2024 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, total tons of alfalfa and mixed hay and average yield per acre harvested in Michigan in 2024 was slightly higher than last year with total acres unchanged. Total yield and acreage of all hay in Michigan, however, was lower than last year. Michigan hay prices in November 2024 were slightly lower than a year ago. A one-ton yield increase of good to premium quality alfalfa hay was worth $175 to $210/acre. Under these market conditions, regardless of forage grown, the importance of improving yield per acre through use of better forage varieties continues to be an important component of profitability. This report contains yield data from trials harvested in 2024 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.

2024 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 slightly above average in April and June but a little lower in May. The three-month total was near the average. For the second year in a row, rainfall in July and August was well above average, more than two times the average for each month. Weather conditions made harvesting dry hay a challenge. Dry conditions prevailed in September and October. The last measurable snow in Chatham was the first part of April in 2024. Overnight temperatures were occasionally slightly below freezing through May. Rainfall at Chatham in the Upper Peninsulas was 50% higher than average in April and May and more than two times higher than normal in June. Conditions were drier from July through October. Total precipitation in July and August was two-thirds of the average for each month and the two-month total for September and October was 25% of normal.

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 is harvested 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 2022 and after do not have Vernal included as a check variety. Yields for individual cuttings in 2024 at East Lansing and Chatham are reported in **Tables 9, 10, and 11**. Previous years yield data may be found at the MSU Forage Connection Website at http://www.forage.msu.edu/publications.

In 2024, alfalfa variety trials were cut four times at East Lansing and three times at Chatham. The first cutting was removed at early to mid-bloom at both

locations. Alfalfa trial cutting dates at East Lansing were May 31, July 18, August 24 to September 3, and October 9 to 11. Cutting dates at Chatham were June 18, August 5, and October 3. In East Lansing, the average total yield in the established trials was slightly lower than last year. Alfalfa varieties seeded in 2021 averaged 5.48 and ranged from 4.10 to 6.39 tons per acre. The lowest yielding variety in the 2021 seeding was 'Vernal', almost 20 percent lower than the next lowest yield. This is the final trial certified seed of Vernal was included as a check variety. Second-year total yield from the 2022 seeding averaged 5.99 and ranged from 5.67 to 6.46 tons per acre. Yield distribution among the cuttings in 2024 was between 60-70% in the combined first two cuts and between 30-40% in the combined final two cuts. The date of the first cutting of alfalfa at Chatham was similar to last year. Second cutting was six weeks later and the last cut was in October with little or no regrowth after cutting. Yields of alfalfa in 2024 at Chatham were higher than previous years. Average total yield of varieties seeded in 2022 was 6.29 and ranged from 5.57 to 6.62 tons per acre. Excellent yields were obtained in each of the first two cuts. The first-cut yield was about 10% higher than the second and the two-cut total was close to 90% of the total yield for the year. A new alfalfa variety trial was seeded in August 2024 at East Lansing and is anticipated to be cut five times per year in 2025 and 2026.

Perennial Cool-Season Grass Variety Trials

Cool-season grass trials were harvested two to four times at East Lansing 2024. 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 and total in 2024 and the previous year's total yields at East Lansing are in **Tables 14, 15, and 16**. Yield data from individual cuttings in previous years may be found at the MSU Forage Connection Website at http://www.forage.msu.edu/publications

In 2024, perennial grass varieties seeded in trials between 2021 and 2023 were evaluated at East Lansing. Orchardgrass, tall fescue, timothy, and perennial ryegrass varieties were evaluated for yield and maturity. In general, perennial grass varieties are cut two or three times per year at East Lansing. In 2024, however, orchardgrass and timothy varieties seeded in 2023 and the tall fescue varieties seeded in 2021 were cut four times. In contrast, the perennial ryegrass seeded in 2021 was only cut two times. All other perennial grass varieties were harvested three times in 2024. Cutting dates at East Lansing were: cut 1 – May 24 to June 4, cut 2 – July 18 to 25, cut 3 – August 24 to September 12, and cut 4 - October 11 to 16.

In the 2021 seeding, all varieties yielded more than each of the last two years. Third-year yields of the tall fescue varieties with four cuttings averaged 6.39 and ranged from 6.11 to 6.89, and the timothy varieties with three cuttings averaged 5.57 and ranged from 4.82 to 6.01 tons/acre, respectively. Despite the abundance of rain in 2024, the perennial ryegrass varieties were only harvested twice, once in May and again in September. Perennial ryegrass yields ranged from 2.71 to 2.93 tons/acre and 90% of the yield was in the first cutting. Yields of perennial ryegrass, timothy, and orchardgrass in the 2022 variety trial were obtained with three cuttings. The second-year yields of orchardgrass averaged 4.41 and ranged from 4.18 to 4.68, perennial ryegrass yields averaged 4.66 and ranged from 4.26 to 5.18, and timothy yields averaged 6.30 and ranged from 5.40 to 6.95 tons/acre, respectively. Yields of timothy and orchardgrass in the 2023 trial variety were obtained with four cuttings. The first-year yields of orchardgrass averaged 6.62 and ranged from 6.36 to 6.89, and timothy yield averaged 6.42 and ranged from 5.03 to 6.78 tons/acre, respectively. In all three trials, the newer varieties of timothy yielded higher than 'Climax', the check variety. Climax had a slightly lower yield in the first cut and was later maturing. Total yield of Climax in 2024 was more than one ton less than the average of the new releases within each a trial.

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 and the total yield for each variety in 2024 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 2024. The cutting dates were: cut 1 - May 31 to June 3, cut 2 – July 18 to 22, and cut 3 on September 12. Dry matter yields of red clover varieties in the 2022 seeding averaged 4.76 and ranged from 2.59 to 5.62 tons per acre. In the 2023 seeding, yields averaged 6.81 and ranged from 6.09 to 7.68 tons per acre. Many of the varieties in the 2023 seeding are experimental entries and are not commercially available. The VNS red clover, a 'common' variety, has been used as a check for several years. This variety consistently becomes unproductive after the first-cut in second full production year. Dry matter yields, per cut and total, of the varieties in the two red clover trials in 2024 are listed in **Tables 12 and 13**.

Annual Forage Trials

Ryegrass – Annual, Italian, and Intermediate. Teffgrass and Crabgrass

Three annual grass trials were evaluated for yield in 2024 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 or more times in the second year. Five varieties of ryegrass (Italian or annual) were seeded in 2023 and harvested three times in the seeding year. Four of the five varieties were cut four times for yield in the second year. The check variety 'Marshall' was the only entry that did not survive after the second cutting in the second year. Marshall is seeded as a check variety and provides a good relative comparison for winter survival as well as second year productivity. Total yield in 2024, the second year, averaged 4.75 and ranged from 3.29 to 5.74 tons per acre. Two new annual grass trials were seeded in the spring of 2024. Five ryegrass varieties (annual or Italian) and two teffgrass varieties were seeded in May and both trials were harvested three times in 2024. The dry matter yields of ryegrass averaged 2.77 and ranged from 2.55 to 3.35, and the yield of the two teffgrass varieties averaged 4.36 tons per acre, respectively. Another annual grass trial was seeded at East Lansing in early July 2024. Three varieties of teffgrass and two of crabgrass were harvested two times. Teffgrass and Crabgrass will not survive cold temperature, and the second cutting was obtained a few days before the first frost. The average yield of teffgrass was 4.12 and crabgrass was 3.39 tons per acre, respectively. Dry matter yields, per cut and total, for each variety in the three annual grass trials harvested in 2024 are listed in **Tables 17, 18, and 19.**

Winter Small Grain Forage
Hybrid Rye

Winter small grain variety trials of rye, hybrid rye and triticale have been conducted at East Lansing for the past 6 years. A trial of hybrid rye was seeded in September 2023. Seeding rates of small grains are determined by the number of seeds per pound of seed. The seeding rate of hybrid rye is 800,000 pure-live seeds per acre. All the varieties tested had excellent winter survival going into the spring and there were no lodging issues prior to harvest. The ideal harvest timing of the hybrid rye for the desired combination of yield and forage quality is prior to heading. The goal is to harvest when a variety is at or near Feekes stage 10.0 to 10.1, just before the head emerges. The cutting in 2024 was between rain events and maturity of the entries ranged from Feekes stage 10.1 to 10.4. All varieties were harvested on May 6, about a week earlier than last year. Dry matter yield in tons per acre, plant height, and maturity at harvest are listed in **Table 20.**

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, 2016 to 2024 at East Lansing and Chatham, Michigan.

	2016	2017	2018	2019	2020	2021	2022	2023	2024	Avg ††
	East Lansing †									
Apr	1.22	5.17	2.18	2.29	2.78	1.49	3.01	3.41	3.80	**3.26**
May	2.97	2.47	4.96	3.80	4.99	0.94	2.62	1.17	2.13	**3.66**
June	0.97	2.30	1.60	7.52	2.46	8.40	2.24	0.83	4.22	**3.76**
July	3.76	2.30	2.18	2.55	2.90	4.72	2.04	6.87	6.79	**2.94**
Aug	6.83	1.99	4.21	1.16	2.69	6.68	3.97	6.17	7.25	**3.48**
Sept	3.47	1.26	3.48	3.60	4.09	3.74	2.39	1.83	1.43	**2.81**
Oct	3.70	8.15	5.66	6.03	2.77	4.99	1.87	5.38	1.29	**3.16**
Total	**22.92**	**23.64**	**24.27**	**26.95**	**22.68**	**30.96**	**18.14**	**25.66**	**26.91**	**23.07**
	Chatham †									
Apr	3.21	5.25	2.02	2.56	1.91	3.46	5.04	3.83	3.99	**2.44**
May	3.45	4.99	1.36	5.53	1.60	1.06	2.51	5.56	4.88	**3.27**
June	2.34	7.36	4.48	2.52	5.11	4.87	3.94	1.88	8.11	**3.37**
July	3.44	1.74	5.08	1.42	7.65	2.43	1.99	3.95	2.29	**3.58**
Aug	3.67	5.50	4.32	2.70	3.82	1.75	4.39	2.26	2.15	**3.03**
Sept	4.78	3.26	5.40	5.08	3.53	3.22	3.77	1.70	1.16	**4.25**
Oct	6.90	7.82	8.02	7.25	5.29	2.53	4.25	5.44	1.11	**4.74**
Total	**27.79**	**35.92**	**30.68**	**27.06**	**28.91**	**19.32**	**25.89**	**24.62**	**23.69**	**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	3	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
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	HR	R	-	-	L	-	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
DKA40-51RR	4	1	HR	HR	HR	HR	HR	HR	HR	R	RR	-	-	-	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
FF42.A2	4	1.9	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	Allied Seed
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	-	-	-	-	-	Allied Seed
FSG 420 BR	3	2	HR	HR	HR	HR	HR	HR	R	-	-	-	-	-	Allied Seed
FSG 426	4	2	HR	HR	HR	HR	HR	HR	HR	-	-	-	H	-	Allied Seed
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/Alforex
HybriForce 3420/Wet	4	-	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Dairyland/Alforex
HybriForce 3430	4	-	HR	HR	HR	HR	HR	HR	R	-	-	-	-	-	Dairyland/Alforex
HybriForce 4400	4	2	HR	HR	HR	HR	HR	HR	R	HR	-	-	-	-	Dairyland/Alforex
HybriForce 4420/Wet	4	2	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Dairyland/Alforex
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/Alforex
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	-	-	-	-	Forage First
54Q29	4	2	HR	HR	HR	HR	R	HR	HR	HR	-	-	-	-	Forage First
55Q27	5	1	HR	HR	HR	HR	HR	HR	R	HR	-	-	-	-	Forage First
54VQ52	3	-	HR	HR	HR	HR	R	HR	HR	R	-	-	-	-	Forage First
55H96	5	-	HR	HR	HR	R	HR	HR	HR	-	-	HR	-	-	Forage First
55VR08	5	-	HR	HR	HR	HR	HR	HR	HR	R	RR	-	-	-	Forage First
54VR10	4	-	HR	HR	HR	HR	R	HR	HR	R	RR	-	-	-	Forage First
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

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
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	R	-	-	L	-	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	(Trials) ††
		2015	2016	2017	2018	2019	2020	2021	2022	%
Variety	Marketer	(2016-18)	(2017-19)	(2018-20)	(2019-21)	(2020-22)	(2021-23)	(2022-24)	(2023-24)	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) 94
AFX 429	Alforex Seeds	-	-	4.56	-	-	-	-	-	(1) 97
AFX 460	Alforex Seeds	-	-	4.77	5.16	-	-	-	-	(2) 99
AFX 469	Alforex Seeds	-	-	4.75	-	-	-	-	-	(1)101
AFX 479	Alforex Seeds	-	-	-	-	-	-	-	6.06	(1)100
Bison	Thomas Ag Services	-	-	-	-	-	-	5.55	-	(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) 98
FF42.A2	Allied Seed	5.05	-	-	-	-	-	-	-	(1)106
FF42.A3	DLF USA Inc	-	-	-	-	-	-	5.44	5.82	(2) 97
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	Allied Seed	5.33	-	-	-	-	-	-	-	(1)112
FSG 420 BR	Farm Science	-	-	-	-	-	7.63	-	-	(1)109
FSG 426	All	4.74	-	-	-	-	-	-	-	(1) 99
GA-497HD	Preferred Alfalfa Gen	-	5.23	-	-	-	-	-	-	(1) 99
HybriForce 3400	Dairyland/Alforex	4.73	-	-	-	-	-	-	-	(1) 99
HybriForce 3420 Wet	Dairyland/Alforex	-	5.41	-	-	-	-	-	-	(1)103
HybriForce 3430	Dairyland/Alforex	-	5.49	-	-	-	-	-	-	(1)104
HybriForce 4400	Dairyland/Alforex	4.94	5.48	5.19	5.85	5.96	7.06	5.95	5.94	(8)104
HybriForce 4420/Wet	Dairyland/Alforex	-	-	-	-	6.16	7.09	6.07	6.21	(4)104
Integra 8420	Wilbur-Ellis	-	5.47	-	-	-	-	-	-	(1)104
Integra 8450	Wilbur-Ellis	-	5.54	-	-	-	-	-	-	(1)105
KF406A2	Byron Seed	-	5.31	-	-	-	-	-	-	(1)101
KF425HD	Byron Seed	-	5.37	-	-	-	-	-	-	(1)102
Mariner V	Growmark	-	-	-	-	-	-	-	6.07	(1)100
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) 89
54Q16	Forage First	-	-	-	-	-	-	5.35	5.75	(2) 96
54Q29	Forage First	-	-	-	-	-	-	-	6.25	(1)103
54VQ52	Forage First	-	-	-	-	-	-	5.61	6.31	(2)103
54VR10	Forage First	-	-	-	-	-	-	5.72	-	(1)103
55Q27	Forage First	4.96	5.22	-	-	-	-	-	-	(2)101
55H96	Forage First	-	-	-	-	-	-	5.10	-	(1) 92
Quail	Blue River Organic	-	-	-	-	5.60	-	-	-	(1) 95
QuickGold	Renk Seed	-	-	-	5.15	-	-	-	-	(1) 96
Rebound 6XT	Croplan Genetics	-	5.10	-	-	-	-	-	-	(1) 97
Signature	Growmark	-	-	-	-	-	-	-	5.74	(1) 95
Stalwart II	LG Seeds	-	5.14	-	-	-	-	-	-	(1) 98
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)105
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	-	-	-	-	-	-	5.95	-	(1)107
SW 5517	S & W Seed Company	-	-	-	-	-	-	5.93	-	(1)106
SW 5614	S & W Seed Company	-	-	-	-	-	-	5.43	-	(1) 97
SW 5615	Mountain View Seed	-	-	-	-	-	-	5.63	6.09	(2)101
Triad	Albert Lea	-	-	-	-	5.52	-	-	-	(1) 94
TriFecta	TriCal	-	5.52	-	5.66	-	-	-	-	(2)105
Trifecta III	Seed Logic	-	-	-	5.48	-	-	-	-	(1)102
Vernal	public	3.93	4.45	4.33	5.05	5.46	6.17	4.66	-	(7) 88
Viking 394 AP	Albert Lea	-	-	-	-	-	-	-	6.20	(1)103
Viking 374HD	Albert Lea	-	-	-	-	-	-	-	5.86	(1) 97
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	-	6.24	(2)102
Mean		**4.78**	**5.27**	**4.71**	**5.35**	**5.87**	**7.02**	**5.57**	**6.04**	

† 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 †			Two-year average		(Trials) ††
		2015	2018	2019	2021	2022	%
Variety	Marketer	(2016-18)	(2019-21)	(2020-23)	(2022-23)	(2023-24)	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/Alforex	3.45	4.58	-	-	-	(2)105
HybriForce 4400	Dairyland/Alforex	-	4.55	4.75	4.78	5.16	(4) 99
HybriForce 4420/Wet	Dairyland/Alforex	-	-	-	4.70	5.64	(2)101
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/Alforex	3.13	-	-	-	-	(1) 97
Mariner IV	Allied Seed	3.14	-	-	-	-	(1) 97
Oneida VR	Public	3.13	-	-	-	-	(1) 97
54Q16	Forage First	-	-	-	-	5.68	(1)104
54Q29	Forage First	-	-	-	-	5.61	(1)103
54VQ52	Forage First	-	-	-	-	5.49	(1)101
55Q27	Forage First	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	-	-	-	-	5.45	(1)100
Viking 374HD	Albert Lea	-	-	-	-	5.19	(1) 95
WL354HQ	W-L Research	3.08	-	-	-	-	(1) 95
X-Force 5400	Alforex Seeds	-	-	-	-	5.45	(1)100
Mean		**3.23**	**4.40**	**4.83**	**4.73**	**5.46**	

† 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 2023 at the Michigan State University Agronomy Farm, East Lansing, Michigan.

			Three-year average				2-year average	1-year total	(Trials) ‡ %
			2016	2018	2020	2021	2022	2023	species
Sp †	Variety	Marketer	(2017-19)	(2019-21)	(2021-23)	(2022-23)	(2023-24)	(2024)	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	3.81	3.85	-	-	-	(3) 99
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**	**3.76**	**3.81**	-	-	-	
OR	Ammo	Barenbrug/Best Forage	-	-	4.25	-	5.08	-	(2) 96
OR	Barlegro	Barenbrug Seed	-	-	-	-	5.50	-	(1)106
OR	Captur	DLF USA Inc	-	-	-	-	5.13	6.71	(1) 99
OR	Echelon	DLF USA Inc	4.45	-	4.78	-	-	-	(2)106
OR	Everlast	Allied Seed	-	-	-	-	-	6.51	-
OR	Intensiv	Barenbrug/Best Forage	-	-	4.61	-	5.51	-	(2)104
OR	Inavale	DLF USA Inc	-	-	4.72	-	-	-	(1)104
OR	Lyra	Hood River Seed	4.00	-	-	-	-	-	(1) 96
OR	Persist	Smith Seed	-	-	-	-	4.96	-	(1) 96
OR	Persist II	Smith Seed	-	-	-	-	5.07	-	(1) 98
OR	Potomac	check variety	4.09	-	4.31	-	5.10	6.36	(3) 97
OR	Swante	Smith Seed	-	-	-	-	5.09	-	(1) 98
OR	Treposno	Hood River Seed	4.09	-	-	-	-	-	(1) 98
OR	**SPECIES MEAN Orchardgrass**		**4.16**	-	**4.53**	-	**5.18**	**6.53**	
PR	Dexter 1 (4n)	DLF USA Inc	2.89	3.04	-	2.23	4.35	-	(4) 96
PR	Garbor (4n)	DLF USA Inc	2.69	3.19	-	-	-	-	(2) 96
PR	Linn (2n)	check variety	2.72	2.89	-	-	-	-	(2) 92
PR	Maximo (4n)	DLF USA Inc	3.48	-	-	-	-	-	(1)118
PR	Halsey (intermediate)	Smith Seed	-	-	-	-	5.19	-	(1)107
PR	Remington (4n)	Barenbrug/Best Forage	-	3.51	3.53	-	-	-	(2)106
PR	Remington NEA (4n)	Barenbrug/Best Forage	-	-	3.46	2.27	-	-	(2)100
PR	TetraGain SLT	Smith Seed	-	-	-	-	5.03	-	(1)103
PR	**SPECIES MEAN Perennial Ryegrass**		**2.95**	**3.16**	**3.50**	**2.25**	**4.86**	**-**	
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/Best Forage	-	4.73	-	-	-	-	(1) 98
TF	Bariane	Barenbrug/Best Forage	-	4.56	4.37	-	-	-	(2) 95
TF	Kentucky 31 minus	check variety	4.11	5.06	-	-	-	-	(2)103
TF	Ranchero	Smith Seed	-	5.00	-	-	-	-	(1)103
TF	STF 43	Barenbrug/Best Forage	-	-	-	4.13	-	-	-
TF	Tower	DLF USA Inc	4.01	-	-	-	-	-	(1) 99
TF	**SPECIES MEAN Tall Fescue**		**4.06**	**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	3.85	3.15	3.42	5.08	5.03	(5) 89
TM	Dawn	Allied Seed	4.00	-	-	-	-	-	(1)104
TM	KY Early Timothy	Smith Seed	-	4.50	-	-	-	-	(1)109
TM	Sahara DT	DLF USA Inc	-	-	-	-	6.34	6.77	(1)108
TM	Winnetow	DLF USA Inc	-	4.01	-	-	-	-	(1) 97
TM	Valor	DLF USA Inc	-	-	-	4.22	5.90	6.74	(2)104
TM	Zenyatta	DLF USA Inc	3.99	-	-	4.18	6.08	6.76	(3)105
TM	**SPECIES MEAN Timothy**		**3.83**	**4.12**	**3.54**	**3.94**	**5.85**	**6.33**	

† 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.

Sp †	Variety	Marketer	Three-year average †† 2014 (2015-17)	2015 (2016-18)	2020 (2021-23)	(Trials) ‡ % species 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/Best Forage	-	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**		-	-	1.99	-
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 and Total Yield (dry matter tons per acre) in 2024 of Varieties Entered in the Perennial Grass Variety Trials at East Lansing from 2021 to 2023.

Perennial Grass Varieties Seeded at East Lansing in 2023

Timothy Variety	Heading Date ††	Four-cut Yield
Climax (check)	Veg	5.03
NC-G22 †	May 23	6.78
Sahara DT	May 23	6.77
Valor	May 22	6.74
Zenyatta	May 21	6.76
LSD 0.05		0.52

Orchardgrass Variety	Heading Date ††	Four-cut Yield
Captur	May 20	6.71
Everlast	May 15	6.51
OG96 †	May 18	6.89
Potomac (check)	May 13	6.36
LSD 0.05		0.79 ns

Perennial Grass Varieties Seeded at East Lansing in 2022

Timothy Variety	Heading Date ††	Three-cut Yield
Climax (check)	May 27	5.40
Sahara DT	May 24	6.95
Valor	May 22	6.36
Zenyatta	May 21	6.49
LSD 0.05		0.39

Ryegrass Variety	Heading Date ††	Three-cut Yield
Check variety (P)	May 23	4.35
Dexter 1 (P)	May 24	4.26
Halsey (I)	May 19	5.18
TetraGain SLT (P)	May 23	4.86
LSD 0.05		0.70 ns
Ryegrass: (P) = perennial, (I) = intermediate		

Orchardgrass Variety	Heading Date ††	Three-cut Yield
Ammo	May 13	4.21
BAR DGL22098 †	May 13	4.44
BAR DGL22099 †	May 16	4.39
BAR DGL22100-C †	May 24	4.46
BAR DGL22100-D †	May 24	4.68
Barlegro	May 24	4.52
Captur	May 23	4.23
Intensiv	May 24	4.63
OG 96 †	May 19	4.55
Persist	May 12	4.31
Persist II	May 13	4.32
Potomac (check)	May 12	4.32
Swante	May 17	4.18
LSD 0.05		0.34

Perennial Grass Varieties Seeded at East Lansing in 2021

Timothy Variety	Heading Date ††	Three-cut Yield
Climax (check)	Veg	4.82
Valor	May 20	6.01
Zenyatta	May 20	5.90
LSD 0.05		1.14

Perennial ryegrass Variety	Heading Date ††	Two-cut Yield
Bar LP237 †	Veg	2.71
Dexter 1	May 24	2.93
Remington NEA	Veg	2.80
LSD 0.05		0.51 ns

Tall Fescue Variety	Heading Date ††	Four-cut Yield
Bar Fafr 160184 †	May 14	6.15
Bar Fafr 181197 †	May 17	6.11
Bar Fafr 184270 †	May 14	6.39
STF 43	May 20	6.89
LSD 0.05		0.81 ns

† Experimental variety - not commercially available.
†† Heading Date - Date in first cutting when 50% of the reproductive tillers have a fully emerged grass head that is clear of the flag leaf.
Veg = vegetative on the day of harvest.

Table 9. Michigan State University Alfalfa Variety Trial Yields (DM tons/acre), Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded in May 2021.

	2024 DM Yields T/A, Four-cuts and Total								
Variety	Cut 1 May 31	Cut 2 July 18	Cut 3 Sept 3	Cut 4 Oct 11	2024 Total	2023 Total	2022 Total	2021 Total	Trial Total
HybriForce-4420/WET	2.00	1.99	1.43	0.65	6.06*	7.14*	5.02*	0.69	18.92*
HybriForce-4400	2.01	1.91	1.33	0.62	5.88*	7.06*	4.92*	0.64	18.48*
SW5520Y	2.09	2.01	1.50	0.69	6.29*	6.67*	4.90*	0.57	18.43*
SW5517	2.06	1.93	1.34	0.69	6.03*	6.84*	4.92*	0.54	18.33*
54VR10	1.91	1.85	1.29	0.64	5.70*	6.67*	4.78*	0.60	17.76*
SW5615	1.88	1.84	1.27	0.63	5.62*	6.51*	4.77*	0.56	17.45*
54VQ52	1.85	1.74	1.29	0.61	5.49*	6.59*	4.76*	0.59	17.44*
Bison	1.83	1.79	1.22	0.61	5.45*	6.61*	4.60	0.72	17.37*
FF 42.A3	1.73	1.68	1.19	0.57	5.18*	6.55*	4.59	0.63	16.95
SW5614	1.80	1.74	1.26	0.64	5.43*	6.20	4.72*	0.59	16.94
54Q16	1.69	1.68	1.17	0.55	5.08*	6.34	4.64	0.56	16.63
55H96	1.65	1.66	1.14	0.53	4.97	5.97	4.37	0.55	15.86
Vernal (certified)	1.34	1.37	0.96	0.43	4.10	5.59	4.29	0.64	14.62
Average	1.83	1.78	1.26	0.61	5.48	6.52	4.71	0.61	17.32
LSD 0.05	0.35	0.34	0.29	0.13	1.02	0.67	0.31	0.06	1.72
CV %	13.3	13.3	16.1	15.5	13.0	7.2	4.5	6.5	6.9

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

Table 10. Michigan State University Alfalfa Variety Trial Yields (DM tons/acre), Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded in May 2022.

	2024 DM Yields T/A, Four-cuts and Total							
Variety	Cut 1 May 31	Cut 2 July 18	Cut 3 Aug 24	Cut 4 Oct 9	2024 Total	2023 Total	2022 Total	Trial Total
AFX184021 †	1.89	1.76	1.61	0.95	6.22*	6.74*	1.97	14.93*
AFX184035 †	2.01	1.89	1.71	0.86	6.46*	6.31*	1.85	14.62*
54VQ52	1.97	1.84	1.55	0.82	6.18*	6.44*	1.87	14.49*
54Q29	2.03	1.82	1.59	0.84	6.27*	6.22*	1.96	14.45*
HybriForce-4420/WET	1.87	1.80	1.51	0.90	6.07*	6.34*	1.97	14.39*
X-Force 5400 ††	1.80	1.77	1.59	0.86	6.02*	6.46*	1.87	14.34*
Viking 394AP	1.82	1.78	1.61	0.84	6.05*	6.34*	1.93	14.32*
Mariner V	1.79	1.80	1.48	0.81	5.88*	6.26*	2.05	14.19*
AFX479	1.83	1.83	1.56	0.85	6.06*	6.06	1.84	13.97*
SW5615	1.91	1.87	1.46	0.79	6.04*	6.14	1.73	13.90*
HybriForce-4400	1.73	1.74	1.36	0.83	5.67	6.21*	1.97	13.85*
Viking 374HD	1.68	1.75	1.46	0.78	5.67	6.05	1.79	13.51
FF 42.A3	1.76	1.74	1.42	0.85	5.77*	5.87	1.75	13.39
Signature	1.77	1.69	1.46	0.76	5.67	5.80	1.85	13.32
54Q16	1.84	1.77	1.42	0.77	5.81*	5.68	1.75	13.24
Average	1.85	1.79	1.52	0.83	5.99	6.19	1.88	14.06
LSD 0.05	0.32	0.17	0.23	0.12	0.71	0.53	0.27	1.29
CV %	12.3	6.6	10.5	10.1	8.3	6.0	10.3	6.4

† Experimental Variety - not commercially available

†† Commercially available variety entered as an experimental.

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

Table 11. Michigan State University Conventional Alfalfa Variety Trial Yields (DM tons/acre) Upper Peninisula Research Station, Chatham, Michigan. Seeded 2022.

	2024 DM Yields T/A, Three-cuts and Total					
Variety	Cut 1 June 18	Cut 2 Aug 5	Cut 3 Oct 3	2024 Total	2023 Total	Trial Total
54Q16	3.08	2.79	0.75	6.62*	4.75*	11.37*
HybriForce-4420/WET	3.27	2.71	0.75	6.73*	4.55	11.27*
54Q29	3.21	2.75	0.66	6.62*	4.60*	11.21*
54VQ52	3.06	2.56	0.75	6.36*	4.63*	10.99*
X-Force 5400 ††	2.87	2.79	0.63	6.29*	4.62*	10.91*
Viking 394AP	3.02	2.45	0.63	6.10*	4.80*	10.89*
Viking 374HD	2.85	2.42	0.75	6.03*	4.36	10.39
HybriForce-4400	2.58	2.35	0.65	5.57	4.76*	10.33
Average	2.99	2.60	0.70	6.29	4.63	10.92
LSD 0.05	0.57	0.43	0.14	0.79	0.21	0.79
CV%	13.0	11.1	14.1	8.5	3.1	4.9

†† Commercially available variety entered as an experimental.

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

Table 12. Michigan State University Red Clover Variety Trial Yields (DM tons/acre), Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded in May 2022

		2024 DM Yields T/A, Three-cuts and Total						
Variety	Marketer	Cut 1 May 31	Cut 2 July 18	Cut 3 Sept 12	2024 Total	2023 Total	2022 Total	Trial Total
Evolve	DLF USA	2.86	1.52	1.10	5.48*	6.07*	2.26	13.81*
BAR TP V23 †	Experimental	2.69	1.58	1.04	5.31*	6.29*	2.14	13.75*
Redkin	DLF USA	2.93	1.48	1.20	5.62*	5.95*	2.15	13.71*
Check ††	Commercial	2.56	1.45	1.06	5.07	5.83*	2.42	13.31*
Freedom!MR	Barenbrug	2.63	1.46	1.15	5.24	5.93*	2.08	13.25*
BAR TS RWR †	Experimental	2.45	1.43	1.09	4.97	5.93*	2.14	13.04*
Ruby Red Brand	Albert Lea	2.39	1.43	1.03	4.85	5.99*	2.01	12.86
Medallion	DLF USA	2.05	1.07	0.62	3.74	5.43	2.05	11.22
VNS Red Clover	Public	1.65	0.72	0.21	2.59	4.27	2.03	8.89
Average		2.47	1.35	0.94	4.76	5.74	2.14	12.65
LSD 0.05		0.35	0.16	0.19	0.37	0.62	0.29	0.94
CV%		9.8	8.1	13.7	5.3	7.4	9.3	5.1

† Experimental entry - variety that is not commercially available

†† Check is a commercially available variety

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

Table 13. Michigan State University Red Clover Variety Trial Yields (DM tons/acre), Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded in August 2023

		2024 DM Yields T/A, Three-cuts and Total			
Variety	Marketer	Cut 1 June 3	Cut 2 July 22	Cut 3 Sep 12	2024 Total
DFRC-29 †	Experimental	3.56	2.43	1.68	7.68*
DFRC-27 †	Experimental	3.28	2.33	1.61	7.22*
DFRC-30 †	Experimental	3.27	2.36	1.58	7.21*
DFRC-25 †	Experimental	3.20	2.32	1.59	7.11*
DFRC-28 †	Experimental	3.19	2.38	1.54	7.11*
Check 1 ††	Commercial	3.20	2.19	1.52	6.91
Evolve	DLF USA	3.29	2.11	1.49	6.89
SERC-V15 †	Experimental	3.16	2.06	1.56	6.78
GA9908	Smith Seed	3.10	2.02	1.30	6.43
Check 2 ††	Public	2.94	2.09	1.16	6.19
Medallion	DLF USA	3.02	1.84	1.29	6.14
Redkin	DLF USA	2.75	2.07	1.27	6.09
Average		3.16	2.18	1.47	6.81
LSD 0.05		0.23	0.29	0.21	0.57
CV%		5.1	9.3	10.2	5.8

† Experimental entry - variety that is not commercially available

†† Check is a commercially available variety

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

Table 14. Michigan State University Perennial Grass Variety Trial Yields (DM tons/acre) of Tall Fescue, Perennial Ryegrass, and Timothy. Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded in May 2021.

Tall Fescue

		2024 DM yields T/A, Four-cuts and Total							
Variety	Heading Date ††	Cut 1 May 30	Cut 2 July 19	Cut 3 Sep 12	Cut 4 Oct 16	2024 Total	2023 Total	2022 Total	Trial Total
Bar Fafr 160184 †	May 14	3.12	1.38	1.15	0.50	6.15	3.69*	2.86*	12.71
STF 43	May 20	3.12	1.63	1.64	0.51	6.89	3.05	2.44	12.38
Bar Fafr 184270 †	May 14	3.24	1.15	1.44	0.56	6.39	3.51*	2.32	12.22
Bar Fafr 181197 †	May 17	3.01	1.32	1.25	0.53	6.11	3.22	2.63*	11.96
Average		3.12	1.37	1.37	0.53	6.39	3.37	2.56	12.31
LSD 0.05		0.30	0.30	0.27	0.07	0.81 ns	0.45	0.23	1.14 ns
CV %		7.8	17.9	16.1	10.3	10.3	10.9	7.7	7.5

Timothy

		2024 DM yields T/A, Three-cuts and Total						
Variety	Heading Date ††	Cut 1 May 30	Cut 2 July 19	Cut 3 Sep 12	2024 Total	2023 Total	2022 Total	Trial Total
Valor	May 20	3.73	0.99	1.28	6.01*	3.11*	3.54*	12.66*
Zenyatta	May 20	3.66	0.94	1.30	5.90*	3.23*	3.42*	12.55*
Climax	Veg	3.08	0.56	1.17	4.82	2.32	3.12	10.26
Average		3.49	0.83	1.25	5.57	2.89	3.36	11.82
LSD 0.05		0.30	0.51	0.54	1.14	0.60	0.26	1.64
CV %		5.0	35.8	24.9	11.9	11.9	4.5	8.0

Perennial ryegrass

		2024 DM yields T/A, Two-cuts and Total					
Variety	Heading Date ††	Cut 1 May 30	Cut 2 Sep 12	2024 Total	2023 Total	2022 Total	Trial Total
Remington NEA2	Veg	2.44	0.36	2.80	1.48	2.53	6.80
Dexter 1	May 24	2.65	0.28	2.93	1.34	2.42	6.69
Bar LP237 †	Veg	2.35	0.35	2.71	1.17	2.32	6.20
Average		2.48	0.33	2.81	1.33	2.42	6.56
LSD 0.05		0.44	0.10	0.51 ns	0.35 ns	0.32 ns	0.86 ns
CV %		10.1	18.0	10.4	15.2	7.7	7.6

† Experimental Variety - not commercially available

* 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 all tillers have a fully emerged grass head.
An emerged head is completely clear of the flag leaf.
Veg - Variety in the vegetative stage on the date of first cutting.

Table 15. Michigan State University Perennial Grass Variety Trial Yields (DM tons/acre) of Orchardgrass and Timothy. MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in May 2023.

Timothy

		2024 DM yields T/A, Four-cuts and Total				
Variety	Heading Date ††	Cut 1 May 24	Cut 2 July 18	Cut 3 August 24	Cut 4 Oct 11	2024 Total
NC-G22 †	May 23	3.13	1.22	1.86	0.58	6.78*
Sahara DT	May 23	3.30	1.30	1.60	0.56	6.77*
Zenyatta	May 21	3.36	1.25	1.60	0.55	6.76*
Valor	May 22	3.36	1.21	1.64	0.53	6.74*
Climax (check)	Veg	2.64	0.98	0.96	0.45	5.03
Average		3.16	1.19	1.53	0.53	6.42
LSD 0.05		0.29	0.22	0.13	0.12	0.52
CV%		6.8	13.9	6.5	17.4	6.1

Orchardgrass

		2024 DM yields T/A, Four-cuts and Total				
Variety	Heading Date ††	Cut 1 May 24	Cut 2 July 18	Cut 3 August 24	Cut 4 Oct 11	2024 Total
OG96	May 18	2.68	2.04	1.43	0.74	6.89
Captur	May 20	2.52	2.09	1.43	0.68	6.71
Everlast	May 15	2.86	1.81	1.28	0.56	6.51
Potomac (check)	May 13	2.56	1.79	1.41	0.60	6.36
Average		2.66	1.93	1.39	0.65	6.62
LSD 0.05		0.45	0.2	0.16	0.14	0.79 ns
CV%		12.2	7.5	8.4	15.8	8.6

† Experimental Variety - not commercially available.

* 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 all tillers have a fully emerged grass head.
An emerged head is completely clear of the flag leaf.
Veg - Variety in the vegetative stage on the date of first cutting.

Table 16. Michigan State University Perennial Grass Variety Trial Yields (DM tons/acre) of Orchardgrass, Perennial Ryegrass, and Timothy. Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded in August 2022.

Orchardgrass

		2024 DM yields T/A, Three-cuts and Total						
Variety	Heading Date ††	Cut 1 June 4	Cut 2 July 25	Cut 3 Sep 3	2024 Total	2023 Total	2022 Total	Trial Total
OG 96 †	May 19	2.40	1.21	0.94	4.55*	6.23*	1.10	11.88*
Intensiv	May 24	2.46	1.21	0.96	4.63*	6.39*	0.79	11.81*
Barlegro	May 24	2.42	1.16	0.94	4.52*	6.47*	0.75	11.74*
BAR DGL22100-D †	May 24	2.61	1.12	0.95	4.68*	6.32*	0.67	11.67*
BAR DGL22100-C †	May 24	2.57	1.04	0.85	4.46*	6.11*	0.67	11.24*
Captur	May 23	2.09	1.26	0.88	4.23	6.03*	0.97	11.23*
BAR DGL22098 †	May 13	2.46	1.03	0.95	4.44*	5.95	0.67	11.06
Potomac (check)	May 12	2.20	1.12	0.99	4.32	5.88	0.84	11.04
Swante	May 17	2.49	0.97	0.73	4.18	5.99*	0.77	10.94
BAR DGL22099 †	May 16	2.56	0.91	0.92	4.39*	5.82	0.65	10.87
Ammo	May 13	2.39	0.88	0.94	4.21	5.94	0.58	10.73
Persist II	May 13	2.35	1.04	0.96	4.35*	5.79	0.58	10.73
Persist	May 12	2.23	1.06	1.02	4.31	5.60	0.75	10.66
Average		2.40	1.08	0.93	4.41	6.04	0.75	11.20
LSD 0.05		0.26	0.15	0.07	0.34	0.49	0.13	0.68
CV %		7.5	9.4	5.3	5.3	5.7	12.1	4.2

Perennial Ryegrass

		2024 DM yields T/A, Three-cuts and Total						
Variety	Heading Date ††	Cut 1 June 4	Cut 2 July 25	Cut 3 Sep 3	2024 Total	2023 Total	2022 Total	Trial Total
Halsey	May 19	3.22	1.00	0.96	5.18*	5.20*	1.54	11.92*
TetraGain SLT	May 23	3.48	0.67	0.71	4.86*	5.20*	0.87	10.94
Commercial Check	May 23	3.32	0.39	0.63	4.35	4.62	0.98	9.95
Dexter 1	May 24	3.22	0.37	0.67	4.26	4.44	0.99	9.70
Average		3.31	0.61	0.74	4.66	4.87	1.10	10.63
LSD 0.05		0.60	0.16	0.12	0.70	0.50	0.15	0.85
CV%		11.4	16.4	10.2	9.4	6.5	8.8	5.0

Table 16 - East Lansing 2022 perennial grass seeding continued next page

Table 16 - East Lansing 2022 perennial grass seeding continued (page 2 of 2)

Timothy

Variety	Heading Date ††	2024 DM yields T/A, Three-cuts and Total Cut 1 June 4	Cut 2 July 25	Cut 3 Sep 3	2024 Total	2023 Total	Trial Total
Sahara DT	May 24	4.25	1.13	1.57	6.95*	5.73*	12.67*
Zenyatta	May 21	3.87	1.16	1.45	6.49	5.66*	12.15*
Valor	May 22	3.88	1.08	1.40	6.36	5.43*	11.79
Climax (check)	May 27	3.84	0.70	0.86	5.40	4.76	10.16
Average		3.96	1.02	1.32	6.30	5.40	11.69
LSD 0.05		0.30	0.14	0.27	0.39	0.33	0.60
CV %		4.8	8.8	12.9	3.8	3.9	3.2

† 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 17. Michigan State University Second-Year Annual Grass Variety Trial Yields (DM tons/acre) of Italian and Annual Ryegrass varieties seeded at the Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded in May 2023.

			2024 DM Yields T/A, Four-cuts and Total					
Variety	Ryegrass	Heading Date ‡	Cut 1 May 24	Cut 2 July 2	Cut 3 Aug 11	Cut 4 Oct 9	2024 Total	2023 Total ††
Ador	Italian	May 20	2.21	0.66	0.94	0.28	4.09	3.34
Bar 14 LMT 503 †	Italian	May 20	2.79	0.84	1.28	0.83	5.74	3.98
Bar LMD TB+ †	Italian	May 20	2.36	0.86	1.35	0.72	5.29	3.91
BarExtra †	Italian	May 20	2.83	0.74	0.95	0.79	5.31	4.03
Marshall	Annual	May 12	2.59	0.61	0.09	-	3.29	3.65
Average			2.56	0.74	0.92	0.66	4.75	3.78
LSD 0.05			0.27	0.12	0.17	0.14	0.46	0.46

† Experimental Variety - not commercially available

†† - Total yield with 3 cuttings in the seeding year 2023.

‡ Maturity Date - Date when 50% of the reproductive tillers have a fully emerged grass head.

Table 18. Michigan State University 2024 Spring Seeded Annual Grass Variety Trial Yields (DM tons/acre) of Ryegrass (Italian, Intermediate and Annual) and Teffgrass varieties seeded at the Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded in May 2024.

Ryegrass		2024 DM Yields T/A, Three-cuts and Total			
Variety	Ryegrass	Cut 1 July 2	Cut 2 Aug 11	Cut 3 Oct 9	2024 Total
Barnael	Italian	0.56	1.86	0.93	3.35
Tetraprime II	Italian	0.51	1.62	0.51	2.64
Centurion	Annual	0.57	1.60	0.47	2.64
Tetramag	Intermediate	0.51	1.84	0.30	2.65
Marshall	Annual	0.60	1.46	0.49	2.55
Average		0.55	1.68	0.54	2.77
LSD 0.05		ns	0.22	0.14	0.32

Teffgrass		2024 DM Yields T/A, Three-cuts and Total			
Variety		Cut 1 July 2	Cut 2 Aug 11	Cut 3 Oct 9	2024 Total
Bonus	Teffgrass	1.04	2.28	0.90	4.22
Tiffany	Teffgrass	1.10	2.28	1.11	4.50
Average		1.07	2.28	1.01	4.36
LSD 0.05		ns	ns	ns	ns

Ryegrass and Teffgrass varieties seeded in two separate trials

Table 19. Michigan State University 2024 Summer Seeded Annual Grass Variety Trial Yields (DM tons/acre) of Crabgrass and Teffgrass varieties seeded at the Michigan State University Agronomy Farm, East Lansing, Michigan. Seeded on July 8, 2024.

Teffgrass	2024 DM Yields T/A, Two-cuts and Total		
Variety	Cut 1 August 26	Cut 2 October 3	2024 Total
Bonus	2.54	1.66	4.20
Moxie	2.61	1.61	4.22
Tiffany	2.30	1.65	3.95
Average	2.48	1.64	4.12
LSD 0.05	ns	ns	ns

Crabgrass	2024 DM Yields T/A, Two-cuts and Total		
Variety	Cut 1 August 26	Cut 2 October 3	2024 Total
Mojo	1.71	1.64	3.34
Red River	1.53	1.90	3.43
Average	1.62	1.77	3.39
LSD 0.05	ns	ns	ns

Table 20. Michigan State University 2023-2024 Winter Small Grain Forage Variety Trial Yields (DM tons/acre). Michigan State University Agronomy Farm, East Lansing, Michigan. Planted September 2023

Variety	DM yield T/A May 6, 2024	Height inches ††	Maturity †††
Aviator	3.76	38.0	10.4
ProGas	3.84	39.0	10.4
H10129 †	3.78	38.0	10.4
H238 †	3.79	39.3	10.4
H240 †	3.76	39.3	10.4
ProPower	3.61	35.0	10.1
Average	3.75	38.1	10.3
LSD 0.05	0.23	1.1	0.1

† Experimental Variety - not commercially available

†† Height on the date of harvest, measured from the base of the flag leaf.

††† Maturity - Feekes stage on the Day of harvest.

Appendix I

East Lansing, Michigan

Rainfall data at the Michigan State University Agronomy farm by date, Summer 2024

Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches
April 1		May 1		June 1		July 1		August 1		Sept 1		Oct 1	
April 2	0.23	May 2		June 2		July 2		August 2	3.41	Sept 2		Oct 2	0.11
April 3	0.33	May 3		June 3	0.09	July 3		August 3		Sept 3		Oct 3	
April 4		May 4	0.86	June 4		July 4		August 4		Sept 4		Oct 4	
April 5		May 5		June 5		July 5		August 5		Sept 5		Oct 5	
April 6		May 6		June 6	0.62	July 6	0.58	August 6	0.35	Sept 6	0.95	Oct 6	
April 7		May 7		June 7		July 7		August 7	0.93	Sept 7		Oct 7	
April 8	0.05	May 8	0.19	June 8		July 8		August 8		Sept 8		Oct 8	
April 9		May 9		June 9		July 9	0.23	August 9		Sept 9		Oct 9	
April 10		May 10	0.03	June 10	0.27	July 10	3.51	August 10		Sept 10		Oct 10	
April 11		May 11	0.17	June 11		July 11	0.39	August 11		Sept 11		Oct 11	
April 12	0.80	May 12		June 12		July 12		August 12		Sept 12		Oct 12	
April 13	0.38	May 13	0.09	June 13	0.03	July 13		August 13		Sept 13		Oct 13	0.76
April 14		May 14		June 14		July 14		August 14		Sept 14		Oct 14	0.28
April 15		May 15		June 15		July 15	0.89	August 15		Sept 15		Oct 15	
April 16		May 16		June 16		July 16	0.31	August 16		Sept 16		Oct 16	
April 17		May 17	0.06	June 17	1.63	July 17		August 17		Sept 17		Oct 17	
April 18	0.92	May 18		June 18		July 18		August 18	1.14	Sept 18		Oct 18	
April 19	0.01	May 19		June 19		July 19		August 19	0.13	Sept 19		Oct 19	
April 20	0.28	May 20		June 20	0.06	July 20		August 20		Sept 20		Oct 20	
April 21		May 21	0.17	June 21	0.27	July 21		August 21		Sept 21		Oct 21	
April 22		May 22		June 22		July 22		August 22		Sept 22		Oct 22	
April 23		May 23		June 23	0.26	July 23		August 23		Sept 23	0.48	Oct 23	0.04
April 24	0.33	May 24		June 24		July 24	0.08	August 24		Sept 24		Oct 24	
April 25		May 25	0.21	June 25	0.48	July 25		August 25		Sept 25		Oct 25	0.05
April 26		May 26		June 26		July 26		August 26		Sept 26		Oct 26	
April 27		May 27	0.28	June 27		July 27		August 27	0.46	Sept 27		Oct 27	
April 28	0.13	May 28		June 28		July 28		August 28	0.60	Sept 28		Oct 28	
April 29	0.34	May 29	0.07	June 29	0.51	July 29		August 29	0.23	Sept 29		Oct 29	0.05
April 30		May 30		June 30		July 30	0.80	August 30		Sept 30		Oct 30	
		May 31				July 31		August 31				Oct 31	
2024 Totals	3.80		2.13		4.22		6.79		7.25		1.43		1.29
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 II

Chatham, Michigan

Rainfall data at the Michigan State University UP Experiment Station by date, Summer 2024 (https://www.weather.gov)

Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches
April 1		May 1	0.25	June 1		July 1		August 1		Sept 1	0.23	Oct 1	0.06
April 2		May 2		June 2		July 2		August 2		Sept 2		Oct 2	
April 3	0.80 †	May 3	0.11	June 3		July 3	0.28	August 3		Sept 3		Oct 3	
April 4	0.68 †	May 4		June 4	0.13	July 4	0.25	August 4		Sept 4		Oct 4	
April 5		May 5	0.27	June 5	0.03	July 5	0.23	August 5		Sept 5		Oct 5	
April 6		May 6		June 6	1.16	July 6	0.09	August 6		Sept 6	0.36	Oct 6	0.17
April 7		May 7		June 7	0.14	July 7		August 7		Sept 7	0.01	Oct 7	
April 8		May 8	0.76	June 8		July 8		August 8	0.07	Sept 8		Oct 8	
April 9	0.16	May 9	0.01	June 9	0.30	July 9	0.07	August 9	0.06	Sept 9		Oct 9	
April 10	0.04	May 10		June 10	0.03	July 10		August 10	0.28	Sept 10		Oct 10	
April 11		May 11	0.37	June 11		July 11		August 11	0.23	Sept 11	0.05	Oct 11	
April 12		May 12	0.03	June 12		July 12		August 12		Sept 12		Oct 12	
April 13		May 13	0.09	June 13	0.04	July 13		August 13		Sept 13		Oct 13	
April 14		May 14		June 14	0.47	July 14		August 14		Sept 14		Oct 14	0.21
April 15		May 15		June 15		July 15	0.18	August 15	0.51	Sept 15		Oct 15	0.07
April 16		May 16		June 16	0.07	July 16	0.58	August 16		Sept 16		Oct 16	0.02
April 17	0.25	May 17	0.04	June 17	0.16	July 17		August 17	T	Sept 17		Oct 17	
April 18	0.30	May 18		June 18	1.93	July 18	0.02	August 18	0.16	Sept 18		Oct 18	
April 19		May 19		June 19		July 19		August 19		Sept 19		Oct 19	
April 20		May 20		June 20		July 20		August 20		Sept 20	0.20	Oct 20	
April 21		May 21	0.07	June 21		July 21		August 21		Sept 21		Oct 21	
April 22		May 22	0.90	June 22	0.05	July 22		August 22		Sept 22	0.05	Oct 22	
April 23		May 23	0.04	June 23	2.26	July 23	0.08	August 23		Sept 23	0.26	Oct 23	0.25
April 24	0.07	May 24		June 24		July 24	0.18	August 24		Sept 24		Oct 24	0.05
April 25		May 25	0.31	June 25	1.02	July 25		August 25		Sept 25		Oct 25	0.02
April 26		May 26		June 26		July 26		August 26		Sept 26		Oct 26	0.11
April 27	0.37	May 27	1.15	June 27		July 27		August 27	0.60	Sept 27		Oct 27	
April 28	0.95	May 28	0.48	June 28		July 28		August 28	0.06	Sept 28		Oct 28	
April 29		May 29		June 29	0.29	July 29		August 29		Sept 29		Oct 29	
April 30		May 30		June 30	0.03	July 30	0.33	August 30	0.17	Sept 30		Oct 30	
		May 31				July 31		August 31				Oct 31	0.15
2024 Totals	3.99		4.88		8.11		2.29		2.15		1.16		1.11
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

Appendix III

Acknowledgements of the staff and students at Chatham and East Lansing

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Marketers	Web Addresses	Phone
Albert Lea Seed	www.alseed.com	800-352-5247
Alforex Seeds	www.alforexseeds.com	877-560-5181
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Growmark	www.growmark.com/	—
Hood River Seeds	www.hoodriverseed.com	855-406-2696
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Legacy Seed	www.legacyseeds.com	866-791-6390
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