	4	1	HR	HR	HR	HR	HR	HR	HR	R	-	-	H	-	W-L Research
WL 365 HQ	5	1	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	W-L Research
X-Force 5400	4	2	HR	HR	HR	HR	HR	HR	HR	MR	-	-	-	-	Alforex Seeds

† 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).

‡‡ Disease resistance ratings - HR (highly resistant) greater than 50 percent of plants resistant, R (resistant) between 31 and 50 percent, MR (moderate resistant) between 15 and 30 percent, S (susceptible) less than 15 % of plants resistant.

Table 4. Long-term yield averages (dry matter tons/acre) of alfalfa varieties seeded in trials from 2015 to 2022 at the Michigan State University Agronomy Farm, East Lansing, Michigan.

		Three-year average †						2-year average	1-year total	(Trials) ††
		2015	2016	2017	2018	2019	2020	2021	2022	%
Variety	Marketer	(2016-18)	(2017-19)	(2018-20)	(2019-21)	(2020-22)	(2021-23)	(2022-23)	(2023)	Mean
		dry matter tons/acre								
1041-2	Albert Lea	-	-	-	-	5.97	-	-	-	(1)102
9401	Albert Lea	-	-	-	-	5.62	-	-	-	(1) 96
Ace	Brett Young	-	-	-	5.01	-	-	-	-	(1) 91
AFX 429	Alforex Seeds	-	-	4.56	-	-	-	-	-	(1) 97
AFX 460	Alforex Seeds	-	-	4.77	5.16	-	-	-	-	(2) 98
AFX 469	Alforex Seeds	-	-	4.75	-	-	-	-	-	(1)101
AFX 479	Alforex Seeds	-	-	-	-	-	-	-	6.06	-
Bison	Thomas Ag Services	-	-	-	-	-	-	5.61	-	(1)100
Caliber	Becks Hybrids	4.33	-	-	-	-	-	-	-	(1) 91
CavalryDQ	Becks Hybrids	5.02	-	4.67	-	-	-	-	-	(2)102
Contender	Becks Hybrids	4.64	-	-	-	-	-	-	-	(1) 97
Emerald	TriCal	-	-	-	5.23	-	-	-	-	(1) 95
FF42.A2	Allied Seed	5.05	-	-	-	-	-	-	-	(1)106
FF42.A3	DLF USA Inc	-	-	-	-	-	-	5.57	5.87	(1) 99
Fierce	Becks Hybrids	4.94	-	4.49	-	-	-	-	-	(2) 99
Finch	Blue River Organic	-	-	-	-	5.82	-	-	-	(1) 99
Fortune	DLF USA Inc	-	5.34	-	-	-	-	-	-	(1)101
FSG 415 BR	Farm Science	5.33	-	-	-	-	-	-	-	(1)112
FSG 420 BR	Farm Science	-	-	-	-	-	7.63	-	-	(1)109
FSG 426	Farm Science	4.74	-	-	-	-	-	-	-	(1) 99
GA-497HD	Preferred Alfalfa Gen	-	5.23	-	-	-	-	-	-	(1) 98
HybriForce 3400	Dairyland Seed	4.73	-	-	-	-	-	-	-	(1) 99
HybriForce 3420 Wet	Dairyland Seed	-	5.41	-	-	-	-	-	-	(1)102
HybriForce 3430	Dairyland Seed	-	5.49	-	-	-	-	-	-	(1)103
HybriForce 4400	Dairyland Seed	4.94	5.48	5.19	5.85	5.96	7.06	5.99	6.21	(7)105
HybriForce 4420/Wet	Dairyland Seed	-	-	-	-	6.16	7.09	6.08	6.34	(3)105
Integra 8420	Wilbur-Ellis	-	5.47	-	-	-	-	-	-	(1)103
Integra 8450	Wilbur-Ellis	-	5.54	-	-	-	-	-	-	(1)104
KF406A2	Byron Seed	-	5.31	-	-	-	-	-	-	(1)100
KF425HD	Byron Seed	-	5.37	-	-	-	-	-	-	(1)101
Mariner V	Growmark	-	-	-	-	-	-	-	6.26	-
L-451APH2+-FL1	Legacy/Osprey	-	-	-	-	6.12	-	-	-	(1)104
L-451APH2+-FL2	Legacy/Osprey	-	-	-	-	6.19	-	-	-	(1)105
L-451APH2+ANS	Legacy/Osprey	-	-	-	-	6.06	-	-	-	(1)103
Oneida VR	Public	-	4.68	-	-	-	-	-	-	(1) 88
54Q16	Pioneer	-	-	-	-	-	-	5.49	5.68	(1) 98
54Q29	Pioneer	-	-	-	-	-	-	-	6.22	-
54VQ52	Pioneer	-	-	-	-	-	-	5.68	6.44	(1)101
54VR10	Pioneer	-	-	-	-	-	-	5.73	-	(1)102
55Q27	Pioneer	4.96	5.22	-	-	-	-	-	-	(2)101
55H96	Pioneer	-	-	-	-	-	-	5.17	-	(1) 92
Quail	Blue River Organic	-	-	-	-	5.60	-	-	-	(1) 95
QuickGold	Renk Seed	-	-	-	5.15	-	-	-	-	(1) 94
Rebound 6XT	Croplan Genetics	-	5.10	-	-	-	-	-	-	(1) 96
Signature	Growmark	-	-	-	-	-	-	-	5.80	-
Stalwart II	LG Seeds	-	5.14	-	-	-	-	-	-	(1) 97
SW 3407	S & W Seed Company	-	-	-	-	6.16	7.11	-	-	(2)103
SW 4107	S & W Seed Company	-	-	4.91	5.54	5.73	6.98	-	-	(4)101
SW 4412Y	S & W Seed Company	-	-	-	-	-	7.07	-	-	(1)101
SW 4506	S & W Seed Company	-	-	-	-	-	7.02	-	-	(1)100
SW 5213	S & W Seed Company	-	5.51	-	-	-	-	-	-	(1)104
SW 5509	S & W Seed Company	-	-	-	-	-	6.97	-	-	(1) 99
SW 5511	S & W Seed Company	-	-	-	-	5.84	-	-	-	(1) 99
SW 5520Y	S & W Seed Company	-	-	-	-	-	-	5.79	-	(1)103
SW 5517	S & W Seed Company	-	-	-	-	-	-	5.88	-	(1)105
SW 5614	S & W Seed Company	-	-	-	-	-	-	5.46	-	(1) 97
SW 5615	Mountain View Seed	-	-	-	-	-	-	5.64	6.14	(1)100
Triad	Albert Lea	-	-	-	-	5.52	-	-	-	(1) 94
TriFecta	TriCal	-	5.52	-	5.66	-	-	-	-	(2)104
Trifecta III	Seed Logic	-	-	-	5.48	-	-	-	-	(1)100
Vernal	public	3.93	4.45	4.33	5.05	5.46	6.17	4.94	-	(7) 88
Viking 394 AP	Albert Lea	-	-	-	-	-	-	-	6.34	-
Viking 374HD	Albert Lea	-	-	-	-	-	-	-	6.05	-
WL 365HQ	W-L Research	-	5.32	-	-	-	-	-	-	(1)100
WL 349HQ	W-L Research	-	-	-	-	5.79	-	-	-	(1) 99
X-Force 5400	Alforex Seeds	-	-	-	-	-	7.06	-	6.46	(1)101
Mean		**4.78**	**5.31**	**4.71**	**5.49**	**5.87**	**7.02**	**5.62**	**6.14**	

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

†† Number of trials with at least 2 years data and % of the average of the commercially available varieties

Table 5. Long-term yield averages (dry matter tons/acre) of alfalfa varieties seeded in trials from 2015 to 2022 at the Michigan State University Upper Peninsula Research and Extension Center, Chatham, Michigan.

		Three-year average †			2-year average	1-year total	(Trials) ††
		2015	2018	2019	2021	2022	%
Variety	Marketer	(2016-18)	(2019-21)	(2020-23)	(2022-23)	(2023)	Mean
		---------- dry matter tons/acre ----------					
1041-2	Albert Lea	-	-	5.24	-	-	(1)108
9401	Albert Lea	-	-	4.97	-	-	(1)103
AmeriStand 403T Plus	America's Alfalfa	3.29	-	-	-	-	(1)102
Bison	Thomas Ag Service	-	-	-	4.29		(1) 91
DG 4210	Crop Production	3.28	-	-	-	-	(1)102
HybriForce 3400	Dairyland Seed	3.45	4.58	-	-	-	(2)105
HybriForce 4400	Dairyland Seed	-	4.55	4.75	4.78	4.76	(3)101
HybriForce 4420/Wet	Dairyland Seed	-	-	-	4.70	4.55	(1) 99
Integra 8420	Wilbur-Ellis	-	4.39	-	-	-	(1)100
Integra 8450	Wilbur-Ellis	-	4.45	-	-	-	(1)101
L455HD	Legacy	3.20	-	-	-	-	(1) 99
Magnum 7 WET	Dairyland	3.13	-	-	-	-	(1) 97
Mariner IV	Allied Seed	3.14	-	-	-	-	(1) 97
Octane	Brett Young	-	-	-	-	-	-
Oneida VR	Public	3.13	-	-	-	-	(1) 97
54Q16	Pioneer	-	-	-	-	4.75	-
54Q29	Pioneer	-	-	-	-	4.60	-
54VQ52	Pioneer	-	-	-	-	4.63	-
55Q27	Pioneer	3.31	-	-	-	-	(1)102
StarGold	Renk Seed	3.27	-	-	-	-	(1)101
SW 3407	S & W Seed	-	-	4.88	4.70	-	(2)100
SW 4107	S & W Seed	-	4.17	4.91	4.82	-	(3) 99
SW 4412Y	S & W Seed	-	-	-	4.94	-	(1)104
SW 4506	S & W Seed	-	-	-	4.82	-	(1)102
SW 5509	S & W Seed	-	-	-	4.79	-	(1)101
SW 5511	S & W Seed	-	-	4.95	-	-	(1)102
Swift	Blue River Organic	-	-	4.95	-	-	(1)102
Triad	Albert Lea	-	-	4.33	-	-	(1) 90
Trifecta	TriCal	-	4.39	-	-	-	(1)100
Vernal	Public	3.14	4.27	4.47	-	-	(3) 96
Viking 394 AP	Albert Lea	-	-	-	-	4.80	-
Viking 374HD	Albert Lea	-	-	-	-	4.36	-
WL354HQ	W-L Research	3.08	-	-	-	-	(1) 95
X-Force 5400	Alforex Seeds	-	-	-	-	4.62	-
Mean		**3.23**	**4.40**	**4.83**	**4.73**	**4.63**	

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

†† Number of trials with at least 2 years data and % of the average of the commercially available varieties

Table 6. Long-term average yields (dry matter tons/acre) of perennial forage grass varieties seeded in trials from 2016 to 2022 at the Michigan State University Agronomy Farm, East Lansing, Michigan.

			three-year averages ††				2-year average	1-year total	(Trials) ‡ %
			2016	2017	2018	2020	2021	2022	species
Sp †	Variety	Marketer	(2017-19)	(2018-20)	(2019-21)	(2021-23)	(2022-23)	(2023)	mean
			dry matter tons/acre						
FEST	Hostyn	DLF USA Inc	-	-	4.45	-	-	-	(1)104
FEST	Lofa	DLF USA Inc	-	-	4.20	-	-	-	(1) 99
FEST	Perun	DLF USA Inc	-	-	4.12	-	-	-	(1) 97
FEST	**SPECIES MEAN Festulolium (ryegrass type)**		-	-	**4.26**	-	-	-	-
FEST	Fojtan	DLF USA Inc	3.72	-	-	-	-	-	(1) 95
FEST	Mahulena	DLF USA Inc	4.11	-	-	-	-	-	(1)105
FEST	**SPECIES MEAN Festulolium (fescue type)**		**3.92**	-	-	-	-	-	-
MdF	Pradel	Barenbrug/Best Forage	2.90	3.76	3.81	3.85	-	-	(4)100
MdF	SW Minto	Albert Lea Seed	-	3.49	-	-	-	-	(1) 96
MdF	Driftless	Barenbrug/Best Forage	-	-	3.70	3.77	-	-	(2) 99
MdF	Raskila	Hood River Seed	3.14	-	-	-	-	-	(1)104
MdF	**SPECIES MEAN Meadow Fescue**		**3.02**	**3.63**	**3.76**	**3.81**	-	-	
OR	Ammo	Barenbrug/Best Forage	-	-	-	4.25	-	5.94	(1) 94
OR	Barlegro	Barenbrug Seed	-	-	-	-	-	6.47	-
OR	Captur	DLF USA Inc	-	-	-	-	-	6.03	-
OR	Echelon	DLF USA Inc	4.45	-	-	4.78	-	-	(2)106
OR	Intensiv	Barenbrug/Best Forage	-	-	-	4.61	-	6.39	(1)102
OR	Inavale	DLF USA Inc	-	-	-	4.72	-	-	(1)104
OR	Lyra	Hood River Seed	4.00	-	-	-	-	-	(1) 96
OR	Lucharm	Albert Lea Seed	-	3.70	-	-	-	-	(1) 99
OR	Lukir	Albert Lea Seed	-	3.61	-	-	-	-	(1) 97
OR	Persist	Smith Seed	-	-	-	-	-	5.60	-
OR	Persist II	Smith Seed	-	-	-	-	-	5.79	-
OR	Potomac	check variety	4.09	3.92	-	4.31	-	5.88	(3) 99
OR	Swante	Smith Seed	-	-	-	-	-	5.99	-
OR	Treposno	Hood River Seed	4.09	-	-	-	-	-	(1) 98
OR	**SPECIES MEAN Orchardgrass**		**4.16**	**3.74**	-	**4.53**	-	**6.01**	
PR	Dexter 1 (4n)	DLF USA Inc	2.89	-	3.04	-	1.88	4.44	(3) 97
PR	Garbor (4n)	DLF USA Inc	2.69	-	3.19	-	-	-	(2) 96
PR	Linn (2n)	check variety	2.72	2.89	2.89	-	-	-	(3) 94
PR	Maximo (4n)	DLF USA Inc	3.48	-	-	-	-	-	(1)118
PR	Halsey (intermediate)	Smith Seed	-	-	-	-	-	5.20	-
PR	Tomaso	Albert Lea Seed	-	2.69	-	-	-	-	(1) 91
PR	Remington (4n)	Barenbrug/Best Forage	-	3.33	3.51	3.53	-	-	(3)108
PR	Remington NEA (4n)	Barenbrug/Best Forage	-	-	-	3.46	2.01	-	(2)101
PR	TetraGain SLT	Smith Seed	-	-	-	-	-	5.20	-
PR	**SPECIES MEAN Perennial Ryegrass**		**2.95**	**2.97**	**3.16**	**3.50**	**1.95**	**4.87**	
SB	Artillary (smooth)	Barenbrug/Best Forage	-	-	-	4.86	-	-	(1) 97
MB	Arsenal (meadow)	Barenbrug/Best Forage	-	-	-	5.18	-	-	(1)103
SB	Lincoln (smooth)	check variety	-	-	-	5.00	-	-	(1)100
MB/SB	**SPECIES MEAN Bromegrass species**		-	-	-	**5.01**	-	-	
TF	Armory	Barenbrug/Best Forage	-	-	-	4.81	-	-	(1)105
TF	BarElite	Barenbrug Seed	-	-	4.73	-	-	-	(1) 98
TF	Bariane	Barenbrug/Best Forage	-	-	4.56	4.37	-	-	(2) 95
TF	Florine	Albert Lea Seed	-	4.75	-	-	-	-	(1)100
TF	Kentucky 31 minus	check variety	4.11	5.06	5.06	-		-	(3)104
TF	Ranchero	Smith Seed	-	-	5.00	-	-	-	(1)103
TF	Swaj	Albert Lea Seed	-	4.45	-	-	-	-	(1) 94
TF	STF 43	Best Forage/Cisco	-	-	-	-	2.75	-	(1)100
TF	Tower	DLF USA Inc	4.01	-	-	-	-	-	(1) 99
TF	**SPECIES MEAN Tall Fescue**		**4.06**	**4.75**	**4.84**	**4.59**	-	-	
TM	Barfleo	Barenbrug/Best Forage	-	-	-	4.04	-	-	(1)114
TM	Baronaise	Barenbrug/Best Forage	-	-	-	3.43	-	-	(1) 97
TM	Climax	check variety	3.50	3.58	3.85	3.15	2.72	4.76	(5) 90
TM	Dawn	Allied Seed	4.00	-	-	-	-	-	(1)104
TM	KY Early Timothy	Smith Seed	-	4.62	4.50	-	-	-	(2)111
TM	Sahara DT	DLF USA Inc	-	-	-	-	-	5.73	-
TM	Winnetow	DLF USA Inc	-	-	4.01	-	-	-	(1) 97
TM	Valor	DLF USA Inc	-	-	-	-	3.33	5.43	(1)106
TM	Zenyatta	DLF USA Inc	3.99	-	-	-	3.33	5.66	(2)105
TM	**SPECIES MEAN Timothy**		**3.83**	**4.10**	**4.12**	**3.54**	**3.13**	**5.40**	

† FEST=Festulolium (ryegrass or fescue type), MdF= Meadow fescue, OR=Orchardgrass, PR=Perennial or Intermediate ryegrass, MB/SB Bromegrass species (meadow or smooth), TF= Tall fescue, TM=Timothy

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

‡ Number of trials with at least 2 years data (in parenthesis) and % of the mean of the commercially available varieties.

Table 7. Long-term average yields (dry matter tons/acre) of perennial forage grass varieties seeded in trials from 2014 to 2020 at the MSU Upper Peninsula Research and Extension Center, Chatham, Michigan.

			Three-year average ††			(Trials) ‡ %
			2014	2015	2020	species
Sp †	Variety	Marketer	(2015-17)	(2016-18)	(2021-23)	mean
			---------- dry matter tons/acre ----------			
MdF	Driftless	Barenbrug/Best Forage	-	-	2.11	(1)103
MdF	Pradel	Barenbrug/Best Forage	-	1.75	1.96	(1) 97
MdF	**SPECIES MEAN Meadow Fescue**		-		**2.04**	
OR	Ammo	Barenbrug/Best Forage	-	-	1.49	(1) 91
OR	Echelon	DLF USA Inc	1.54	-	-	(1) 98
OR	Intensiv	Barenbrug/Best Forage	1.68	-	1.67	(2)104
OR	Persist	Smith Seed	1.58	-	-	(1)101
OR	Potomac	check variety	1.59	1.69	1.75	(3)103
OR	**SPECIES MEAN Orchardgrass**		**1.57**	**1.69**	**1.64**	
PR	Albion (4n)	Cisco Seeds	-	0.72	-	(1) 88
PR	Linn (2n)	check variety	-	0.98	-	(1)120
PR	Mara (2n)	Barenbrug Seed	-	0.80	-	(1) 98
PR	Remington (4n)	Barenbrug/Best Forage	-	0.78	-	(1) 95
PR	**SPECIES MEAN Perennial Ryegrass**		**-**	**0.82**	-	-
MB	Arsenal (meadow)	Barenbrug/Best Forage	-	-	2.24	-
SB	Artillary (smooth)	Barenbrug/Best Forage	-	-	1.88	-
SB	Lincoln (smooth)	check variety	-	-	1.84	-
MB/SB	**SPECIES MEAN Bromegrass species**		-	-	-	-
TF	Armory	Barenbrug/Best Forage	-	-	1.96	(1)102
TF	Bariane	Barenbrug/Best Forage	1.53	1.35	1.87	(3) 90
TF	Kentucky 31 Plus	check variety	1.89	1.74	-	(2)108
TF	Kentucky 31 minus	check variety	1.82	-	-	(1)101
TF	Tuscany II	Forage First	1.98	-	-	(1)109
TF	**SPECIES MEAN Tall Fescue**		**1.81**	**1.55**	**1.92**	
TM	Barfleo	Barenbrug/Best Forage	-	-	2.19	(1) 99
TM	Baronaise	Barenbrug/Best Forage	-	-	2.18	(1) 98
TM	BarPenta	Barenbrug Seed	1.94	-	-	(1) 92
TM	Climax	check variety	2.03	1.75	2.30	(3) 97
TM	Crest	Allied Seed	2.19	-	-	(1)103
TM	Summit	Allied Seed	2.33	-	-	(1)110
TM	Winnetow	DLF USA Inc	-	1.77	-	(1) 94
TM	Zenyatta	DLF USA Inc	-	2.16	-	(1)114
TM	**SPECIES MEAN Timothy**		**2.12**	**1.89**	**2.22**	

† MdF= Meadow fescue, OR=Orchardgrass, PR=Perennial ryegrass, MB/SB Bromegrass species (meadow or smooth), TF= Tall fescue, TM=Timothy.

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

‡ Number of trials with at least 2 years data (in parenthesis) and % of the mean of the commercially available varieties.

Table 8. First cutting maturity dates in 2023 of the varieties entered in the Perennial Grass Variety Trials at East Lansing in 2020, 2021, and 2022.

2020 Perennial Grass Variety Trial

Tall Fescue

Variety	Date ††
Armory	May 24
7FACF82 †	Veg
BAR FA 9125 †	Veg
BAR FAF 135 †	Veg
BAR FAF 137 †	Veg
BAR FAF 146 †	May 26
BAR FAFL 239 †	May 26
Bariane	Veg
PST FA-A1733 †	May 25

Perennial Ryegrass

Variety	Date ††
DSV LP-A1901 †	Veg
DSV LP-A1902 †	May 24
PST LP-A1703 †	Veg
Remington	Veg
Remington NEA	Veg

Meadow Fescue

Variety	Date ††
BAR FP 2044 †	May 27
BAR FPF 77-2 †	May 27
BAR FPF82 †	May 28
Driftless	May 27
Pradel	May 26
PST FP-A1747 †	May 27
PST FP-A1750 †	May 27

Smooth Bromegrass

Variety	Date ††
Artillery	Veg
Lincoln	Veg

Meadow Bromegrass

Variety	Date ††
Arsenal	May 16
Commercial Check	May 17

Orchardgrass

Variety	Date ††
Ammo	May 19
BAR DGLF 2094 †	May 26
BAR DGLF 2095 †	Veg
Echelon	May 24
Inavale	May 22
Intensiv	May 27
OG 80 †	May 23
OG 96 †	May 24
Potomac	May 17
PST DG-1739 †	May 22
PST DG-A1737 †	May 26

Timothy

Variety	Date ††
Barfleo	Veg
Baronaise	Veg
Climax	Veg

2021 Perennial Grass Trials seeded in East Lansing

Perennial Ryegrass

Variety	Date ††
Bar LP237 †	Veg
Dexter 1	Veg
Remington NEA2	Veg

Tall Fescue

Variety	Date ††
BAR FAFR 160184 †	May 23
BAR FAFR 181197 †	May 24
BAR FAFR 184270 †	May 23
STF 43	May 28

Timothy

Variety	Date ††
Climax	Veg
Valor	May 28
Zenyatta	May 27

2022 Perennial Grass Trials seeded in East Lansing

Perennial Ryegrass

Variety	Date ††
Halsey	May 26
TetraGain SLT	Veg
Commercial check	Veg
Dexter 1	Veg

Timothy

Variety	Date ††
Sahara DT	Veg
Zenyatta	Veg
Valor	Veg
Climax	Veg

Orchardgrass

Variety	Date ††	Variety	Date ††
Ammo	May 20	Intensiv	May 25
BAR DGL22098 †	May 20	OG 96 †	May 24
BAR DGL22099 †	May 23	Persist	May 17
BAR DGL22100-C †	May 26	Persist II	May 20
BAR DGL22100-D †	May 27	Potomac	May 18
Barlegro	Veg	Swante	May 24
Captur	May 26		

† Experimental entry - not commercially available.

†† Maturity Date - Date when 50% of reproductive tillers have a fully emerged grass head that is clear of the flag leaf. Varieties listed as vegetative (Veg) had not reached maturity on the date of harvest.

Table 9. Michigan State University Alfalfa Variety Trial Yields (DM tons/acre), MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in August 2020

	2023 DM Yields T/A, Four-cuts and Total							
Variety	Cut 1 June 3	Cut 2 July 7	Cut 3 August 5	Cut 4 Sep 30	2023 Total	2022 Total	2021 Total	Trial Total
FSG 420BR ††	3.37	1.69	1.93	1.26	8.24*	6.34*	8.31*	22.89*
SW 3407	3.04	1.68	1.85	1.09	7.67	6.03*	7.64	21.34
HybriForce 4420/WET	3.15	1.62	1.75	1.15	7.68	5.82	7.78	21.28
SW 4412Y	3.06	1.63	1.83	1.10	7.62	5.83	7.77	21.21
X-Force 5400 ††	3.37	1.62	1.88	1.12	7.99	5.86	7.34	21.19
HybriForce 4400	3.30	1.54	1.66	1.08	7.58	5.73	7.86	21.17
AFX174082 †	3.20	1.53	1.83	1.10	7.66	5.88	7.62	21.16
SW 4506	3.16	1.63	1.79	1.01	7.58	5.89	7.59	21.07
SW 4107	2.96	1.52	1.71	1.01	7.20	5.98	7.75	20.93
SW 5509	2.99	1.60	1.84	1.01	7.43	6.03*	7.46	20.92
Vernal (certified)	2.80	1.33	1.46	0.91	6.50	5.06	6.96	18.52
Average	3.13	1.58	1.78	1.08	7.56	5.86	7.64	21.06
LSD 0.05	0.21	0.12	0.13	0.08	0.39	0.35	0.32	0.83
CV %	5.3	5.8	5.6	6.1	4.0	4.6	3.3	3.1

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

Table 10. Michigan State University Alfalfa Variety Trial Yields (DM tons/acre), MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in May 2021.

	2023 DM Yields T/A, Four-cuts and Total							
Variety	Cut 1 June 3	Cut 2 July 7	Cut 3 August 4	Cut 4 Sept 30	2023 Total	2022 Total	2021 Total	Trial Total
HybriForce-4420/WET	3.07	1.20	1.70	1.17	7.14*	5.02*	0.69	12.86*
HybriForce-4400	3.21	1.21	1.58	1.07	7.06*	4.92*	0.64	12.61*
SW5517	2.98	1.13	1.63	1.10	6.84*	4.92*	0.54	12.30*
SW5520Y	2.80	1.09	1.62	1.17	6.67*	4.90*	0.57	12.14*
54VR10	2.89	1.14	1.58	1.06	6.67*	4.78*	0.60	12.06*
54VQ52	2.84	1.03	1.64	1.08	6.59*	4.76*	0.59	11.95*
Bison	2.90	1.06	1.59	1.05	6.61*	4.60	0.72	11.92
SW5615	2.75	1.09	1.59	1.08	6.51*	4.77*	0.56	11.83
FF 42.A3	2.85	1.05	1.57	1.08	6.55*	4.59	0.63	11.77
54Q16	2.82	1.04	1.48	1.00	6.34	4.64	0.56	11.54
SW5614	2.63	1.04	1.49	1.04	6.20	4.72*	0.59	11.51
55H96	2.74	0.95	1.42	0.86	5.97	4.37	0.55	10.90
Vernal (certified)	2.57	0.87	1.29	0.86	5.59	4.29	0.64	10.52
Average	2.85	1.07	1.55	1.05	6.52	4.71	0.61	11.84
LSD 0.05	0.35	0.16	0.14	0.14	0.67	0.31	0.06	0.92
CV%	8.6	10.6	6.3	9.2	7.2	4.5	6.5	5.4

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

Table 11. Michigan State University Alfalfa Variety Trial Yields (DM tons/acre), MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in May 2022.

	2023 DM Yields T/A, Four-cuts and Total						
Variety	Cut 1 June 3	Cut 2 July 7	Cut 3 August 4	Cut 4 Sept 30	2023 Total	2022 Total	Trial Total
AFX184021 †	2.86	0.93	1.84	1.11	6.74*	1.97	8.71*
X-Force 5400 ††	2.67	0.90	1.81	1.07	6.46*	1.87	8.33*
HybriForce-4420/WET	2.68	0.90	1.69	1.07	6.34*	1.97	8.32*
54VQ52	2.86	0.86	1.69	1.04	6.44*	1.87	8.31*
Mariner V	2.62	0.95	1.71	0.99	6.26*	2.05	8.31*
Viking 394AP	2.74	0.82	1.75	1.03	6.34*	1.93	8.27*
54Q29	2.58	0.85	1.67	1.12	6.22*	1.96	8.18*
HybriForce-4400	2.63	0.85	1.70	1.02	6.21*	1.97	8.18*
AFX184035 †	2.51	0.92	1.79	1.09	6.31*	1.85	8.16*
AFX 479	2.55	0.87	1.62	1.02	6.06	1.84	7.90
SW5615	2.62	0.88	1.63	1.00	6.14	1.73	7.87
Viking 374HD	2.58	0.86	1.66	0.94	6.05	1.79	7.84
Signature	2.47	0.81	1.60	0.92	5.80	1.85	7.65
FF 42.A3	2.37	0.88	1.63	0.99	5.87	1.75	7.61
54Q16	2.47	0.78	1.52	0.91	5.68	1.75	7.43
Average	2.61	0.87	1.69	1.02	6.19	1.88	8.07
LSD 0.05	0.33	0.10	0.14	0.11	0.53	0.27	0.75
CV%	8.9	7.7	5.8	7.8	6.0	10.3	6.5

† 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 Alfalfa Variety Trial Yields (DM tons/acre) Upper Peninsula Research Station, Chatham, Michigan. Seeded August 2021.

	2023 DM Yields T/A, Three-cuts and Total					
	Cut 1 June 22	Cut 2 July 31	Cut 3 Sept 20	2023 Total	2022 Total	Trial Total
SW 4412	2.34	1.75	0.79	4.88*	5.00*	9.88*
SW 4107	2.30	1.71	0.85	4.86*	4.77*	9.63*
SW 4506	2.25	1.71	0.92	4.88*	4.75*	9.63*
SW 5509	2.28	1.66	0.90	4.83*	4.74*	9.57*
HybriForce-4400	2.29	1.71	0.92	4.92*	4.64*	9.56*
HybriForce-4420/WET	2.19	1.64	0.81	4.63*	4.76*	9.39*
SW 3407	2.24	1.66	0.90	4.80*	4.59	9.39*
Bison	2.00	1.46	0.95	4.42	4.16	8.58
Average	2.24	1.66	0.88	4.78	4.68	9.45
LSD 0.05	0.22	0.13	0.15	0.26	0.38	0.55
CV%	6.9	5.4	11.5	3.6	5.5	4.0

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

Table 13. Michigan State University Conventional Alfalfa Variety Trial Yields (DM tons/acre) Upper Peninsula Research Station, Chatham, Michigan. Seeded 2022.

	2023 DM Yields T/A, Three-cuts and Total			
Variety	Cut 1 June 22	Cut 2 July 27	Cut 3 Sept 20	2023 Total
Viking 394AP	2.34	1.62	0.84	4.80*
HybriForce-4400	2.37	1.55	0.83	4.76*
54Q16	2.52	1.58	0.65	4.75*
54VQ52	2.38	1.49	0.75	4.63*
X-Force 5400 ††	2.24	1.64	0.73	4.62*
54Q29	2.30	1.52	0.78	4.60*
HybriForce-4420/WET	2.25	1.56	0.74	4.55
Viking 374HD	2.13	1.54	0.69	4.36
Average	2.32	1.56	0.75	4.63
LSD 0.05	0.18	0.10	0.14	0.21
CV%	5.4	4.3	12.7	3.1

† 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 Red Clover Variety Trial Yields (DM tons/acre), MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in May 2021.

		2023 DM Yields T/A, Three-cuts and Total						
Variety		Cut 1 June 2	Cut 2 July 19	Cut 3 August 31	2023 Total	2022 Total	2021 Total	Trial Total
Evolve	DLF USA	2.72	0.92	1.16	4.80	4.69*	1.22	10.71*
Check ††	Commercial	2.61	0.85	1.04	4.50	4.66*	1.50	10.66*
Redkin	DLF USA	2.66	0.91	1.18	4.75	4.47	1.25	10.47*
Renegade	DLF USA	2.38	0.80	0.66	3.84	4.70*	1.45	9.99
TP 12 †	DLF USA	2.54	0.79	0.71	4.03	4.56*	1.30	9.89
VNS Red Clover	Public	2.04	0.72	0.28	3.03	4.38	1.35	8.77
Average		2.49	0.83	0.84	4.16	4.58	1.34	10.08
LSD 0.05		0.18	0.08	0.10	0.26	0.16	0.16	0.38
CV%		6.2	8.2	9.5	5.2	2.9	9.8	3.2

† Experimental Variety †† Commercially available check variety

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

Table 15. Michigan State University Red Clover Variety Trial Yields (DM tons/acre), MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in May 2022

		2023 DM Yields T/A, Three-cuts and Total					
Variety	Marketer	Cut 1 June 2	Cut 2 July 19	Cut 3 August 31	2023 Total	2022 Total	Trial Total
BAR TP V23 †	Barenbrug	3.23	1.31	1.76	6.29*	2.14	8.44*
Evolve	DLF USA	3.06	1.30	1.71	6.07*	2.26	8.33*
Check ††	Commercial	2.99	1.17	1.67	5.83*	2.42	8.24*
Redkin	DLF USA	3.01	1.19	1.75	5.95*	2.15	8.10*
BAR TS RWR †	Barenbrug	3.08	1.19	1.66	5.93*	2.14	8.07*
Freedom!MR	Barenbrug	2.97	1.20	1.76	5.93*	2.08	8.01*
Ruby Red Brand	Albert Lea	2.97	1.20	1.82	5.99*	2.01	8.00*
Medallion	DLF USA	2.93	1.09	1.40	5.43	2.05	7.48
VNS Red Clover	Public	2.56	0.99	0.72	4.27	2.03	6.30
Average		2.98	1.18	1.58	5.74	2.14	7.89
LSD 0.05		0.46	0.21	0.11	0.62	0.29	0.74
CV %		10.7	12.2	4.8	7.4	9.3	6.4

† Experimental Variety †† Commercially available check variety

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

Table 16. Michigan State University Perennial Grass Variety Trial Yields (DM tons/acre) of Tall Fescue, Meadow Fescue, Orchardgrass, Perennial Ryegrass, Timothy, and Bromegrass (Smooth and Meadow). MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded August 2020.

Orchardgrass

		2023 DM yields T/A, Three-cuts and Total						
Variety	Heading Date ††	Cut 1 May 28	Cut 2 August 5	Cut 3 Nov 13	2023 Total	2022 Total	2021 Total	Trial Total
OG 80 †	5/23/2023	2.06	0.86	0.75	3.67*	3.01	7.81*	14.50*
Echelon	5/24/2023	2.17	0.82	0.55	3.54*	3.19*	7.62*	14.35*
Inavale	5/22/2023	2.51	0.86	0.53	3.89*	3.25*	7.03	14.17*
Intensiv	5/27/2023	2.22	0.97	0.43	3.62*	2.94	7.26	13.82*
OG 96 †	5/24/2023	2.13	0.89	0.63	3.65*	2.96	6.98	13.60*
Potomac	5/17/2023	2.39	0.68	0.51	3.59*	3.16*	6.19	12.94
Ammo	5/19/2023	2.52	0.55	0.50	3.57*	2.64	6.53	12.74
BAR DGLF 2094 †	5/26/2023	1.98	0.91	0.45	3.33	2.91	6.46	12.70
PST DG-A1737 †	5/26/2023	1.72	0.90	0.59	3.22	2.37	6.76	12.35
PST DG-1739 †	5/22/2023	2.30	0.57	0.45	3.32	2.56	6.36	12.24
BAR DGLF 2095 †	Veg	1.97	0.82	0.42	3.21	3.03*	5.89	12.13
Average		2.18	0.80	0.53	3.51	2.91	6.81	13.23
LSD 0.05		0.32	0.20	0.08	0.52	0.23	0.53	0.98
CV%		10.1	16.9	11.0	10.3	5.4	5.4	5.1

Tall Fescue

		2023 DM yields T/A, Three-cuts and Total						
Variety	Heading Date ††	Cut 1 May 28	Cut 2 August 5	Cut 3 Nov 13	2023 Total	2022 Total	2021 Total	Trial Total
PST FA-A1733 †	5/25/2023	1.81	1.06	0.68	3.55*	3.10*	8.05*	14.69*
Armory	5/24/2023	1.92	0.86	0.49	3.26*	3.07*	8.11*	14.44*
BAR FAF 137 †	Veg	1.55	1.03	0.60	3.18*	3.02*	8.22*	14.42*
BAR FAF 146 †	5/26/2023	1.81	0.88	0.46	3.16*	3.17*	7.70*	14.03*
Bariane	Veg	1.49	1.03	0.48	3.00*	2.78	7.33	13.10
7FACF82 †	Veg	1.40	0.99	0.48	2.86	2.59	7.59*	13.05
BAR FAF 135 †	Veg	1.31	0.89	0.57	2.78	2.70	7.42	12.89
BAR FAFL 239 †	5/26/2023	1.82	0.71	0.46	2.99	2.37	7.32	12.68
BAR FA 9125 †	Veg	0.79	0.86	0.51	2.15	1.96	6.10	10.21
Average		1.54	0.92	0.53	2.99	2.75	7.54	13.28
LSD 0.05		0.30	0.19	0.14	0.55	0.36	0.66	1.13
CV%		13.1	14.4	17.7	12.6	8.7	5.9	5.8

Notes - Kentucky 31 minus dropped from the trial due to orchardgrass contamination.

Table 16. 2020 Perennial Grass East Lansing continued next page

Table 16. 2020 Perennial Grass East Lansing continued (page 2 of 3)

Meadow Fescue

		2023 DM yields T/A, Three-cuts and Total						
Variety	Heading Date ††	Cut 1 May 28	Cut 2 August 5	Cut 3 Nov 13	2023 Total	2022 Total	2021 Total	Trial Total
BAR FPF82 †	5/28/2023	1.72	0.67	0.46	2.86*	2.62*	6.31	11.79*
Pradel	5/26/2023	1.42	0.78	0.50	2.70*	2.51*	6.35	11.57*
PST FP-A1750 †	5/27/2023	1.32	0.64	0.47	2.43	2.41	6.67*	11.51*
BAR FPF 77-2 †	5/27/2023	1.60	0.78	0.38	2.76*	2.66*	5.95	11.38*
PST FP-A1747 †	5/27/2023	1.31	0.75	0.42	2.49	2.54*	6.34	11.37*
Driftless	5/27/2023	1.46	0.78	0.52	2.76*	2.54*	6.02	11.32*
BAR FP 2044 †	5/27/2023	1.19	0.66	0.37	2.23	2.15	5.88	10.26
Average		1.43	0.72	0.45	2.60	2.49	6.22	11.31
LSD 0.05		0.22	0.18	0.11	0.36	0.18	0.30	0.51
CV%		10.2	16.9	16.9	9.2	5.0	3.2	3.0

Perennial ryegrass

		2023 DM yields T/A, Three-cuts and Total						
Variety	Heading Date ††	Cut 1 May 28	Cut 2 August 5	Cut 3 Nov 13	2023 Total	2022 Total	2021 Total	Trial Total
Remington	Veg	1.03	0.68	0.35	2.06*	1.90*	6.64*	10.60*
Remington NEA	Veg	0.89	0.79	0.31	1.99*	1.76*	6.62*	10.37*
PST LP-A1703 †	Veg	0.73	0.63	0.33	1.69*	1.57*	5.55	8.80*
DSV LP-A1902 †	5/24/2023	1.65	0.45	0.19	2.29*	1.51	4.85	8.65
DSV LP-A1901 †	Veg	0.88	0.50	0.25	1.63	1.45	5.26	8.34
Average		1.04	0.61	0.29	1.93	1.64	5.78	9.35
LSD 0.05		0.50	0.15	0.10	0.65	0.37	0.46	0.80
CV%		31.3	15.7	22.4	22	14.8	5.2	5.6

Timothy

	Heading	2023 DM yield T/A - One cutting	2022	2021	Trial
Variety	Date ††	May 28	Total	Total	Total
Barfleo	Veg	2.23*	3.24*	6.66*	12.13*
Baronaise	Veg	1.83*	2.73	5.72	10.29
Climax	Veg	1.58	2.63	5.24	9.45
Average		1.88	2.87	5.87	10.6
LSD 0.05		0.54	0.29	0.37	0.41
CV%		16.8	5.8	3.6	2.2

Notes -Three cuttings in 2021, One in 2022 and 2023.

Table 16. 2020 Perennial Grass East Lansing continued next page

Table 16. 2020 Perennial Grass East Lansing continued (page 3 of 3)

Bromegrass (Smooth and Meadow)

Smooth Brome	Heading Date ††	2023 DM yields T/A, Three-cuts and Total: Cut 1 May 28	Cut 2 Aug 5	Cut 3 Nov 13	2023 Total	2022 Total	2021 Total	Trial Total
Lincoln	Veg	2.51	0.43	0.26	3.20	2.61	9.19	15.00
Artillery	Veg	2.34	0.51	0.25	3.11	2.67	8.79	14.57
Average		2.43	0.47	0.26	3.16	2.64	8.99	14.79
LSD 0.05 (smooth bromegrass)		0.31	0.09	0.09	0.27 ns	0.30 ns	0.41 ns	0.57 ns
CV%		7.4	10.9	19.6	4.9	6.5	2.6	2.2

Meadow Brome	Heading Date ††	2023 DM yields T/A, Three-cuts and Total: Cut 1 May 28	Cut 2 Aug 5	Cut 3 Nov 13	2023 Total	2022 Total	2021 Total	Trial Total
Commercial Check	5/17/2023	2.51	0.85	0.46	3.82	3.35	8.46	15.64
Arsenal	5/16/2023	2.50	0.71	0.44	3.65	3.10	8.80*	15.55
Average		2.51	0.78	0.45	3.74	3.23	8.63	15.6
LSD 0.05 (meadow brome)		0.30	0.13	0.14	0.42 ns	0.59 ns	0.30	0.67 ns
CV%		6.9	9.8	17.1	6.5	10.4	2.0	2.4

All Bromegrass								
Average		2.47	0.63	0.35	3.45	2.93	8.81	15.19
LSD 0.05		0.25	0.09	0.08	0.28	0.38	0.38	0.55
CV%		7.5	10.8	16.0	5.6	9.5	3.1	2.6

† Experimental Variety.

†† Date when 50% of reproductive tillers have a fully emerged grass head that is clear of the flag leaf.
Veg - Variety in the vegetative stage on the date of first cutting.

* 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 17. Michigan State University Perennial Grass Variety Trial Yields (DM tons/acre) of Tall Fescue, Perennial Ryegrass, and Timothy. MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in May 2021.

Tall Fescue

		2023 DM yields T/A, Two-cuts and Total				
Variety	Heading Date ††	Cut 1 May 28	Cut 2 Oct 4	2023 Total	2022 Total	Trial Total
Bar Fafr 160184 †	5/23/2023	2.37	1.32	3.69*	2.86*	6.55*
Bar Fafr 181197 †	5/24/2023	1.99	1.23	3.22	2.63*	5.85
Bar Fafr 184270 †	5/23/2023	2.55	0.97	3.51*	2.32	5.83
STF 43	5/28/2023	1.73	1.31	3.05	2.44	5.49
Average		2.16	1.21	3.37	2.56	5.93
LSD 0.05		0.38	0.13	0.45	0.23	0.44
CV%		14.2	8.7	10.9	7.7	6.0

Perennial ryegrass

		2023 DM yields T/A, Two-cuts and Total				
Variety	Heading Date ††	Cut 1 May 28	Cut 2 Oct 4	2023 Total	2022 Total	Trial Total
Remington NEA2	Veg	0.86	0.62	1.48*	2.53	4.01*
Dexter 1	Veg	0.91	0.43	1.34*	2.42	3.76*
Bar LP237 †	Veg	0.66	0.51	1.17	2.32	3.49
Average		0.81	0.52	1.33	2.42	3.75
LSD 0.05		0.30	0.12	0.35	0.32 ns	0.51
CV%		21.5	12.8	15.2	7.7	7.9

Timothy

		2023 DM yields T/A, Two-cuts and Total				
Variety	Heading Date ††	Cut 1 May 28	Cut 2 Oct 4	2023 Total	2022 Total	Trial Total
Valor	5/28/2023	2.38	0.74	3.11*	3.54*	6.66*
Zenyatta	5/27/2023	2.49	0.74	3.23*	3.42*	6.65*
Climax	Veg	1.71	0.62	2.32	3.12	5.44
Average		2.19	0.7	2.89	3.36	6.25
LSD 0.05		0.55	0.14	0.60	0.26	0.68
CV%		14.4	11.2	11.9	4.5	6.3

† Experimental Variety.

†† Date when 50% of reproductive tillers have a fully emerged grass head that is clear of the flag leaf.
Veg - Variety in the vegetative stage on the date of first cutting.

* 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 18. Michigan State University Perennial Grass Variety Trial Yields (DM tons/acre) of Orchardgrass, Perennial Ryegrass, and Timothy. MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in August 2022.

Orchardgrass

		2023 DM yields T/A, Three-cuts and Total					
Variety	Heading Date ††	Cut 1 May 27	Cut 2 July 18	Cut 3 Oct 1	2023 Total	2022 Total	Trial Total
OG 96 †	5/24/2023	3.36	1.47	1.39	6.23*	1.10	7.33*
Barlegro	Veg	3.77	1.40	1.30	6.47*	0.75	7.22*
Intensiv	5/25/2023	3.86	1.35	1.18	6.39*	0.79	7.18*
Captur	5/26/2023	3.01	1.64	1.38	6.03*	0.97	7.00*
BAR DGL22100-D †	5/27/2023	3.80	1.34	1.18	6.32*	0.67	6.99*
BAR DGL22100-C †	5/26/2023	3.68	1.27	1.16	6.11*	0.67	6.78
Swante	5/24/2023	3.71	1.26	1.01	5.99*	0.77	6.76
Potomac	5/18/2023	3.37	1.31	1.20	5.88	0.84	6.72
BAR DGL22098 †	5/20/2023	3.49	1.28	1.18	5.95	0.67	6.62
Ammo	5/20/2023	3.80	1.08	1.06	5.94	0.58	6.52
BAR DGL22099 †	5/23/2023	3.66	1.07	1.09	5.82	0.65	6.47
Persist II	5/20/2023	3.31	1.25	1.23	5.79	0.58	6.37
Persist	5/17/2023	3.24	1.21	1.16	5.60	0.75	6.35
Average		3.54	1.30	1.19	6.04	0.75	6.79
LSD 0.05		0.34	0.12	0.19	0.49	0.13	0.49
CV %		6.7	6.6	11.3	5.7	12.1	5.1

Perennial ryegrass

		2023 DM yields T/A, Three-cuts and Total					
Variety	Heading Date ††	Cut 1 May 27	Cut 2 July 9	Cut 3 Oct 1	2023 Total	2022 Total	Trial Total
Halsey	5/26/2023	3.46	1.34	0.41	5.20*	1.54	6.74*
TetraGain SLT	Veg	3.73	0.90	0.57	5.20*	0.87	6.07
Commercial Check	Veg	3.05	0.95	0.62	4.62	0.98	5.60
Dexter 1	Veg	3.06	0.74	0.64	4.44	0.99	5.43
Average		3.33	0.98	0.56	4.87	1.10	5.96
LSD 0.05		0.28	0.26	0.10	0.50	0.15	0.59
CV %		5.2	16.4	10.9	6.5	8.8	6.2

Table 18 - East Lansing 2022 Perennial grass seeding continued next page

Table 18 - East Lansing 2022 Perennial grass seeding continued (page 2 of 2)

Timothy

Variety	Heading Date ††	2023 DM yields T/A, Three-cuts and Total			
		Cut 1 May 27	Cut 2 July 18	Cut 3 Oct 1	2023 Total
Sahara DT	Veg	3.25	1.31	1.17	5.73*
Zenyatta	Veg	3.44	1.04	1.18	5.66*
Valor	Veg	3.22	1.07	1.14	5.43*
Climax	Veg	2.93	0.98	0.85	4.76
Average		3.21	1.10	1.09	5.40
LSD 0.05		0.41	0.15	0.13	0.33
CV %		8.0	8.5	7.6	3.9

† Experimental Variety.

†† Date when 50% of reproductive tillers have a fully emerged grass head that is clear of the flag leaf.
Veg - Variety in the vegetative stage on the date of first cutting.

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

Table 19. Michigan State University Perennial Grass Variety Trial Yields (DM tons/acre) of Tall Fescue, Meadow Fescue, Orchardgrass, Timothy, and Bromegrass (Smooth and Meadow). Upper Peninsula Research and Extension Center, Chatham, Michigan. Seeded August 2020

Tall Fescue	2023 DM yields T/A, Two-cuts and Total					
Variety	Cut 1 June 20	Cut 2 Sept 21	2023 Total	2022 Total	2021 Total	Trial Total
BAR FAF 135 †	1.24	0.77	2.01*	2.76*	1.45*	6.22*
BAR FAF 146 †	1.22	0.51	1.72*	2.81*	1.49*	6.03*
Armory	1.17	0.32	1.49*	2.96*	1.43*	5.89*
Bariane	1.06	0.51	1.56*	2.49*	1.55*	5.60*
BAR FAF 137 †	0.88	0.59	1.47*	2.37	1.29*	5.13*
7FACF82 †	1.08	0.56	1.64*	2.17	1.10	4.91
BAR FAFL 239 †	1.07	0.25	1.32	2.56*	1.00	4.87
BAR FA 9125 †	0.73	0.61	1.34	1.78	1.05	4.17
Average	1.06	0.52	1.57	2.49	1.30	5.35
LSD 0.05	0.36	0.33	0.60	0.51	0.30	1.15
CV%	22.3	43.6	25.4	13.7	15.9	14.4

Meadow Fescue	2023 DM yields T/A, Two-cuts and Total					
Variety	Cut 1 June 21	Cut 2 Sept 20	2023 Total	2022 Total	2021 Total	Trial Total
BAR FPF 82 †	1.21	0.40	1.61	2.25*	2.55*	6.40*
Pradel	0.95	0.70	1.65	2.39*	2.28*	6.32*
BAR FPF 77-2 †	1.18	0.33	1.52	2.48*	1.99	5.98*
Driftless	1.06	0.48	1.54	2.30*	2.05	5.89*
BAR FP 2044 †	0.85	0.66	1.51	2.06	2.19	5.75
Average	1.05	0.51	1.57	2.3	2.21	6.07
LSD 0.05	0.09	0.10	0.17 ns	0.23	0.35	0.64
CV%	5.9	13.1	7.3	6.7	10.4	6.9

Orchardgrass	2023 DM yields T/A, Two-cuts and Total					
Variety	Cut 1 June 21	Cut 2 Sept 20	2023 Total	2022 Total	2021 Total	Trial Total
BAR DGLF 2095 †	1.43	0.60	2.04	1.76*	1.79*	5.59*
Potomac	1.36	0.47	1.83	1.74*	1.68*	5.25*
Intensiv	1.37	0.48	1.85	1.60*	1.57*	5.02*
Ammo	1.35	0.37	1.72	1.50*	1.25*	4.47*
BAR DGLF 2094 †	1.05	0.41	1.46	1.16	1.14	3.75
Average	1.31	0.47	1.78	1.55	1.49	4.82
LSD 0.05	0.40	0.27	0.63 ns	0.54	0.58	1.69
CV%	19.6	38.2	23.2	22.8	25.4	22.8

Table 19. 2020 Perennial Grass Chatham continued next page

Table 19. 2020 Perennial Grass Chatham continued (page 2 of 2)

Meadow Brome	2023 DM yields T/A, Two-cuts and Total					
Variety	Cut 1 June 20	Cut 2 Sept 21	2023 Total	2022 Total	2021 Total	Trial Total
Arsenal	1.26	0.60	1.86	2.42	2.44	6.72
Commercial check	1.28	0.54	1.82	2.10	2.45	6.37
Average	1.27	0.57	1.84	2.26	2.45	6.55
LSD 0.05	0.49	0.19	0.65 ns	1.10 ns	0.60 ns	2.22 ns
CV%	17.1	14.8	15.6	21.6	10.9	15.1

Smooth Brome	2023 One-cutting, DM T/A	2022	2021	Trial
Variety	June 20	Total	Total	Total
Artillery	1.69	1.90	2.04	5.64
Lincoln	1.77	1.84	1.90	5.51
Average	1.73	1.87	1.97	5.58
LSD 0.05	0.55 ns	0.54 ns	0.36 ns	1.24 ns
CV%	14.2	12.9	8.1	9.9

Timothy	2023 One-cutting, DM T/A	2022	2021	Trial
Variety	July 13	Total	Total	Total
Climax	2.68*	2.93*	1.28	6.89
Barfleo	2.45	2.85*	1.27	6.56
Baronaise	2.65*	2.61	1.27	6.53
Average	2.59	2.80	1.27	6.66
LSD 0.05	0.20	0.31	0.42 ns	0.89 ns
CV%	4.8	6.3	19.3	7.7

† 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 20. Michigan State University 2023 Annual Grass Variety Trial Yields (DM tons/acre) of Annual, Intermediate, and Italian ryegrass varieties seeded at the MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in May 2022.

			2023 DM Yields T/A, Four-cuts and Total						
		% Stand	Cut 1	Cut 2	Cut 3	Cut 4	2023	2022	Trial
Variety	Type	April 27	May 22	July 1	Aug 5	Nov 13	Total	Total	Total
Halsey	Intermediate	85	2.57	0.36	0.68	0.36	3.97*	2.43	6.40*
Dexter	Annual	88	2.76	0.50	0.64	0.35	4.26*	2.03	6.29*
Koga	Annual	65	2.77	0.50	0.73	0.32	4.32*	1.82	6.14*
Green Spirit	Italian	90	2.48	0.33	0.49	0.43	3.72	2.41	6.13*
Grazekeeper	Annual	63	2.69	0.55	0.68	0.25	4.17*	1.89	6.06*
Meroa	Annual	80	2.61	0.39	0.65	0.29	3.95*	1.97	5.92*
Mantis	Annual	50	2.20	0.37	0.19	-	2.76	2.87*	5.63
Marshall	Annual	50	2.29	0.56	0.14	-	2.98	2.41	5.39
Average			2.54	0.45	0.53	0.34	3.77	2.23	6.00
LSD 0.05			0.35	0.12	0.12	0.11	0.47	0.24	0.58
CV%			9.5	19.1	14.9	21.9	8.50	7.20	6.5

Notes - Varieties 'Mantis' and 'Marshall' did not regrow after cut 3 in 2023

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

Table 21. Michigan State University 2023 Annual Grass Variety Trial Yields (DM tons/acre), MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in May 2023.

		2023 DM Yields T/A, Three-cuts and Total			
		Cut 1	Cut 2	Cut 3	2023
Variety		July 9	Aug 31	Nov 13	Total
BAREXTRA	Italian	1.27	2.02	0.74	4.03
BAR 14 LMT 503 †	Italian	1.33	1.93	0.73	3.98
BAR LMD TB+ †	Italian	1.27	2.07	0.58	3.92
Marshall	Annual	1.72	1.49	0.45	3.66
Ador	Italian	1.52	1.29	0.53	3.34
Average		1.42	1.76	0.61	3.79
LSD 0.05		0.34	0.33	0.11	0.46
CV %		15.5	12.2	11.3	8.0

† Experimental Variety

Table 22. Michigan State University 2023 Multiple-cutting Sorghum Sudangrass Variety Trial Yields (DM tons/acre). MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Planted June 17, 2023.

			Cut 1 - September 1, 2023				Cut 2 - Oct 23, 2023		2023
Variety	Type	Heading date †	Lodging score ††	Height Feet	Yield tons/acre	DM %	Yield tons/acre	DM % %	Total Yield
Viking 100	Sorghum x sudangrass	Aug 26	1.0	7.9	5.48	19.3	0.69	26.3	6.17
Piper (check)	Sudangrass	Aug 26	1.0	7.9	4.78	22.3	1.13	25.7	5.91
Viking 200 BMR	Sorghum x sudangrass	Aug 25	1.3	8.4	4.90	20.1	0.76	26.2	5.66
Viking 150	Sorghum x sudangrass	Veg	1.0	7.0	4.95	17.1	0.54	28.3	5.49
Blackhawk 12 BMR	Sorghum x sudangrass	Sept 1	1.8	6.6	4.67	18.5	0.63	27.8	5.31
Viking 510 BMR	Sudangrass	Aug 29	2.8	6.6	4.39	18.1	0.67	28.9	5.05
Viking 232 BMR	Sorghum x sudangrass	Veg	1.3	5.4	4.36	18.0	0.51	24.8	4.87
Viking O.225	Sorghum x sudangrass	Veg	5.8	6.6	3.96	16.0	0.30	31.4	4.26
Viking O.210	Sorghum x sudangrass	Sept 1	4.8	6.5	3.47	16.2	0.58	25.3	4.05
Average				7.0	4.55	18.4	0.65	27.2	5.20
LSD 0.05				0.5	0.67	1.58	0.16	1.47	0.70
CV%				4.6	10.1	5.9	16.5	3.8	9.2

Table 23. Michigan State University 2023 Single-cut Sorghum Sudangrass and Forage Sorghum Variety Trial Yields (DM tons/acre). MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Planted June 17, 2023

				Cut 1 - September 29, 2023			
Variety	Type	seeding rate lbs/acre	Heading date †	Lodging score ††	Height Feet	Yield tons/acre	DM %
Viking 150	Sorghum x sudangrass	30	Sept 11	1.0	8.4	9.28	23.93
Viking 300 BMR PPS	Sorghum x sudangrass	30	Veg	2.3	7.6	7.92	23.54
Viking O.225	Sorghum x sudangrass	30	Sept 19	4.3	7.0	7.06	22.38
Viking 401	Forage Sorghum	10	Sept 14	10.0	n/a	5.11	17.93
Average						7.34	21.95
LSD 0.05						1.74	2.27
CV %						14.8	6.4

† Heading dates - Date when 50% of plants had an emerged seed head. Veg = vegetative on the day of harvest.
†† Lodging scale - 1 = upright, 10 = 100 % down

Table 24. Michigan State University 2022-2023 Winter Small Grain Forage Variety Trial Yields (DM tons/acre). MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Planted September 2022

Triticale

			2023 DM yields T/A, Two-cuts and Total			
		Height	Cut 1 - May 23		Cut 2 - July 1	2023
Variety	Maturity	inches	yield	DM %	yield ††	Total
Ace	10.3	28.0	2.90*	15.9	0.58	3.48*
Gunner	9.9	29.8	2.72*	13.9	0.67*	3.39*
Flex 719	10.0	32.5	2.83*	14.8	0.51	3.33*
Exp 0220 †	10.0	30.5	2.79*	14.4	0.50	3.29*
Exp 0305 †	9.6	31.0	2.47	14.2	0.77*	3.24*
Exp 71321 †	10.3	25.5	2.68*	15.3	0.45	3.13
Exp 0209 †	10.1	29.5	2.53	14.5	0.54	3.07
Average		29.5	2.70	14.7	0.57	3.28
LSD 0.05		2.8	0.31	0.7	0.12	0.32
CV%		6.3	7.6	3.1	13.6	6.6

Hybrid Rye

			2023 DM yields T/A, Two-cuts and Total			
		Height	Cut 1 - May 16		Cut 2 -July 1	2023
Variety	Maturity	inches	yield	DM %	yield ††	Total
Aviator	10.1	33.3	2.53	14.7	1.44	3.96
Progas	10.2	32.3	2.37	14.6	1.43	3.80
ProPower	10.1	30.5	2.25	13.5	1.52	3.76
Average		32.0	2.38	14.3	1.46	3.84
LSD 0.05		2.0	0.38 ns	1.2	0.18 ns	0.40 ns
CV%		3.6	9.1	4.7	7.0	5.9

† Experimental Variety

†† DM % in cut two not significantly different among hybrid rye (39 to 40 %) or triticale entries (35-37 %)

Appendix I

Acknowledgements of the staff and students at Chatham and East Lansing

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Appendix II

East Lansing, Michigan

Rainfall data at the Michigan State University Agronomy farm by date, Summer 2023

Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches
April 1		May 1	0.04	June 1		July 1		August 1		Sept 1		Oct 1	
April 2	0.25	May 2	0.34	June 2		July 2	1.11	August 2		Sept 2		Oct 2	
April 3		May 3	0.13	June 3		July 3	0.64	August 3		Sept 3		Oct 3	
April 4	0.43	May 4	0.04	June 4		July 4		August 4		Sept 4		Oct 4	
April 5	0.53	May 5		June 5		July 5		August 5		Sept 5		Oct 5	
April 6	0.94	May 6		June 6		July 6	0.18	August 6		Sept 6		Oct 6	2.60
April 7		May 7		June 7		July 7	0.17	August 7	0.62	Sept 7	0.55	Oct 7	0.24
April 8		May 8	0.07	June 8		July 8		August 8	0.03	Sept 8	0.28	Oct 8	0.14
April 9		May 9	0.05	June 9		July 9		August 9		Sept 9		Oct 9	
April 10		May 10		June 10		July 10	0.04	August 10		Sept 10		Oct 10	
April 11		May 11		June 11		July 11		August 11	0.03	Sept 11		Oct 11	0.11
April 12		May 12		June 12	0.13	July 12		August 12		Sept 12	0.19	Oct 12	
April 13		May 13		June 13	0.01	July 13	1.73	August 13	0.01	Sept 13	0.03	Oct 13	
April 14		May 14		June 14		July 14	0.87	August 14		Sept 14		Oct 14	0.32
April 15		May 15		June 15		July 15		August 15	0.58	Sept 15		Oct 15	0.30
April 16		May 16		June 16		July 16		August 16	1.93	Sept 16		Oct 16	0.05
April 17	0.21	May 17		June 17		July 17	0.70	August 17		Sept 17		Oct 17	
April 18	0.08	May 18		June 18		July 18		August 18	0.79	Sept 18		Oct 18	
April 19		May 19		June 19		July 19		August 19		Sept 19		Oct 19	
April 20	0.22	May 20	0.50	June 20		July 20		August 20		Sept 20		Oct 20	0.41
April 21		May 21		June 21		July 21	0.11	August 21		Sept 21		Oct 21	0.20
April 22	0.06	May 22		June 22		July 22		August 22		Sept 22		Oct 22	0.02
April 23	0.13	May 23		June 23		July 23		August 23		Sept 23		Oct 23	
April 24		May 24		June 24		July 24	0.03	August 24	2.18	Sept 24		Oct 24	
April 25		May 25		June 25		July 25		August 25		Sept 25		Oct 25	
April 26	0.10	May 26		June 26	0.02	July 26		August 26		Sept 26	0.03	Oct 26	0.29
April 27		May 27		June 27	0.58	July 27	0.79	August 27		Sept 27	0.04	Oct 27	0.24
April 28		May 28		June 28		July 28		August 28		Sept 28	0.56	Oct 28	0.06
April 29	0.24	May 29		June 29		July 29		August 29		Sept 29	0.15	Oct 29	0.01
April 30	0.22	May 30		June 30	0.09	July 30		August 30		Sept 30		Oct 30	0.26
		May 31				July 31	0.50	August 31				Oct 31	0.13
2023 Totals	3.41		1.17		0.83		6.87		6.17		1.83		5.38
Normal †	3.03		3.36		3.45		2.84		3.23		3.50		2.53

† Thirty year (1991 to 2020) averages in the Lansing Michigan area. https/www.weather.gov

Appendix III

Chatham, Michigan

Rainfall data at the Michigan State University UP Experiment Station by date, Summer 2023 (https://www.weather.gov)

Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches
April 1	0.81†	May 1	2.46	June 1		July 1		August 1		Sept 1		Oct 1	1.22
April 2	0.20†	May 2	1.30†	June 2		July 2		August 2		Sept 2		Oct 2	0.38
April 3		May 3	0.15†	June 3		July 3		August 3	0.30	Sept 3		Oct 3	
April 4		May 4		June 4		July 4		August 4		Sept 4		Oct 4	
April 5	0.54	May 5	0.09	June 5		July 5	0.65	August 5		Sept 5		Oct 5	
April 6		May 6	0.16	June 6		July 6	0.01	August 6		Sept 6	0.35	Oct 6	0.05
April 7	0.01	May 7	0.59	June 7		July 7		August 7		Sept 7	0.35	Oct 7	0.73
April 8		May 8		June 8		July 8		August 8		Sept 8	0.03	Oct 8	0.40
April 9		May 9		June 9		July 9	0.10	August 9		Sept 9		Oct 9	0.03
April 10		May 10		June 10		July 10	0.05	August 10		Sept 10	0.08	Oct 10	0.42
April 11		May 11		June 11	0.10	July 11	0.60	August 11		Sept 11	0.40	Oct 11	0.18
April 12		May 12		June 12		July 12		August 12	0.28	Sept 12	0.12	Oct 12	0.13
April 13		May 13		June 13	0.51	July 13		August 13		Sept 13	0.22	Oct 13	0.01
April 14		May 14		June 14	0.42	July 14		August 14		Sept 14	0.01	Oct 14	T
April 15		May 15		June 15	0.02	July 15	0.72	August 15		Sept 15		Oct 15	
April 16	0.10	May 16		June 16	0.02	July 16	0.24	August 16		Sept 16	T	Oct 16	
April 17		May 17		June 17		July 17	0.13	August 17	0.61	Sept 17		Oct 17	
April 18	0.17†	May 18		June 18		July 18	0.05	August 18	0.02	Sept 18		Oct 18	
April 19	0.05†	May 19	0.43	June 19		July 19	0.20	August 19		Sept 19		Oct 19	0.14
April 20		May 20	0.36	June 20		July 20	0.62	August 20		Sept 20		Oct 20	0.24
April 21	0.39	May 21		June 21		July 21		August 21		Sept 21		Oct 21	
April 22	0.01	May 22		June 22		July 22		August 22	0.70	Sept 22		Oct 22	
April 23		May 23		June 23		July 23	0.12	August 23	0.03	Sept 23		Oct 23	
April 24		May 24	0.02	June 24		July 24	0.01	August 24	0.01	Sept 24		Oct 24	
April 25	0.16†	May 25		June 25		July 25		August 25		Sept 25		Oct 25	1.10
April 26		May 26		June 26	0.28	July 26		August 26	0.11	Sept 26		Oct 26	0.05
April 27	0.13	May 27		June 27	0.15	July 27		August 27		Sept 27		Oct 27	0.36
April 28	0.26	May 28		June 28		July 28	0.45	August 28		Sept 28		Oct 28	
April 29		May 29		June 29	0.38	July 29		August 29	0.08	Sept 29		Oct 29	
April 30	1.00	May 30		June 30		July 30		August 30	0.12	Sept 30	0.14	Oct 30	
		May 31				July 31		August 31				Oct 31	
2023 Totals	3.83		5.56		1.88		3.95		2.26		1.70		5.44
Normal ††	2.44		3.27		3.37		3.58		3.03		4.25		4.74

† Precipitation was snow, reported as inches of rain

†† Thirty year (1991 to 2020) averages from the Experiment Station in Chatham. https/www.weather.gov

Marketers	Web Addresses	Phone
Albert Lea Seed	www.alseed.com	800-352-5247
Alforex Seeds	www.alforexseeds.com	877-560-5181
Allied Seed	www.alliedseed.com	—
America's Alfalfa	www.americasalfalfa.com	800-406-7662
Barenbrug USA	www.barusa.com	800-547-4101
Beck's Hybrids	www.beckshybrids.com	800-937-2325
Best Forage	www.bestforage.com	888-836-3697
Blue River Organic Seeds	www.blueriverorgseed.com	800-370-7979
Brett Young Seeds	www.brettyoung.ca	800-665-5015
Byron Seed	www.byronseeds.net	800-801-3596
CISCO Seed	www.ciscoseeds.com	800-888-2986
CropLan Genetics	www.winfieldunited.com	—
Dairyland Seed Co.	www.dairylandseed.com	800-236-0163
DLF USA	www.dlfpickseed.com/usa	800-445-2251
Farm Science	www.farmsciencegenetics.com	—
Growmark	www.growmark.com/	—
Hood River Seeds	www.hoodriverseed.com	855-406-2696
KWS Seeds	www.kws.com	—
La Crosse Forage and Turf	www.lacrosseseed.com	800-647-8873
Legacy Seed	www.legacyseeds.com	866-791-6390
Lewis Seed Co.	www.lewisseed.com	541-491-3700
LG Seeds	www.lgseeds.com	989-834-2251
Mountain Veiw Seeds	www.mtviewseeds.com	503-588-7333
Nexgrow	www.plantnexgrow.com	855-463-9476
Pioneer	www.pioneer.com	800-247-6803
ProSeeds Marketing	www.proseedsmarketing.com	541-928-9999
Renk Seed	www.renkseed.com	800-289-7365
Seed Research of Oregon	www.sroseed.com	800-253-5766
Smith Seed Services	www.smithseed.com	888-550-2930
S&W Seeds	www.swseedco.com	916-554-5480
TriCal	www.tricalforage.com	843-817-2484
Wilbur-Ellis Seeds	http://ag.wilburellis.com	—
Winfield Solutions	www.winfieldunited.com	989-845-2093
W-L Research	www.wlalfalfas.com	—

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