



2021 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 for row crops for land use continues to squeeze forage production acres while equipment, land, and labor costs increase. Michigan hay prices were strong in 2021, and a one-ton yield increase of average quality alfalfa hay was worth \$160 to \$190/acre. Under these market conditions, the importance of improving yield per acre through use of better forage varieties is an important component of profitability. This report contains yield data totals from 2021. Yield data for individual cuttings from previous years are in the variety test report archive on the MSU Forage Connection website at <http://www.forage.msu.edu/publications>.



2021 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**. Weather conditions at test sites were typical of conditions across upper and lower Michigan. Last winter was mild and dry. Some counties entered drought classification in spring. Weather conditions in general were very good for planting of spring-seeded forage crops. In many counties perennial forage growth was slower than usual in May due to the combination of cooler than normal temperatures, late frosts, and drought. Many perennial forages matured a few days later than in recent years. As a result, first cutting yields were lower than normal across much of the state, but ample rainfall beginning in June supported excellent forage regrowth in second and later cuttings. Weather conditions were good for haymaking late in May and the first week of June in southern Michigan, but rain events hampered cutting and harvesting in early July and again in August. There were at least three events of heavy rain and localized flooding from late June to mid-August and another in October in some lower counties. Rainfall was below normal for much of the summer at Chatham, where June was the only month that reached average rainfall totals, with most of that rainfall in the last 10 days of June. Temperatures at Chatham were above average for much of the summer, with growing degree day accumulation April – October (base 41°F) totaling 113% of the five-year average.

Methods

Plots are managed to provide optimum

fertility and pest control. All plots are planted into prepared seedbeds using a cultipacker seeder. Alfalfa and red clover plots are 3 feet wide and 20-23 feet long. Grass plots are 20-23 feet long and 5 feet wide. Annual grass plots measure 15-20 ft long x 5 ft wide. Only the center 3 ft of 5-ft-wide plots is harvested. Phosphorus, potassium, and sulfur are applied according to soil test and MSUE recommendations for the species. Perennial and annual grass plots receive 50 lb of N in spring and again after first cutting. Spring small grains receive 100 lb N topdressed after emergence, while 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 prevent establishment failure but are usually not irrigated during production years. This provides 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 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** are included in most tests. These provide reference points for estimation of

relative differences among tests conducted across different years. The relative difference among varieties is expressed as a **percentage of the check** variety yield. Check varieties are chosen for suitability across a wide area of the USA. Where meaningful check varieties are not available, relative differences are expressed as a **percentage of the test 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 the LSD value, the varieties are likely to be truly different. The **Coefficient of Variation (CV)** provides an estimate of overall procedural and environmental variability in a test or cutting. When CV is greater than 10%, it can be difficult to detect genetic differences in variety performance. High CV can be related to low yields and environmental stress.

Alfalfa Variety Trials

Long-term yield summaries for alfalfa varieties planted at multiple locations in Michigan variety trials from 2014 to 2020 are listed in **Tables 4 through 6**. Alfalfa dry matter yields, individual cuttings and total, in 2021 from trials at East Lansing are in **Tables 10 to 12** and yields from the trials at Chatham are in **Tables 14 to 16**. Yield data for individual cuttings from previous years are in

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Table 1. Actual and 30-year average precipitation (Inches) from April to October 2014 to 2021 at two variety test sites in Michigan.

	2014	2015	2016	2017	2018	2019	2020	2021	Avg ††
	East Lansing †								
Apr	1.07	1.10	1.22	5.17	2.18	2.29	2.78	1.49	3.26
May	3.66	4.83	2.97	2.47	4.96	3.80	4.99	0.94	3.66
June	5.60	7.23	0.97	2.30	1.60	7.52	2.46	8.40	3.76
July	2.97	2.89	3.76	2.30	2.18	2.55	2.90	4.72	2.94
Aug	5.33	6.15	6.83	1.99	4.21	1.16	2.69	6.68	3.48
Sept	4.49	4.34	3.47	1.26	3.48	3.60	4.09	3.74	2.81
Oct	2.41	1.92	3.70	8.15	5.66	6.03	2.77	4.99	3.16
Total	25.53	28.46	22.92	23.64	24.27	26.95	22.68	30.96	23.07
	Chatham †								
Apr	3.32	2.03	3.21	5.25	2.02	2.56	1.91	3.46	2.44
May	3.36	5.60	3.45	4.99	1.36	5.53	1.60	1.06	3.27
June	3.85	2.67	2.34	7.36	4.48	2.52	5.11	4.87	3.37
July	4.27	2.15	3.44	1.74	5.08	1.42	7.65	2.43	3.58
Aug	3.18	1.86	3.67	5.50	4.32	2.70	3.82	1.75	3.03
Sept	3.53	2.41	4.78	3.26	5.40	5.08	3.53	3.22	4.25
Oct	6.98	4.25	6.90	7.82	8.02	7.25	5.29	2.53	4.74
Total	28.49	20.97	27.79	35.92	30.68	27.06	28.91	19.32	24.68

† Rainfall from the MSU Plant Soil and Microbial Sciences Agronomy Farm in East Lansing and the Chatham Experiment Station.

†† Thirty-year (1991 to 2020) averages in the Lansing area and the MSU Experiment Station in Chatham. <https://www.weather.gov>

the variety test report archive on the MSU Forage Connection website at <http://www.forage.msu.edu/publications>. In 2021, alfalfa variety trials were cut four times at East Lansing and three times at Chatham. First cutting was removed at late-bud to early flower stage of maturity at both locations in 2021. There was alfalfa weevil damage in first cutting of all the alfalfa trials in Chatham. Weevil damage was variable among the trials in East Lansing and was the most severe in the 2019 seeding. Alfalfa trial cutting dates at East Lansing were May 30-June 1, July 20-21, August 19-24, and October 20-22. Cutting dates at Chatham were on June 17, July 21, and October 7. Yields were much higher at East Lansing in 2021 than in 2020. Average total yields in 2021 from the 2018 and 2019 trials, respectively, were 2.41 and 2.08 tons per acre higher than last year. Alfalfa varieties seeded in 2018 had an average total yield of 6.89 and ranged from 6.37 to 7.40 tons/acre. Twenty alfalfa varieties seeded in 2019 averaged 7.08 and ranged from 6.34 to 7.60 tons per acre. A new trial of 12 varieties was established at East Lansing in the late summer of 2020. First-year average total yield in this trial was 7.64 and ranged from 6.96 to 8.31 tons/acre. Trials of both conventional and Roundup Ready® alfalfa varieties were seeded at Chatham in the Upper Peninsula in 2018. Despite the dry summer at Chatham, average total yield was only about 1/3

ton less in 2021 than in 2020. First cutting of alfalfa at Chatham was one week earlier in 2021 than in 2020. Second cutting was 5 weeks after first and the third and final cutting was in early October. Average yield in 2021 of the conventional varieties in the 2018 seeding was 5.07 and ranged from 4.72 to 5.29 tons/acre. Yields of the four varieties in the Roundup Ready® trial averaged 4.47 and ranged from 4.30 to 4.65 tons/acre. Total yield in 2021 of nine conventional varieties seeded in 2019 averaged 3.88 and ranged from 3.26 to 4.25 tons per acre.

Perennial Cool-Season Grass Variety Trials

Cool-season grass trials were harvested three times at East Lansing and one or two times at Chatham in 2021. 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 from 2014 to 2018 are reported in **Tables 7 and 8**. Yields in 2021 from the trials at Chatham are in **Table 17** and yields from the trials in East Lansing are in **Tables 18 and 19**. Dry matter yield of individual cutting and total in 2021, and the total yield from the previous years are reported. Yield data for individual cuttings from previous years are in the variety test report archive on the MSU Forage Connection website at

<http://www.forage.msu.edu/publications>.

In 2021, we evaluated perennial grasses in trials seeded in 2018 and 2020 at East Lansing and seeded in 2020 at Chatham. Grass trials at East Lansing were harvested later than the alfalfa trials in 2021. Cutting dates in East Lansing were: cut 1 – June 6-11, cut 2 – July 30-31, and cut 3 – October 23-November 7. Yields at East Lansing were highest in the first cutting and lowest in the third and final cut. In general, percent yield per cutting of tall fescue was about 45, 35, and 20 percent, respectively. Orchardgrass and meadow fescue yield per cutting was about 50, 35, and 15 percent. Percent yield by cutting of timothy, ryegrass, festulolium, and bromegrass was about 60, 30, and 10 percent per cutting. Cutting dates for the grass variety trials at Chatham varied by species. Bromegrass, meadow fescue, and orchardgrass were harvested in early June and late July. Tall fescue was harvested in late June and late September. Timothy was cut once in early July. Yields at Chatham were higher in the second cut than first cutting for meadow fescue, orchardgrass and bromegrass in 2021. Tall fescue yields were higher in first cut than in second cut. Three-year-old stands (seeded 2018) of tall fescue, meadow fescue, timothy, perennial ryegrass, and festulolium (ryegrass type) were evaluated in East Lansing. Dry matter yield of tall fescue averaged 5.22 and ranged from 4.74 to 5.69, meadow fescue yields averaged 3.61 and ranged from 3.35 to 4.09,

timothy average yield was 4.60 and ranged from 4.20 to 5.33, the perennial ryegrass average yield was 3.25 and ranged from 2.97 to 3.53, festulolium (ryegrass-type) varieties yield average was 4.12 and ranged from 3.84 to 4.48 tons/acre, respectively (Table 18, pages 22-23).

One-year-old stands (seeded in 2020) of orchardgrass, tall fescue, meadow fescue, timothy, smooth bromegrass, meadow bromegrass, and perennial ryegrass were evaluated at both East Lansing and Chatham. Yields at East Lansing for all species in this trial were higher in 2021 than in several years. Highest dry matter total yields were obtained with the bromegrass varieties averaging 8.81 and ranging from 8.46 to 9.19 tons/acre. Dry matter yield of tall fescue averaged 7.60 and ranged from 6.10 to 8.22, orchardgrass yields averaged 6.81 and ranged from 5.89 to 7.81, meadow fescue yields averaged 6.22 and ranged from 5.88 to 6.67, timothy yields averaged 5.87 and ranged from 5.24 to 6.66, and the perennial ryegrass average yield was 5.78 and ranged from 4.85 to 6.64 tons/acre, respectively (Table 19, pages 24-26).

Dry weather at Chatham resulted in low yields from the one-year-old grass varieties in 2021. Meadow fescue average yield was 2.21 and ranged from 1.99 to 2.55, orchardgrass average yield was 1.49 and ranged from 1.14 to 1.79, tall fescue average yield was 1.31 and ranged from 1.00 to 1.55 tons/acre, respectively. Average yield of two smooth bromegrass varieties was 1.97, two meadow bromegrass varieties was 2.45, and three timothy varieties was 1.27 tons/acre, respectively (Table 17, pages 20-21).

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 2021 are reported in **Table 9**. 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 before the harvest date is rated 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. A red clover trial was seeded in 2020 in late summer at East Lansing. This trial was not cut in the seeding year and was harvested for yield three times in 2021. Cutting dates were: June 10, July 21, and September 9, respectively. Yields of red clover varieties in the 2020 seeding averaged 5.54 and ranged from 4.87 to 5.96 tons/acre. Yields of the red clover varieties in 2021, per cut and total, are listed in **Table 13**.

Annual Forage Trials

Trials of winter triticale, rye, and hybrid rye varieties were seeded at East Lansing in September, 2020. The ideal harvest timing of the hybrid rye and triticale for forage is prior to heading. Harvest maturity of the winter small grains was about one week earlier in 2021 than in 2020. Rye varieties matured earlier than the hybrid rye, which was a few days earlier than the triticale. The rye and hybrid rye varieties were harvested on May 12 and triticale was harvested on May 17. Dry matter yields of winter triticale varieties averaged 4.75 and ranged from 4.02 to 5.12 tons/acre. Yields of the rye and hybrid rye varieties averaged 3.38 and ranged from 3.07 to 4.17 tons/acre. These varieties were cut once with little or no regrowth. Plant height, heading date and yield are listed in **Table 24**.

Several varieties of triticale were also seeded in the spring of 2021. These varieties were planted in April and harvested 2 times for yield. Maturity date, height, and yield data were obtained in first cutting and height and yield were obtained in second cutting. Yield was lower in first cut than expected due to the dry conditions in May. Dry matter yields of the varieties entered are listed in **Table 25**.

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 2014. 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. Because glyphosate is used for weed control in Roundup-Ready trials, these are conducted as separate tests from conventional varieties. Vernal, a highly fall-dormant (FD 2) public variety released in 1953 has poor disease resistance compared to modern varieties, is used as the historical check variety to maintain long-term comparisons across time. An index value for variety yield as a percent of Vernal is presented for each conventional alfalfa entry. Because there is no industry standard

check variety with the RR trait, index values RR alfalfa tests are presented as a percentage of the test average.

Alfalfa Trait Ratings.

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

Fall Dormancy and Winterhardiness Ratings.

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

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

Alfalfa Disease and Pest Ratings.

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

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

Phytophthora Root Rot (PRR). This fungal disease, first found in Michigan in 1972, is now one of the state's most important alfalfa diseases. PRR occurs primarily on heavy or poorly drained soils, but any soil may result in severe injury if

saturated for seven to ten days, especially to one- to two-month old seedlings. Planting seed treated with *Apron* or *Stamina* may further reduce disease when planting resistant varieties. Treating a susceptible variety, such as Vernal, with a seed fungicide is unlikely to compensate for susceptibility. Most of the highest yielding varieties entered in our tests are resistant to PRR.

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

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

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

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

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

root rot (PRR) is also recommended when alfalfa is grown on damp, fine-textured soils. For stand life longer than four years or for Northern Michigan and UP regions, select dormant (FD = 2-4), winterhardy (WSI 1 to 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 three locations. More than 50 varieties have been evaluated at East Lansing and more than 25 varieties have been planted at Lake City or Chatham. Nitrogen fertilizer is applied at green-up in early April and after each cutting.

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

Bromegrasses (*Bromus spp.*) are rhizomatous, sod-forming grasses that are high in forage quality and yield. **Smooth bromegrass** is one of the most winter-hardy grasses in Michigan and can be grown on a wide range of soil types. Smooth bromegrass has poor regrowth potential, producing most of its yield in the first cutting, and it should not be grazed or cut during stem elongation or early heading to prevent a reduction in tillering. **Meadow brome** has better regrowth potential and heat tolerance than smooth brome. Crosses between smooth and meadow brome, sometimes called **Intermediate Brome**, 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 winterhardness 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. Tall fescue varieties containing the toxic wild-type endophyte (E+) are not recommended for Michigan. **Meadow fescue** has better forage quality, palatability, and cold tolerance than tall fescue and does not contain toxic endophytes, but usually yields less.

Ryegrasses (*Lolium spp.*) are sod-forming bunchgrasses that are noted for extremely high forage quality and good regrowth potential. **Perennial ryegrass** is suitable for rotational grazing and multiple harvests for haylage, but it lacks the winterhardness 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.

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

	Seeding rate (lb/acre) †	Seeds/lb (approx.)	Ease of establishment	Stand life (yr)	Acid	Wet	Drought	Cold	Heat	Pasture	Hay
PERENNIALS											
Alfalfa	12-16	213,000	Easy	3-5+	5††	5	2	1	2	2	1
Red Clover	8-12	262,000	Easy	2	4	2	4	1	3	2	2
Brome, meadow	15-20	93,000	Fair	5+	3	5	2	1	-	2	2
Brome, smooth	12-15	139,000	Slow	5+	2	5	2	1	2	2	1
Fescue, meadow	15-20	280,000	Easy	3-4	2	2	4	1	4	1	1
Fescue, tall	12-15	218,000	Easy	5+	1	2	1	3	1	1	1
Festulolium	20-30	207,000	Easy	2-3	3	2	3	2	5	1	3
Kentucky bluegrass	8-15	2,056,000	Easy	5+	2	3	5	1	5	1	5
Orchardgrass	10-15	536,000	Easy	3-5	3	3	2	2	3	2	1
Reed canarygrass	6-8	509,000	Slow	5+	2	1	1	1	3	3	2
Ryegrass, Annual/Italian	20-30	209,000	Easy	1	2	2	5	*	5	1	4
Ryegrass, perennial	20-30	278,500	Easy	2-5	2	2	5	4	5	1	5
Timothy	6-8	1,119,000	Easy	5+	2	2	5	1	3	3	1
ANNUALS											
Berseem clover	8-25	207,000	Easy	1-2	3	2	1	*	1	1	1
Crabgrass	3-5	800,000	Easy	1	3	4	2	5	1	1	3
Teff grass	6-10	1,226,000	Fair	1	3	2	2	5	1	4	1
Oats	64-80	17,800	Easy	1	1	3	4	4	4	1	1
Rye	60-120	17,000	Easy	1	1	3	2	1	4	1	1
Triticale	50-120	16,000	Easy	1	1	3	2	1	4	1	1
†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.											

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

Variety	FD †	WSI ††	BW ‡	PRR	AN	VW	FW	Aph 1	Aph 2	SN	RR	PLF	Multi	Salt	Stand	Marketer
1041-2	4	2	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Albert Lea
428RR	4	1	HR	HR	HR	HR	HR	HR	-	MR	RR	-	H	G	-	Allied Seed
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
6497R	4	2	HR	HR	HR	HR	HR	HR	-	R	RR	-	H	G	-	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 469	4	-	HR	HR	HR	HR	HR	HR	-	HR	-	-	L	G	-	Alforex Seeds
AFX 460	4	2	HR	HR	HR	HR	HR	HR	R	R	-	-	-	-	-	Alforex Seeds
AmeriStand 403T Plus	4	2	HR	HR	HR	HR	HR	HR	R	MR	-	-	-	-	-	America's Alfalfa
AmeriStand 455TQ RR	4	2	HR	HR	HR	HR	HR	HR	-	R	RR	-	H	G	-	America's Alfalfa
Armour	4	2	HR	HR	HR	HR	HR	HR	-	-	RR	-	-	-	-	Becks Hybrids
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
Enduro Elite	4	-	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	Cisco Seeds
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	-	-	La Crosse
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 Pickseed
FSG 415 BR	4	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 409	4	-	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	Pref Alfalfa Gen
GA 497 HD	5	2	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	-	Pref Alfalfa Gen
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

Table 3 continued next page

Table 3 continued

Variety	FD †	WSI††	BW ‡	PRR	AN	VW	FW	Aph 1	Aph 2	SN	RR	PLF	Multi	Salt	Stand	Marketer
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
MVS 4220Q	4	2	HR	HR	HR	HR	HR	HR	HR	HR	-	-	-	-	-	Mountain View Seeds
Octane	3	1.4	HR	HR	HR	HR	HR	HR	HR	-	-	-	L	-	-	Brett Young
Oneida VR	3	-	R	MR	MR	HR	HR	-	-	-	-	-	-	-	-	Public
Pioneer 54Q14	4	1	HR	HR	HR	HR	HR	HR	R	MR	-	-	-	-	-	Pioneer
Pioneer 54Q16	4	-	HR	HR	HR	HR	HR	HR	R	HR	-	-	-	-	-	Pioneer
Pioneer 55Q27	5	1	HR	HR	HR	HR	HR	HR	R	HR	-	-	-	-	-	Pioneer
Pioneer 54VQ52	3	-	HR	HR	HR	HR	R	HR	HR	R	-	-	-	-	-	Pioneer
Pioneer 55H96	5	-	HR	HR	HR	R	HR	HR	HR	-	-	HR	-	-	-	Pioneer
Pioneer 55V50	5	-	HR	HR	HR	HR	R	HR	HR	R	-	-	-	-	-	Pioneer
Pioneer 55QR04	4	1	HR	HR	HR	HR	HR	HR	-	R	RR	-	H	-	-	Pioneer
Pioneer 55VR06	5	1	HR	HR	HR	HR	R	HR	MR	MR	RR	-	-	-	-	Pioneer
Pioneer 55VR08	5	-	HR	HR	HR	HR	HR	HR	HR	R	RR	-	-	-	-	Pioneer
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
RR Stratica	4	2	HR	HR	HR	HR	HR	HR	-	R	RR	-	H	G	-	Croplan Genetics
RR501	5	2	HR	HR	HR	-	HR	HR	-	HR	RR	-	H	G/F	-	Channel
StarGold	5	-	HR	HR	HR	HR	HR	HR	-	-	-	-	-	-	-	Renk Seed
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
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
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
WL 356 HQ RR	4	1	HR	HR	HR	HR	HR	HR	HR	HR	RR	-	H	G	-	W-L Research
WL 372 HQ RR	5	2	HR	HR	HR	HR	HR	HR	-	HR	RR	-	-	-	-	W-L Research
Yieldmaster RR	4	2	HR	HR	HR	HR	HR	HR	-	R	RR	-	H	-	-	Monsanto

† Refer to Alfalfa Trait Ratings found in the summary for more information
†† Winter survival index : 1=superior winter survival, 2=very good, 3=good, 4=adequate, 5=low, 6=no winter survival.
‡ BW = Bacterial Wilt, PRR = Phytophthora Root Rot, AN = Anthracnose, VW = Verticillium Wilt, FW = Fusarium Wilt,
APH 1 = Aphanomyces race one, APH 2 = Aphanomyces race two, SN=Stem nematode, RR = Roundup Ready® Alfalfa Variety, PLF = Potato leafhopper resistance, Multi = Multifoliate leaf expression (H-High, M-Medium, L-Low), Salt = Salt tolerance (G = germination, F = Forage), Stand = Standability or lodging resistance.

Table 4. Long-term yield averages (dry matter tons/acre) from MSU Alfalfa Variety Trials.
Seeded in East Lansing, Michigan from 2014 to 2020.

Variety	Marketer	Three-year average ‡					2-year	1-year	(Trials) †
		2014	2015	2016	2017	2018	average	total	
		(2015-17)	(2016-18)	(2017-19)	(2018-20)	(2019-21)	(2020-21)	(2021)	%
----- dry matter tons/acre -----									
1041-2	Albert Lea	-	-	-	-	-	6.10	-	(1)105
9401	Albert Lea	-	-	-	-	-	5.75	-	(1) 99
Ace	Brett Young	-	-	-	-	5.01	-	-	(1) 99
AFX 429	Alforex Seeds	-	-	-	4.56	-	-	-	(1)105
AFX 469	Alforex Seeds	-	-	-	4.75	-	-	-	(1)110
AFX 460	Alforex Seeds	-	-	-	4.77	5.16	-	-	(2)106
Caliber	Becks Hybrids	5.81	4.33	-	-	-	-	-	(2)110
CavalryDQ	Becks Hybrids	-	5.02	-	4.67	-	-	-	(2)118
Contender	Becks Hybrids	5.80	4.64	-	-	-	-	-	(2)114
Emerald	TriCal	-	-	-	-	5.23	-	-	(1)104
Enduro Elite	Cisco Seeds	5.73	-	-	-	-	-	-	(1)109
FF42.A2	La Crosse Seeds	-	5.05	-	-	-	-	-	(1)128
Fierce	Becks Hybrids	5.86	4.94	-	4.49	-	-	-	(3)114
Finch	Blue River Organic	-	-	-	-	-	6.03	-	(1)104
Fortune	DLF Pickseed	-	-	5.34	-	-	-	-	(1)120
FSG 415 BR	Farm Science	-	5.33	-	-	-	-	-	(1)136
FSG 426	Farm Science	-	4.74	-	-	-	-	-	(1)121
GA-409	Preferred Alfalfa Gen	5.79	-	-	-	-	-	-	(1)110
GA-497HD	Preferred Alfalfa Gen	-	-	5.23	-	-	-	-	(1)118
HybriForce 3400	Dairyland Seed	-	4.73	-	-	-	-	-	(1)120
HybriForce 3420 Wet	Dairyland Seed	-	-	5.41	-	-	-	-	(1)122
HybriForce 3420/Wet-OB1	Osprey Biotechnics	-	-	5.46	-	-	-	-	(1)123
HybriForce 3420/Wet-OB2	Osprey Biotechnics	-	-	5.83	-	-	-	-	(1)131
HybriForce 3430	Dairyland Seed	-	-	5.49	-	-	-	-	(1)123
HybriForce 4400	Dairyland Seed	-	4.94	5.48	5.19	5.85	6.19	7.86	(5)118
HybriForce 4400-OBT2002	Osprey Biotechnics	-	-	-	-	5.80	-	-	(1)115
HybriForce 4400-OBT2013	Osprey Biotechnics	-	-	-	-	5.63	-	-	(1)111
HybriForce 4420/Wet	Dairyland Seed	-	-	-	-	-	6.32	7.78	(1)109
Integra 8420	Wilbur-Ellis	-	-	5.47	-	-	-	-	(1)123
Integra 8450	Wilbur-Ellis	-	-	5.54	-	-	-	-	(1)124
KF406A2	Byron Seed	-	-	5.31	-	-	-	-	(1)119
KF425HD	Byron Seed	-	-	5.37	-	-	-	-	(1)121
L-451APH2+-FL1	Legacy/Osprey	-	-	-	-	-	6.27	-	(1)108
L-451APH2+-FL2	Legacy/Osprey	-	-	-	-	-	6.36	-	(1)110
L-451APH2+ANS	Legacy/Osprey	-	-	-	-	-	6.20	-	(1)107
Oneida VR	Public	5.33	-	4.68	-	-	-	-	(2)103
Pioneer 54Q14	Pioneer	5.54	-	-	-	-	-	-	(1)106
Pioneer 55Q27	Pioneer	6.13	4.96	5.22	-	-	-	-	(3)120
Quail	Blue River Organic	-	-	-	-	-	5.75	-	(1) 99
QuickGold	Renk Seed	-	-	-	-	5.15	-	-	(1)102
Rebound 6XT	Croplan Genetics	-	-	5.10	-	-	-	-	(1)115
Stalwart II	LG Seeds	-	-	5.14	-	-	-	-	(1)116
StarGold	Renk Seed	6.17	-	-	-	-	-	-	(1)118
SW 3407	S & W Seed Company	-	-	-	-	-	6.23	7.64	(1)108
SW 4107	S & W Seed Company	-	-	-	4.91	5.54	5.85	7.75	(3)108
SW 4412Y	S & W Seed Company	-	-	-	-	-	-	7.77	-
SW 4506	S & W Seed Company	-	-	-	-	-	-	7.59	-
SW 5213	S & W Seed Company	-	-	5.51	-	-	-	-	(1)124
SW 5509	S & W Seed Company	-	-	-	-	-	-	7.46	-
SW 5511	S & W Seed Company	-	-	-	-	-	5.86	-	(1)101
Triad	Albert Lea	-	-	-	-	-	5.48	-	(1) 95
TriFecta	TriCal	-	-	5.52	-	5.66	-	-	(2)118
Trifecta III	Seed Logic	-	-	-	-	5.48	-	-	(1)109
Vernal	public	5.25	3.93	4.45	4.33	5.05	5.79	6.96	(6)100
WL365HQ	W-L Research	-	-	5.32	-	-	-	-	(1)120
WL 349 HQ	W-L Research	-	-	-	-	-	5.89	-	(1)102
Mean		5.74	4.78	5.31	4.71	5.49	5.90	7.60	114

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

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

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

Table 5. Yields of Alfalfa Varieties (dry matter tons/acre) seeded from 2014 to 2019 at Chatham in the Upper Peninsula and at Lake City in Northern Lower Michigan.

Variety	Marketer	Chatham				Lake City			
		3-yr average ‡		2-yr avg	(Trials) †	3-yr average ‡			(Trials) †
		2015	2018	2019	% Vernal ††	2014	2015	2016	% Vernal ††
		(2016-18)	(2019-21)	(2020-21)		(2015-17)	(2016-18)	(2017-19)	
		---- dry matter tons/acre ----				---- dry matter tons/acre ----			
1041-2	Albert Lea	-	-	4.48	(1)114	-	-	-	-
9401	Albert Lea	-	-	4.34	(1)110	-	-	-	-
AmeriStand 403T Plus	America's Alfalfa	3.29	-	-	(1)105	3.18	4.36	-	(2) 96
DG 4210	Crop Production	3.28	-	-	(1)104	3.35	4.53	-	(2)100
Hi-Gest 360	Alforex	-	-	-	-	3.40	-	-	(1) 97
HybriForce 3400	Dairyland Seed	3.45	4.58	-	(2)109	3.65	4.91	-	(2)109
HybriForce 4400	Dairyland Seed	-	4.55	4.05	(2)105	-	-	-	-
Integra 8420	Wilbur-Ellis	-	4.39	-	(1)103	-	-	3.48	(1)103
Integra 8450	Wilbur-Ellis	-	4.45	-	(1)104	-	-	3.44	(1)102
L455HD	Legacy	3.20	-	-	(1)102	3.83	4.48	-	(2)106
Magnum 7 WET	Dairyland	3.13	-	-	(1)100	3.62	4.67	-	(2)105
Mariner IV	Allied Seed	3.14	-	-	(2) 99	3.81	4.76	-	(2)109
Octane	Brett Young	-	-	-	-	3.46	-	-	(1) 99
Oneida VR	Public	3.13	-	-	(1)100	3.62	4.63	-	(2)105
Pioneer 54Q14	Pioneer	-	-	-	-	3.20	4.45	-	(2) 97
Pioneer 55Q27	Pioneer	3.31	-	-	(1)105	3.81	4.48	3.39	(3)104
Pioneer 55V50	Pioneer	-	-	-	-	3.79	4.83	-	(2)110
StarGold	Renk Seed	3.27	-	-	(1)104	3.48	-	-	(1)100
SW 3407	S & W Seed	-	-	4.00	(1)102	-	-	-	-
SW 4107	S & W Seed	-	4.17	4.23	(2)103	-	-	-	-
SW 5511	S & W Seed	-	-	3.87	(1) 98	-	-	-	-
Swift	Blue River Organic	-	-	4.21	(1)107	-	-	-	-
Triad	Albert Lea	-	-	3.47	(1) 88	-	-	-	-
Trifecta	TriCal	-	4.39	-	(1)103	-	-	-	-
Vernal	Public	3.14	4.27	3.94	(3)100	3.49	4.36	3.37	(3)100
WL354HQ	W-L Research	3.08	-	-	(1) 98	3.11	-	-	(1) 89
Mean		3.23	4.40	4.07	102	3.54	4.60	3.42	102

† Number of 3-year trials with at least 2 years of data after the seeding year.
†† Average % Vernal of varieties with more than 2 full years of yield data.
‡ Seeding year and (the years the trial was harvested to obtain the average yield)

Table 6. Yields of Roundup Ready® Alfalfa Varieties (dry matter tons/acre) seeded from 2013 to 2018 at East Lansing, Chatham, and Lake City, Michigan.

Variety	Marketer	East Lansing					Chatham				Lake City					
		Three-year average ††					Three-year average ††			(Number)	Three-year average ††				(Number)	
		2013 (2014-16)	2014 (2015-17)	2015 (2016-18)	2016 (2017-19)	2017 (2018-20)	% Mean †	2013 (2014-16)	2015 (2016-18)	2018 (2019-21)	% Mean †	2013 (2014-16)	2014 (2015-17)	2015 (2016-18)	2016 (2017-19)	% Mean †
		----- dry matter tons/acre -----					-- dry matter tons/acre --				----- dry matter tons/acre -----					
428RR	Allied Seed	6.01	-	-	-	-	(1)102	-	-	-	-	-	-	-	-	-
430RRLH	Allied Seed	-	-	4.16	-	-	(1) 89	-	-	-	-	-	-	-	-	-
6424R	NEXGROW	-	-	-	-	4.45	(1) 97	-	-	3.87	(1)101	-	-	-	-	-
6497R	NEXGROW	5.94	-	-	-	-	(1)101	-	-	-	-	-	-	-	-	-
9200RR	LG Seeds	-	-	-	4.79	-	(1)101	-	-	-	-	-	-	-	-	-
AmeriStand 455TQ RR	America's Alfalfa	5.81	-	-	-	-	(1) 99	-	-	-	-	-	-	-	-	-
Armour	Becks Hybrids	-	-	-	-	4.78	(1)104	-	-	-	-	-	-	-	-	-
DKA40-51RR	Dekalb	-	5.10	4.80	4.49	-	(3) 98	-	2.83	3.92	(2) 98	-	2.88	3.59	3.17	(3) 96
DKA41-18RR	Dekalb	5.72	-	-	-	-	(1) 97	3.66	3.14	-	(2)102	2.83	-	3.84	-	(2)100
DKA43-22RR	Dekalb	-	5.20	-	-	-	(1)102	-	3.11	-	(1)103	-	3.10	4.06	-	(2)104
DKA44-16RR	Dekalb	5.99	5.24	4.52	4.75	4.53	(5)100	3.59	3.09	3.85	(3)100	2.85	3.04	3.87	3.23	(4)101
Integra 8444R	Wilbur-Ellis	-	-	-	4.61	-	(1) 97	-	-	3.75	(1) 97	-	-	-	3.03	(1) 95
Pioneer 54QR04	Pioneer	5.98	-	-	-	-	(1)102	-	-	-	-	2.84	-	-	-	(1)101
Pioneer VR06	Pioneer	-	5.40	5.16	-	-	(2)107	-	-	-	-	-	-	3.87	-	(1)101
Pioneer 55VR08	Pioneer	-	-	-	5.01	-	(1)106	-	-	-	-	-	-	-	3.36	(1)105
RR AphaTron 2XT	Croplan Genetics	-	-	-	4.81	-	(1)101	-	-	-	-	-	-	-	-	-
RR 501	Channel	-	5.26	-	-	-	(1)100	-	2.93	-	(1) 97	-	-	-	-	-
RR Stratica	Croplan Genetics	5.95	-	-	-	-	(1)101	-	-	-	-	-	-	-	-	-
WL 356HQ.RR	W-L Research	5.96	-	-	-	-	(1)101	-	-	-	-	-	-	-	-	-
WL 372HQ.RR	W-L Research	5.88	-	-	-	-	(1)100	-	-	-	-	-	-	-	-	-
Yieldmaster RR	Monsanto	5.70	-	-	-	-	(1) 97	3.64	-	-	(1)100	2.75	-	-	-	(1) 98
Mean		5.89	5.24	4.66	4.74	4.59		3.63	3.02	3.85		2.82	3.01	3.85	3.20	

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

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

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

Table 7. Long-term average yields (dry matter tons/acre) of perennial forage grasses seeded from 2014 to 2020 at East Lansing, Michigan.

Sp †	Variety	Marketer	Multi-year averages ‡					1-year total	% species mean ††
			2014 (2015-17)	2015 (2016-18)	2016 (2017-19)	2017 (2018-20)	2018 (2019-21)	2020 (2021)	
----- dm tons/acre -----									
FEST	Becva	DLF Pickseed	2.61	-	-	-	-	-	(1)106
FEST	Barfest	Barenbrug/Best Forage	2.33	-	-	-	-	-	(1) 94
FEST	Hostyn	DLF Pickseed	-	-	-	-	4.45	-	(1)104
FEST	Lofa	DLF Pickseed	-	-	-	-	4.20	-	(1) 99
FEST	Perun	DLF Pickseed	-	-	-	-	4.12	-	(1) 97
FEST	SPECIES MEAN Festulolium (ryegrass type)		2.47	-	-	-	4.26	-	-
FEST	Fojtan	DLF Pickseed	-	-	3.72	-	-	-	(1) 95
FEST	Mahulena	DLF Pickseed	-	-	4.11	-	-	-	(1)105
FEST	SPECIES MEAN Festulolium (fescue type)		-	-	3.92	-	-	-	-
MB	Arsenal	Barenbrug/Best Forage	-	-	-	-	-	8.80	-
MB	Fleet	check variety	-	-	-	-	-	8.46	-
MB	SPECIES MEAN Meadow Bromegrass		-	-	-	-	-	8.63	-
MdF	Cosmonaut	Barenbrug Seed	3.25	-	-	-	-	-	(1)100
MdF	Pradel	Barenbrug/Best Forage	3.25	2.41	2.90	3.76	3.81	6.35	(3)100
MdF	SW Minto	Albert Lea Seed	-	-	-	3.49	-	-	(1) 96
MdF	Driftless	Barenbrug/Best Forage	-	-	-	-	3.70	6.02	(1) 98
MdF	Raskila	Hood River Seed	-	-	3.14	-	-	-	(1)104
MdF	SPECIES MEAN Meadow Fescue		3.25	2.41	3.02	3.63	3.76	6.19	-
OR	Ammo	Barenbrug/Best Forage	-	-	-	-	-	6.53	-
OR	Barlegro	Barenbrug Seed	3.42	-	-	-	-	-	(1)100
OR	Echelon	DLF Pickseed	3.43	-	4.45	-	-	7.62	(2)104
OR	FSG506OG	Allied Seed	3.46	-	-	-	-	-	(1)101
OR	Intensiv	Barenbrug/Best Forage	3.48	-	-	-	-	7.26	(1)102
OR	Inavale	DLF Pickseed	-	-	-	-	-	7.03	-
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	3.37	-	-	-	-	-	(1) 99
OR	Potomac	check variety	3.28	3.37	4.09	3.92	-	6.19	(4)100
OR	Treposno	Hood River Seed	-	-	4.09	-	-	-	(1) 98
OR	SPECIES MEAN Orchardgrass		3.41	3.37	4.16	3.74	-	6.93	-
PR	Albion (4n)	Cisco Seed	-	2.33	-	-	-	-	(1)100
PR	Dexter 1 (4n)	DLF Pickseed	-	-	2.89	-	3.04	-	(2) 97
PR	Garbor (4n)	DLF Pickseed	-	-	2.69	-	3.19	-	(2) 96
PR	Linn (2n)	check variety	2.22	2.31	2.72	2.89	2.89	-	(5) 93
PR	Mara (2n)	Barenbrug Seed	2.59	-	-	-	-	-	(1) 98
PR	Maximo (4n)	DLF Pickseed	2.54	-	3.48	-	-	-	(2)107
PR	Payday (4n)	Smith Seed	2.96	-	-	-	-	-	(1)112
PR	Tomaso	Albert Lea Seed	-	-	-	2.69	-	-	(1) 91
PR	Remington (4n)	Barenbrug/Best Forage	2.88	-	-	3.33	3.51	6.64	(3)111
PR	Remington NEA (4n)	Barenbrug/Best Forage	-	-	-	-	-	6.62	-
PR	SPECIES MEAN Perennial Ryegrass		2.64	2.32	2.95	2.97	3.16	6.63	-
SB	Artillery	Barenbrug/Best Forage	-	-	-	-	-	8.79	-
SB	Lincoln	check variety	3.71	-	-	-	-	9.19	(1)104
SB	Hakari (Alaska brome)	Barenbrug Seed	3.33	-	-	-	-	-	(1) 93
SB	MBA	DLF Pickseed	3.70	-	-	-	-	-	(1)103
SB	SPECIES MEAN Smooth Bromegrass		3.58	-	-	-	-	8.99	-
TF	Armory	Barenbrug/Best Forage	-	-	-	-	-	8.11	-
TF	BarElite	Barenbrug Seed	4.18	-	-	-	4.73	-	(2) 98
TF	Bariane	Barenbrug/Best Forage	3.72	3.21	-	-	4.56	7.33	(3) 91
TF	Dominate	Allied Seed	4.50	-	-	-	-	-	(1)106
TF	Cajun II	Smith Seed	4.21	-	-	-	-	-	(1) 99
TF	Florine	Albert Lea Seed	-	-	-	4.75	-	-	(1)100
TF	FSG402TF	Allied Seed	4.33	-	-	-	-	-	(1)102
TF	Kentucky 31 plus	check variety	-	3.63	-	-	-	-	(1)105
TF	Kentucky 31 minus	check variety	4.24	3.58	4.11	5.06	5.06	8.18	(5)103
TF	Ranchero	Smith Seed	-	-	-	-	5.00	-	(1)103
TF	Swaj	Albert Lea Seed	-	-	-	4.45	-	-	(1) 94
TF	Tower	DLF Pickseed	4.61	-	4.01	-	-	-	(2)103
TF	SPECIES MEAN Tall Fescue		4.26	3.47	4.06	4.75	4.84	7.87	-
TM	Barfleo	Barenbrug/Best Forage	-	-	-	-	-	6.66	-
TM	Baronaise	Barenbrug/Best Forage	-	-	-	-	-	5.72	-
TM	Climax	check variety	2.94	2.73	3.50	3.58	3.85	5.24	(4) 91
TM	Dawn	Allied Seed	-	-	4.00	-	-	-	(1)104
TM	Express II	Allied Seed	3.44	-	-	-	-	-	(1)108
TM	KY Early Timothy	Smith Seed	-	-	-	4.62	4.50	-	(2)111
TM	Winnetow	DLF Pickseed	-	-	-	-	4.01	-	(1) 97
TM	Zenyatta	DLF Pickseed	-	-	3.99	-	-	-	(1)104
TM	SPECIES MEAN Timothy		3.19	-	3.83	4.10	4.12	5.87	-

† FEST=Festulolium (ryegrass or fescue type), MB=Meadow brome, MdF= Meadow fescue, OR=Orchardgrass, PR=Perennial ryegrass, SB=Smooth Bromegrass,

TF= Tall fescue, TM=Timothy

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

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

Table 8. Forage Yield (dry matter tons/acre) of Perennial Forage Grasses Seeded at Lake City in Northern Lower Michigan and at Chatham in the Upper Peninsula.

Sp †	Variety	Marketer	Lake City ‡			Chatham ‡			
			Three-year average †††		% species mean ††	Three-year average †††		1-year total (2021)	% species mean ††
			2014 (2015-17)	2015 (2016-18)		2014 (2015-17)	2015 (2016-18)		
			---- dry matter tons/acre ----			----- dry matter tons/acre -----			
MB	Arsenal	Barenbrug/Best Forage	-	-	-	-	-	2.44	-
MB	Fleet	check variety	-	-	-	-	-	2.45	-
MB	SPECIES MEAN Meadow Bromegrass							2.45	
MdF	Driftless	Barenbrug/Best Forage	-	-	-	-	-	2.05	-
MdF	Pradel	Barenbrug/Best Forage	-	3.70	-	1.75	-	2.28	-
MdF	SPECIES MEAN Meadow Fescue							2.17	
OR	Ammo	Barenbrug/Best Forage	-	-	-	-	-	1.25	-
OR	Echelon	DLF Pickseed	3.20	-	(1)103	1.54	-	-	(1) 96
OR	Intensiv	Barenbrug/Best Forage	3.27	4.09	(2)105	1.68	-	1.57	(1)105
OR	Persist	Smith Seed	2.97	3.84	(2) 97	1.58	-	-	(1) 99
OR	Potomac	check variety	3.02	3.82	(2) 97	1.59	1.69	1.68	(1)101
OR	SPECIES MEAN Orchardgrass		3.12	3.92		1.57	1.69	1.50	
PR	Albion (4n)	Cisco Seeds	-	3.27	(1)107	-	0.72	-	(1) 88
PR	Linn (2n)	check variety	-	-	(1) 99	-	0.98	-	(1)120
PR	Mara (2n)	Barenbrug Seed	-	2.75	(1) 90	-	0.80	-	(1) 98
PR	Payday (4n)	Smith Seed	-	3.15	(1)103	-	-	-	-
PR	Remington (4n)	Barenbrug/Best Forage	-	-	-	-	0.78	-	(1) 95
PR	SPECIES MEAN Perennial Ryegrass			3.06			0.82		
SB	Artillary	Barenbrug/Best Forage	-	-	-	-	-	2.04	-
SB	Lincoln	check variety	-	-	-	-	-	1.90	-
SB	SPECIES MEAN Smooth Bromegrass							1.97	
TF	Armory	Barenbrug/Best Forage	-	-	-	-	-	1.43	-
TF	Bariane	Barenbrug/Best Forage	2.79	4.35	(2) 97	1.53	1.35	1.55	(2) 86
TF	Kentucky 31 Plus	check variety	3.08	4.19	(2)100	1.89	1.74	-	(2) 108
TF	Kentucky 31 minus	check variety	2.98	4.29	(3)100	1.82	-	1.39	(1) 101
TF	Tuscany II	Forage First	3.11	4.27	(2)102	1.98	-	-	(1) 109
TF	SPECIES MEAN Tall Fescue		2.99	4.28		1.81	1.55	1.46	
TM	Barfleo	Barenbrug/Best Forage	-	-	-	-	-	1.27	-
TM	Baronaise	Barenbrug/Best Forage	-	-	-	-	-	1.27	-
TM	BarPenta	Barenbrug Seed	3.12	-	(1) 95	1.94	-	-	(1) 92
TM	Climax	check variety	2.92	4.69	-	2.03	1.75	1.28	(2) 94
TM	Crest	Allied Seed	3.65	-	(1)111	2.19	-	-	(1)103
TM	Summit	Allied Seed	3.46	4.75	(2)102	2.33	-	-	(1)110
TM	Winnetow	DLF Pickseed	-	-	-	-	1.77	-	(1) 94
TM	Zenyatta	DLF Pickseed	-	5.01	(1)104	-	2.16	-	(1)114
TM	SPECIES MEAN Timothy		3.29	4.82		2.12	1.89	1.27	

† MB=Meadow Bromegrass, MdF= Meadow fescue, OR=Orchardgrass, PR=Perennial ryegrass, SB=Smooth brome, TF= Tall fescue, TM=Timothy.

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

†† Number of trials and % of the mean (released varieties)

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

Table 9. First cutting maturity dates in 2021 of the varieties entered in the Perennial Grass Variety Trials at East Lansing in 2018 and 2020.

2018 Perennial Grass Trial		2020 Perennial Grass Variety Trial			
Tall Fescue		Tall Fescue		Orchardgrass	
Variety	Date ††	Variety	Date ††	Variety	Date ††
7FACF82 †	May 26	Armory	May 23	Ammo	May 22
BAR FAF 17135 †	May 26	7FACF82 †	May 26	BAR DGLF 2094 †	May 29
BAR FAF 17137 †	May 26	BAR FA 9125 †	May 29	BAR DGLF 2095 †	May 27
Barelite	May 26	BAR FAF 135 †	May 25	Echelon	May 26
Bariane	May 28	BAR FAF 137 †	May 25	Inavale	May 23
Kentucky 31 minus	May 19	BAR FAF 146 †	May 23	Intensiv	May 26
Ranchero	May 20	BAR FAFL 239 †	May 23	OG 80 †	May 25
		Bariane	May 27	OG 96 †	May 26
		Kentucky 31 minus	May 19	Potomac	May 22
		PST FA-A1733 †	May 25	PST DG-1739 †	May 23
				PST DG-A1737 †	May 26
Meadow Fescue		Meadow Fescue		Smooth Bromegrass	
Variety	Date ††	Variety	Date ††	Variety	Date ††
Bar FPF 17079 †	May 28	BAR FP 2044 †	May 25	Artillery	May 22
Driftless ††	May 27	BAR FPF 77-2 †	May 26	Lincoln	May 22
Pradel	May 25	BAR FPF82 †	May 26		
		Driftless	May 28		
		Pradel	May 26		
		PST FP-A1747 †	May 26		
		PST FP-A1750 †	May 26		
Festulolium		Perennial Ryegrass		Meadow Bromegrass	
Variety	Date ††	Variety	Date ††	Variety	Date ††
Hostyn	May 23	DSV LP-A1901 †	May 26	Arsenal	May 17
Lofa	May 26	DSV LP-A1902 †	May 21	Fleet	May 17
Perun	May 25	PST LP-A1703 †	June 1		
		Remington	June 4		
		Remington NEA	June 4		
Perennial Ryegrass		Timothy			
Variety	Date ††	Variety	Date ††		
Dexter 1	May 28	Barfleo	June 5		
Garbor	May 27	Baronaise †††	Vegetative		
Linn	May 22	Climax †††	Boot stage		
LP 17253 †	June 4				
Remington	June 2				
ROM 99 †	June 5				
Timothy					
Variety	Date ††				
Climax	June 5				
KY Early	May 24				
Winnetow	June 5				

† Experimental entry.

†† 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 or boot had not reached maturity on June 6, the date of harvest.

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 July 2018.

Variety	2021 DM Yields T/A, Four-cuts and Total					2020 Total	2019 Total	Trial Total
	Cut 1	Cut 2	Cut 3	Cut 4	2021			
	May 30	July 20	Aug 19	Oct 22	Total			
msSunstra-164101 †	2.53	2.37	1.75	0.65	7.31*	4.88*	5.86*	18.04*
AFX164048 †	2.63	2.27	1.66	0.67	7.23*	4.96*	5.62*	17.81*
AFX164046 †	2.69	2.41	1.65	0.64	7.40*	4.77*	5.42*	17.59*
HybriForce 4400	2.56	2.32	1.65	0.58	7.11*	4.83*	5.60*	17.55*
HybriForce 4400-OBT2002	2.56	2.37	1.70	0.61	7.23*	4.71*	5.45*	17.39*
TriFecta	2.51	2.28	1.58	0.60	6.98*	4.37	5.64*	16.99*
AFX164047 †	2.51	2.36	1.68	0.63	7.18*	4.65*	5.10	16.93*
HybriForce 4400-OBT2013	2.52	2.30	1.60	0.56	6.98*	4.51*	5.40*	16.89*
SW4107	2.41	2.27	1.56	0.58	6.81	4.42*	5.39*	16.62
Trifecta III ††	2.28	2.29	1.67	0.58	6.82	4.23	5.39*	16.44
Emerald	2.31	2.05	1.59	0.49	6.45	4.13	5.10	15.68
AFX 460 ††	2.38	1.98	1.60	0.55	6.51	4.30	4.67	15.49
QuickGold ††	2.41	2.02	1.59	0.55	6.56	4.21	4.68	15.45
Vernal	2.30	2.08	1.45	0.54	6.37	4.30	4.47	15.14
Ace ††	2.50	1.96	1.47	0.55	6.48	3.96	4.59	15.03
Average	2.47	2.22	1.61	0.59	6.89	4.48	5.23	16.60
LSD 0.05	0.22	0.17	0.11	0.08	0.45	0.52	0.53	1.32
CV%	6.3	5.4	4.9	10.3	4.6	8.1	7.1	5.9

† Experimental Variety †† Released variety seeded as an experimental.

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

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



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 July 2019.

Variety	2021 DM Yields T/A, Four-cuts and Total					2020 Total	2019 Seeding year	Trial Total
	Cut 1 May 30	Cut 2 July 21	Cut 3 Aug 20	Cut 4 Oct 22	2021 Total			
msSunstra-184104 †	2.38	2.77	1.70	0.75	7.60*	5.28*	1.25	14.13*
L-451Aph2+-FL2 ††	2.38	2.73	1.67	0.70	7.48*	5.24*	1.19	13.91*
HybriForce-4420/Wet ††	2.39	2.56	1.62	0.73	7.30*	5.33*	1.22	13.85*
L-451Aph2+-FL1 ††	2.29	2.71	1.71	0.71	7.42*	5.12*	1.15	13.69*
msSunstra-184108 †	2.35	2.73	1.69	0.66	7.43*	5.11*	1.08	13.61*
L-451Aph2+ ANS ††	2.22	2.81	1.64	0.70	7.37*	5.03*	1.20	13.60*
SW3407	2.35	2.57	1.68	0.66	7.26*	5.20*	1.11	13.57*
HybriForce 4400	2.37	2.71	1.60	0.64	7.32*	5.06*	1.08	13.46*
1041-2	2.21	2.64	1.62	0.68	7.15*	5.05*	1.13	13.33*
OBT 3510-FL1 †	2.26	2.62	1.60	0.67	7.16*	4.98*	1.13	13.28*
Finch	2.15	2.69	1.63	0.66	7.13*	4.92*	1.14	13.19*
OBT 3510-FL2 †	2.21	2.54	1.55	0.64	6.95	4.99*	1.17	13.12*
OBT 3510-ANS †	2.13	2.56	1.59	0.66	6.94	5.00*	1.14	13.07*
WL349HQ	2.09	2.44	1.57	0.70	6.80	4.97*	1.07	12.83
Vernal	2.23	2.60	1.48	0.53	6.84	4.74*	1.22	12.80
SW4107	2.08	2.46	1.61	0.61	6.77	4.93*	1.07	12.78
SW5511	2.01	2.43	1.62	0.68	6.74	4.97*	0.95	12.66
Quail	2.13	2.41	1.54	0.64	6.72	4.78*	1.05	12.55
9401	2.09	2.51	1.59	0.65	6.83	4.67*	1.02	12.53
Triad	1.45	2.42	1.67	0.80	6.34	4.62	1.22	12.18
Average	2.19	2.60	1.62	0.67	7.08	5.00	1.13	13.21
LSD 0.05	0.31	0.17	0.09	0.10	0.53	0.61	0.17	1.17
CV%	10.0	4.7	3.8	10.6	5.3	8.7	10.6	6.3

† Experimental Variety †† Released variety seeded as an experimental.

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

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

Table 12. 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.

Variety	2021 DM Yields T/A, Four-cuts and Total				2021 Total
	Cut 1 June 1	Cut 2 July 20	Cut 3 Aug 24	Cut 4 Oct 20	
DSX174085 †	2.84	2.45	1.90	1.12	8.31*
HybriForce 4400	2.82	2.45	1.68	0.90	7.86
HybriForce 4420/wet	2.67	2.35	1.78	0.98	7.78
SW4412Y	2.67	2.37	1.80	0.92	7.77
SW4107	2.69	2.33	1.75	0.97	7.75
SW3407	2.59	2.36	1.78	0.92	7.64
DSX174082 †	2.55	2.33	1.79	0.94	7.62
SW4506	2.64	2.28	1.74	0.93	7.59
SW5509	2.47	2.34	1.74	0.90	7.46
DSX174083 †	2.44	2.22	1.77	0.91	7.34
Vernal	2.47	2.22	1.44	0.83	6.96
Average	2.62	2.34	1.74	0.94	7.64
LSD 0.05	0.17	0.17	0.14	0.06	0.32
CV%	5.0	5.8	6.3	5.1	3.3

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

Variety	2021 DM Yields T/A, Three-cuts and Total			2021 Total
	Cut 1 June 10	Cut 2 July 21	Cut 3 Sept 9	
Redkin	2.55	2.23	1.18	5.96*
commercial check	2.13	2.31	1.34	5.78*
Freedom MR	2.01	2.10	1.61	5.73*
Renegade	2.23	2.20	1.27	5.70*
Evolve	2.11	2.19	1.38	5.68*
IS TP 12 †	2.16	1.99	1.20	5.34*
Bar TP 10 †	2.03	2.05	1.16	5.25*
Common	2.26	1.98	0.63	4.87
Average	2.19	2.13	1.22	5.54
LSD 0.05	0.53	0.32	0.29	0.77
CV%	16.5	10.3	16.3	9.4

† 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 14. Michigan State University Conventional Alfalfa Variety Trial Yields (DM tons/acre) Upper Peninsula Research Station, Chatham, Michigan. Seeded July 2018.

Variety	2021 DM Yields T/A, Three-cuts and Total				2020 Total	2019 Total	Trial Total
	Cut 1	Cut 2	Cut 3	2021			
	June 17	July 21	Oct 7	Total			
HybriForce 3400	2.73	1.77	0.79	5.29*	5.73*	2.73	13.75*
HybriForce 4400	2.59	1.79	0.73	5.11*	5.68*	2.86	13.65*
Integra 8450	2.65	1.86	0.77	5.28*	5.39*	2.68	13.34*
TriFecta	2.60	1.81	0.73	5.14*	5.18	2.85	13.17*
Integra 8420	2.51	1.80	0.84	5.15*	5.24	2.77	13.16*
Vernal	2.58	1.57	0.57	4.72	5.25	2.83	12.80
SW4107	2.38	1.76	0.63	4.76	5.14	2.60	12.51
Average	2.58	1.77	0.72	5.07	5.37	2.77	13.28
LSD 0.05	0.18	0.18	0.14	0.39	0.39	0.28 ns	0.91
CV%	4.7	7.0	13.2	5.3	5.0	6.9	4.7

Table 15. Michigan State University Roundup Ready Alfalfa Variety Trial Yields (DM tons/acre) Upper Peninsula Research Station, Chatham, Michigan. Seeded July 2018.

Variety	2021 DM Yields T/A, Three-cuts and Total				2020 Total	2019 Total	Trial Total
	Cut 1	Cut 2	Cut 3	2021			
	June 17	July 21	Oct 7	Total			
DKA 40-51RR	2.36	1.69	0.61	4.65	4.88	2.22	11.75
6424R	2.17	1.68	0.59	4.44	4.83	2.35	11.63
DKA 44-16RR	2.18	1.68	0.61	4.46	4.73	2.35	11.55
Integra 8444R	2.09	1.60	0.61	4.30	4.69	2.26	11.26
Average	2.20	1.66	0.60	4.47	4.78	2.30	11.55
LSD 0.05	0.18	0.22	0.16	0.47 ns	0.45 ns	0.25 ns	1.03 ns
CV%	5.1	8.2	16.9	6.5	5.8	6.9	5.6

* 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 16. Michigan State University Conventional Alfalfa Variety Trial Yields (DM tons/acre) Upper Peninsula Research Station, Chatham, Michigan. Seeded May 2019.

Variety	2021 DM Yields T/A, Three-cuts and Total			2021 Total	2020 Total	Trial Total
	Cut 1 June 17	Cut 2 July 21	Cut 3 Oct 14			
1041-2	2.00	1.59	0.66	4.25*	4.70*	8.95*
9401	1.87	1.67	0.61	4.15*	4.52*	8.67*
SW4107	1.97	1.63	0.54	4.14*	4.32*	8.46*
Swift	1.82	1.54	0.60	3.96*	4.45*	8.41*
Hybriforce 4400	1.71	1.50	0.53	3.73*	4.37*	8.10*
SW3407	1.77	1.54	0.55	3.86*	4.13	7.99
Vernal (certified)	1.90	1.35	0.42	3.67	4.21	7.88
SW5511	1.76	1.55	0.57	3.88*	3.86	7.74
Triad	1.35	1.30	0.62	3.26	3.67	6.94
GO-018-FU (Falcata) †	1.55	0.79	0.24	2.58	3.98	6.56
Average	1.77	1.45	0.53	3.75	4.22	7.97
LSD 0.05 (All entries)	0.34	0.18	0.07	0.52	0.46	0.90
CV%	13.4	8.4	8.6	9.5	7.5	7.8
Among the nine alfalfa Varieties						
Average	1.79	1.52	0.57	3.88	4.25	8.13
LSD 0.05	0.36	0.18	0.07	0.54	0.48	0.93
CV%	13.6	8.3	8.3	9.5	7.7	7.9
Comparison of Vernal (certified seed) and GO-018-FU (experimental falcata)						
Vernal (certified)	1.90	1.35	0.42	3.67	4.21	7.88
GO-018-FU (Falcata) †	1.55	0.79	0.24	2.58	3.98	6.56
LSD 0.05	0.54	0.21	0.09	0.78	0.55	1.26
CV%	13.8	8.6	11.8	11.1	5.9	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 17. 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

Variety	2021 DM yields T/A, Two-cuts and Total		
	Cut 1	Cut 2	2021
	June 23	Sept 29	Total
Bariane	0.95	0.60	1.55*
BAR FAF 146 †	0.85	0.64	1.49*
BAR FAF 135 †	0.92	0.54	1.45*
Armory	0.87	0.57	1.43*
Kentucky 31 minus	0.87	0.52	1.39*
BAR FAF 137 †	0.80	0.49	1.29*
7FACF82 †	0.64	0.47	1.10
BAR FA 9125 †	0.60	0.45	1.05
BAR FAFL 239 †	0.64	0.36	1.00
Average	0.79	0.51	1.31
LSD 0.05	0.23	0.17	0.30
CV%	19.7	22.5	15.9

Meadow Fescue

Variety	2021 DM yields T/A, Two-cuts and Total		
	Cut 1	Cut 2	2021
	June 10	July 28	Total
BAR FPF 82 †	1.15	1.39	2.55*
Pradel	0.86	1.42	2.28*
BAR FP 2044 †	0.78	1.40	2.19
Driftless	0.72	1.33	2.05
BAR FPF 77-2 †	0.80	1.19	1.99
Average	0.86	1.35	2.21
LSD 0.05	0.23	0.31	0.35
CV%	17.1	15.4	10.4

Timothy

Variety	2021 One-cut Total, DM T/A
	July 1
Climax	1.28
Baronaise	1.27
Barfleo	1.27
Average	1.27
LSD 0.05	0.42 ns
CV%	19.3

Orchardgrass

Variety	2021 DM yields T/A, Two-cuts and Total		
	Cut 1	Cut 2	2021
	June 10	July 21	Total
BAR DGLF 2095 †	0.47	1.32	1.79*
Potomac	0.53	1.15	1.68*
Intensiv	0.43	1.14	1.57*
Ammo	0.41	0.84	1.25*
BAR DGLF 2094 †	0.26	0.88	1.14
Average	0.42	1.06	1.49
LSD 0.05	0.20	0.40	0.58
CV%	31.6	24.4	25.4

Table 17 - Chatham 2020 Perennial grass seeding continued next page

Table 17 - Chatham 2020 Perennial grass seeding continued (page 2 of 2)

Smooth Bromegrass

Variety	2021 DM yields T/A, Two-cuts and Total		
	Cut 1 June 9	Cut 2 Aug 3	2021 Total
Artillery	0.75	1.29	2.04
Lincoln	0.64	1.26	1.90
Average	0.69	1.28	1.97
LSD 0.05	0.38	0.18	0.36 ns
CV%	24.1	6.4	8.1

Meadow Bromegrass

Variety	2021 DM yields T/A, Two-cuts and Total		
	Cut 1 June 9	Cut 2 Aug 3	2021 Total
Fleet	0.92	1.53	2.45
Arsenal	0.93	1.51	2.44
Average	0.92	1.52	2.45
LSD 0.05	0.59	0.13	0.60 ns
CV%	28.4	3.8	10.9

† 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 18. Michigan State University Perennial Grass Variety Trial Yields (DM tons/acre) of Ryegrass (Perennial, Hybrid/Intermediate, Festulolium), Timothy, and Fescue (Tall and Meadow). MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Seeded in late July 2018.

Ryegrass (Perennial, Intermediate, Hybrid, and Festulolium)

Perennial Ryegrass

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total				2021 Total	2020 Total	2019 Total	2018	
		Cut 1 June 11	Cut 2 July 30	Cut 3 Nov 7	Seeding Year				Trial Total	
ROM 99 †	June 5	2.12	1.12	0.22	3.46	1.57	5.40*	1.39	11.83*	
Remington	June 2	2.10	1.20	0.23	3.53	1.73	5.26*	1.29	11.81*	
Dexter 1	May 28	2.03	1.05	0.21	3.28	1.46	4.39	1.30	11.44*	
Garbor	May 27	1.92	1.05	0.23	3.21	1.55	4.82	1.51	11.08*	
LP 17253 †	June 4	1.75	1.01	0.22	2.97	1.62	4.45	0.93	9.97	
Linn	May 22	1.92	0.97	0.16	3.06	2.06	3.54	0.59	9.24	
LSD 0.05 (P ryegrass)		0.53	0.14	0.08	0.60 ns	0.21	0.42	0.19	0.94	

Festulolium (Ryegrass type)

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total				2021 Total	2020 Total	2019 Total	2018	
		Cut 1 June 11	Cut 2 July 30	Cut 3 Nov 7	Seeding Year				Trial Total	
Hostyn	May 23	2.68	1.49	0.31	4.48*	2.67	6.19	1.32	14.66*	
Perun	May 25	2.40	1.39	0.23	4.03	2.45	5.89	1.11	13.49	
Lofa	May 26	2.37	1.36	0.11	3.84	2.46	6.31	0.82	13.42	
LSD 0.05 (festulolium)		0.25	0.17	0.06	0.38	0.28 ns	0.62 ns	0.25	0.89	
Average (All ryegrass types)		2.14	1.18	0.21	3.54	1.95	5.14	1.14	11.80	
LSD 0.05 (All ryegrass types)		0.45	0.18	0.06	0.50	0.29	0.46	0.18	0.94	
CV %		14.3	10.3	20.8	9.8	10.2	6.1	10.9	5.5	

Timothy

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total				2021 Total	2020 Total	2019 Total	Trial Total
		Cut 1 June 11	Cut 2 July 30	Cut 3 Nov 7					
KY Early	May 24	2.93	1.90	0.49	5.33*	3.31*	4.87	13.50*	
Winnetow	June 5	2.94	1.17	0.16	4.26	2.57	5.20	12.04	
Climax	June 5	2.85	1.19	0.16	4.20	2.38	4.97	11.55	
Average		2.90	1.41	0.27	4.60	2.75	5.01	12.36	
LSD 0.05		0.35	0.22	0.14	0.46	0.33	0.51 ns	1.00	
CV%		7.0	8.8	29.9	5.8	6.9	5.8	4.6	

Table 18. 2018 Perennial Grass East Lansing continued next page

Table 18. 2018 Perennial Grass East Lansing continued (page 2 of 2)

Fescue (Tall and Meadow)

Tall Fescue

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total				2021 Total	2020 Total	2019 Total	Trial Total
		Cut 1 June 11	Cut 2 July 30	Cut 3 Nov 7	Total				
Kentucky 31 minus	May 19	2.36	2.26	0.87	5.48*	3.58*	6.13*	15.18*	
BAR FAF 17137 †	May 26	2.18	2.02	1.04	5.23*	3.43*	6.40*	15.06*	
Ranchero	May 20	2.55	2.11	1.03	5.69*	3.34*	5.98*	15.01*	
Barelite	May 26	2.39	1.88	0.87	5.14	3.03	6.01*	14.18	
Bariane	May 28	2.43	2.02	0.85	5.29*	2.98	5.41	13.67	
BAR FAF 17135 †	May 26	2.10	1.73	0.91	4.74	2.94	5.80*	13.49	
7FACF82 †	May 26	2.02	2.00	0.92	4.95	2.71	5.67	13.34	
LSD 0.05 (Tall Fescue)		0.36	0.32	0.13	0.54	0.26	0.63	0.97	

Meadow Fescue

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total				2021 Total	2020 Total	2019 Total	Trial Total
		Cut 1 June 11	Cut 2 July 30	Cut 3 Nov 7	Total				
Bar FPF 17079 †	May 28	2.30	1.43	0.36	4.09	2.75	5.27	12.11	
Pradel	May 25	1.64	1.30	0.44	3.38	2.54	5.50	11.42	
Driftless ††	May 27	1.47	1.43	0.44	3.35	2.55	5.20	11.09	
LSD 0.05 (Meadow Fescue)		0.59	0.17	0.20	0.76 ns	0.45 ns	0.60 ns	1.25 ns	

Average	2.14	1.82	0.77	4.73	2.98	5.74	13.45
LSD 0.05 (All Fescue)	0.43	0.27	0.14	0.59	0.34	0.58	0.96
CV%	13.9	10.3	12.6	8.6	7.8	7.0	4.9

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

† Experimental Variety, †† Released variety entered as an experimental.
 * Yield is not statistically different from the greatest value in the column.
 ns - Total yield among varieties in this column are not statistically different.

Table 19. 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 in August 2020.

Orchardgrass

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total			
		Cut 1 June 8	Cut 2 July 31	Cut 3 Oct 23	2021 Total
OG 80 †	May 25	3.93	2.56	1.32	7.81*
Echelon	May 26	3.68	2.69	1.24	7.62*
Intensiv	May 26	3.51	2.58	1.18	7.26
Inavale	May 23	3.38	2.52	1.13	7.03
OG 96 †	May 26	3.18	2.60	1.20	6.98
PST DG-A1737 †	May 26	3.29	2.36	1.10	6.76
Ammo	May 22	3.30	2.10	1.14	6.53
BAR DGLF 2094 †	May 29	2.88	2.48	1.09	6.46
PST DG-1739 †	May 23	3.22	2.29	0.85	6.36
Potomac	May 22	2.69	2.50	1.00	6.19
BAR DGLF 2095 †	May 27	2.51	2.33	1.04	5.89
Average		3.23	2.46	1.12	6.81
LSD 0.05		0.37	0.21	0.13	0.53
CV%		8.0	6.0	8.3	5.4

Tall Fescue

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total			
		Cut 1 June 7	Cut 2 July 31	Cut 3 Oct 23	2021 Total
BAR FAF 137 †	May 25	3.55	2.93	1.74	8.22*
Kentucky 31 minus	May 19	3.82	2.91	1.45	8.18*
Armory	May 23	3.94	2.85	1.32	8.11*
PST FA-A1733 †	May 25	3.39	2.87	1.79	8.05*
BAR FAF 146 †	May 23	3.41	2.77	1.53	7.70*
7FACF82 †	May 26	3.26	2.84	1.49	7.59*
BAR FAF 135 †	May 25	3.08	2.80	1.53	7.42
Bariane	May 27	3.18	2.86	1.29	7.33
BAR FAFL 239 †	May 23	3.14	2.70	1.47	7.32
BAR FA 9125 †	May 29	2.61	2.16	1.32	6.10
Average		3.34	2.77	1.49	7.60
LSD 0.05		0.45	0.22	0.18	0.65
CV%		9.3	5.5	8.3	5.9

Table 19. 2020 Perennial Grass East Lansing continued next page

Table 19. 2020 Perennial Grass East Lansing continued (page 2 of 3)

Meadow Fescue

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total			
		Cut 1 June 7	Cut 2 July 31	Cut 3 Oct 23	2021 Total
PST FP-A1750 †	May 26	3.04	2.51	1.12	6.67*
Pradel	May 26	2.96	2.32	1.08	6.35
PST FP-A1747 †	May 26	2.66	2.58	1.10	6.34
BAR FPF82 †	May 26	3.58	1.95	0.79	6.31
Driftless	May 28	2.78	2.25	0.98	6.02
BAR FPF 77-2 †	May 26	3.03	2.18	0.75	5.95
BAR FP 2044 †	May 25	3.15	1.90	0.83	5.88
Average		3.03	2.24	0.95	6.22
LSD 0.05		0.20	0.16	0.16	0.30
CV%		4.3	4.9	11.0	3.2

Perennial Ryegrass

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total			
		Cut 1 June 6	Cut 2 July 30	Cut 3 Oct 23	2021 Total
Remington	June 4	3.66	2.24	0.74	6.64*
Remington NEA	June 4	3.66	2.15	0.81	6.62*
PST LP-A1703 †	June 1	3.17	1.81	0.58	5.55
DSV LP-A1901 †	May 26	3.27	1.49	0.51	5.26
DSV LP-A1902 †	May 21	2.60	1.54	0.71	4.85
Average		3.27	1.84	0.67	5.78
LSD 0.05		0.36	0.12	0.12	0.46
CV%		7.1	4.1	11.3	5.2

Timothy

Variety	Heading Date	2021 DM yields T/A, Three-cuts and Total			
		Cut 1 June 6	Cut 2 July 30	Cut 3 Oct 23	2021 Total
Barfleo	June 5	3.62	2.32	0.72	6.66*
Baronaise	Vegetative	3.46	1.65	0.62	5.72
Climax	Boot stage	2.98	1.76	0.50	5.24
Average		3.35	1.91	0.61	5.87
LSD 0.05		0.37	0.21	0.14	0.37
CV%		6.4	6.3	13.4	3.6

Table 19. 2020 Perennial Grass East Lansing continued next page

Table 19. 2020 Perennial Grass East Lansing continued (page 3 of 3)

Bromegrass (Smooth and Meadow)

Smooth Brome	Heading Date	2021 DM yields T/A, Three-cuts and Total			
		Cut 1 June 6	Cut 2 July 30	Cut 3 Oct 23	2021 Total
Lincoln	May 22	5.64	3.01	0.54	9.19
Artillery	May 22	5.32	2.91	0.56	8.79
LSD 0.05 (Smooth Bromegrass)		0.51 ns	0.07	0.10 ns	0.41 ns
Meadow Brome	Heading Date	Cut 1 June 6	Cut 2 July 30	Cut 3 Oct 23	2021 Total
Arsenal	May 17	5.30	2.72	0.78	8.80
Fleet	May 17	5.03	2.56	0.87	8.46
LSD 0.05 (Meadow Bromegrass)		0.37 ns	0.11	0.21 ns	0.30
Average		5.32	2.80	0.69	8.81
LSD 0.05 (All bromegrass)		0.39	0.23	0.12	0.38
CV%		5.3	5.9	12.9	3.1

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

† Experimental Variety.

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

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



Tables 20 to 23. Michigan State University 2021 Seeding-Year Yields (DM tons/acre) of Alfalfa, Red Clover, Berseem Clover, and Italian Ryegrass, East Lansing, Michigan.

Table 20. Alfalfa DM Yield tons/acre

Variety	Oct 24, 2021	Variety	Oct 24, 2021
Bison	0.72	SW5614	0.59
Hybriforce 4420/wet	0.69	SW5520Y	0.57
Hybriforce 4400	0.64	54Q16	0.56
Vernal	0.64	SW5615	0.56
FF 42.A3	0.63	55H96	0.55
54VR10	0.60	SW5517	0.54
54VQ52	0.59		
		Average (13 entries)	0.61
		LSD 0.05	0.06
		CV%	6.5

Table 21. Red Clover

DM Yield tons/acre

Variety	Oct 24, 2021
Evolve	1.22
Redkin	1.25
TP 12 †	1.30
Check 1	1.50
Common	1.35
Check 2	1.45
Average	1.34
LSD 0.05	0.16
CV%	9.8

† Experimental entry

Table 22. Berseem Clover

DM Yield tons/acre

Variety	Nov 6, 2021
Super 10	0.62
CW 9092 †	0.56
Bigbee	0.52
Frosty	0.49
CW 8903 †	0.45
VNS Berseem	0.44
Average	0.52
LSD 0.05	0.16
CV%	19.3

† Experimental entry

Table 23. Italian Ryegrass

2021 DM Yields T/A, Three-cuts and Total

Variety	Cut 1	Cut 2	Cut 3	2021
	July 22	Sept 9	Nov 6	Total
Green Spirit	1.11	0.98	0.24	2.33
commercial variety	1.27	0.97	0.25	2.49
LSD 0.05	ns	ns	ns	ns

Alfalfa and Red Clover were seeded on May 13, 2021. Cut 2 times in 2021 - Aug 3 for crop and weed removal (no yield reported) and October 24 for weed-free yield.

Berseem Clover seeded on August 18, 2021. Harvested once for weed-free yield on November 6.

Italian ryegrass seeded on May 11, 2021 and harvested 3 times for weed-free yield in 2021.

Table 26. Michigan State University 2020-2021 Winter Small Grain Forage Variety Trial Yields (DM tons/acre). MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan. Planted September 2020.

Rye and Hybrid Rye entries harvested on May 12, 2021

Entry	Heading Date	DM Yield Tons/acre	% DM	Height on the Harvest date (Inches) †††	Height on May 24 (Inches) †††
KWS Propower	May 15	4.17	16.2	31.8	40.0
KWS Progas	May 14	3.44	17.4	33.0	40.8
KWS Problend	May 14	3.39	16.8	31.5	39.3
Hazlet	May 13	3.36	17.5	33.3	45.5
Aroostook	May 03	3.13	20.2	34.3	47.3
Wheeler	May 13	3.08	17.1	32.8	44.5
Gardner	May 03	3.07	19.1	33.0	45.5
Average		3.38	17.7	32.8	43.3
LSD 0.05 - Rye and Hybrid Rye		0.47	1.61	2.59	3.01
CV %		9.4	6.1	5.3	4.7

Triticale entries harvested on May 17, 2021

Entry	Heading date ††	DM Yield Tons/acre	% DM	Height on the Harvest date (Inches) †††	Height on May 24 (Inches) †††
TriCal Gunner	May 22	5.12	16.9	31.5	34.5
TriCal Flex 719	May 22	5.03	17.7	32.8	35.5
TriCal Thor	May 23	4.82	15.8	33.5	35.5
TriCal Surge	May 19	4.79	18.0	32.0	33.3
TriCal Flex 719 Hybrid	May 19	4.76	17.7	33.3	34.8
TriCal Exp 2T02 †	May 18	4.74	17.1	30.0	33.0
TriCal Gainer 154	May 17	4.73	16.9	29.5	34.5
TriCal Surge Hybrid	May 18	4.02	16.6	29.8	31.8
Average		4.75	17.1	31.6	34.1
LSD 0.05 - Triticale entries		0.51	1.60	1.7	2.1
CV %		7.3	6.6	3.7	4.1

Average of all 15 entries		4.11	17.40	32.1	38.4
LSD 0.05 - all entries		0.49	1.58	2.03	2.44
CV %		8.4	6.4	4.4	4.5

Notes- Separate ANOVA on: 1 - All 15 entries, 2 - Hybrid rye and rye entries, 3 - Triticale entries.

† Experimental Variety - not commercially available.

†† Heading dates were obtained prior to harvest or on the remaining guard rows after harvest

††† Plant height was measured at harvest and from the remaining guard rows after harvest.

Table 25. Michigan State University 2021 Spring Small Grain Forage Variety Trial. Seeded in April 2021 at the MSU Plant Soil and Microbial Sciences Agronomy Farm, East Lansing, Michigan.

Triticale

Variety	Heading date	Cut 1 - June 14, 2021			Cut 2 - July 20, 2021			2-cut Total DM T/A
		Height	DM T/A	DM %	Height	DM T/A	DM %	
Flex 719	Veg Boot	NA	0.98	24.2	25.0	1.21	22.9	2.18*
EXP 20T03 †	June 12	18.5	1.29	26.1	16.5	0.81	27.1	2.11*
Thor	Veg Boot	17.8	1.20	23.6	23.5	0.80	21.7	2.00*
Gunner	Veg Boot	16.0	1.07	24.7	19.8	0.91	22.5	1.98
Surge	June 14	17.0	1.23	24.2	22.7	0.72	23.8	1.94
Trical 344	June 11	17.8	1.25	26.6	12.3	0.66	28.3	1.91
Merlin Max	June 14	16.5	1.13	24.3	16.8	0.63	23.3	1.76
Average		17.3	1.16	24.8	19.5	0.82	24.2	1.98
LSD 0.05 (Triticale)		1.6	0.18	1.8	1.9	0.13	0.5	0.19
CV%		6.1	10.2	4.8	6.5	10.9	1.5	6.4

Oats

Entry	Heading date	Cut 1 - June 14, 2021			Cut 2 - July 20, 2021			2-cut Total DM T/A
		Height	DM T/A	DM %	Height	DM T/A	DM %	
EXP 21O01 †	June 14	14.0	1.41	26.0	12.5	1.15	23.3	2.55
Check variety ††	June 12	19.5	1.12	24.1	21.1	1.38	21.4	2.50
Average		16.8	1.26	25.0	16.8	1.26	22.3	2.52
LSD 0.05 (Oat)		2.1	0.44 ns	2.2 ns	3.3	0.23 ns	2.1 ns	0.64 ns
CV%		5.5	15.4	3.9	8.6	8.3	4.1	11.3

Heading date Veg Boot - Head had not emerged on date of first cutting.

All entries had headed on the date of second cutting.

Height Measured in Inches on the day of harvest.

† Experimental Variety - not commercially available. †† Check variety is commercially available.

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Appendix II - East Lansing, Michigan

Rainfall data at the Michigan State University Agronomy farm by date, Summer 2021.

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		May 2		June 2	0.04	July 2		August 2		Sept 2		Oct 2	
April 3		May 3	0.17	June 3		July 3		August 3		Sept 3		Oct 3	
April 4		May 4		June 4		July 4		August 4		Sept 4		Oct 4	0.81
April 5		May 5		June 5		July 5		August 5		Sept 5		Oct 5	
April 6		May 6		June 6		July 6	0.03	August 6		Sept 6		Oct 6	
April 7		May 7	0.07	June 7	0.25	July 7		August 7	0.17	Sept 7	0.24	Oct 7	
April 8	0.07	May 8		June 8		July 8	2.64	August 8		Sept 8		Oct 8	
April 9	0.01	May 9		June 9		July 9		August 9		Sept 9		Oct 9	0.75
April 10	0.78	May 10		June 10		July 10		August 10	0.16	Sept 10		Oct 10	
April 11	0.27	May 11		June 11	0.10	July 11		August 11		Sept 11		Oct 11	0.03
April 12		May 12		June 12		July 12		August 12	5.56	Sept 12		Oct 12	0.07
April 13		May 13		June 13		July 13	0.08	August 13		Sept 13	1.30	Oct 13	
April 14		May 14		June 14	0.10	July 14	0.30	August 14		Sept 14		Oct 14	0.18
April 15		May 15		June 15		July 15		August 15		Sept 15		Oct 15	0.41
April 16		May 16	0.05	June 16		July 16	0.50	August 16		Sept 16		Oct 16	
April 17		May 17		June 17		July 17		August 17		Sept 17		Oct 17	
April 18		May 18		June 18	0.57	July 18		August 18		Sept 18		Oct 18	
April 19		May 19		June 19	0.10	July 19		August 19		Sept 19		Oct 19	
April 20		May 20		June 20		July 20		August 20		Sept 20		Oct 20	
April 21		May 21		June 21	1.02	July 21		August 21		Sept 21	0.01	Oct 21	0.20
April 22		May 22		June 22		July 22	0.28	August 22		Sept 22	0.14	Oct 22	
April 23		May 23		June 23		July 23	0.27	August 23		Sept 23	0.81	Oct 23	
April 24	0.19	May 24		June 24	0.21	July 24	0.62	August 24	0.31	Sept 24	0.87	Oct 24	1.25
April 25		May 25		June 25	1.65	July 25		August 25		Sept 25	0.37	Oct 25	0.64
April 26		May 26	0.30	June 26	3.01	July 26		August 26		Sept 26		Oct 26	
April 27		May 27		June 27	0.28	July 27		August 27		Sept 27		Oct 27	
April 28		May 28	0.35	June 28		July 28		August 28		Sept 28		Oct 28	
April 29	0.17	May 29		June 29	1.07	July 29		August 29		Sept 29		Oct 29	0.63
April 30		May 30		June 30		July 30		August 30	0.48	Sept 30		Oct 30	0.02
		May 31				July 31		August 31				Oct 31	
2021 Totals	1.49		0.94		8.40		4.72		6.68		3.74		4.99
Normal	3.03		3.36		3.45		2.84		3.23		3.50		2.53

Appendix III - Chatham, Michigan

Rainfall data at the Michigan State University UP Experiment Station, Summer 2021.

Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches	Date	Inches
April 1	0.02	May 1	0.03	June 1	0.14	July 1	0.02	August 1	0.32	Sept 1		Oct 1	
April 2		May 2		June 2		July 2		August 2	0.02	Sept 2		Oct 2	
April 3		May 3	0.12	June 3	0.22	July 3		August 3		Sept 3		Oct 3	0.06
April 4		May 4	0.29	June 4	0.07	July 4		August 4		Sept 4	0.03	Oct 4	0.09
April 5		May 5	0.02	June 5		July 5		August 5		Sept 5	0.05	Oct 5	
April 6	0.08	May 6		June 6		July 6		August 6		Sept 6	0.19	Oct 6	0.04
April 7	0.53	May 7	0.24	June 7		July 7	0.10	August 7		Sept 7	0.15	Oct 7	
April 8	0.12	May 8	0.05	June 8		July 8	0.11	August 8	0.16	Sept 8	0.05	Oct 8	0.09
April 9	0.37	May 9		June 9		July 9		August 9	0.27	Sept 9	0.27	Oct 9	0.08
April 10	0.11	May 10		June 10		July 10		August 10	0.02	Sept 10		Oct 10	
April 11	0.21	May 11	0.01	June 11	0.01	July 11		August 11	0.39	Sept 11		Oct 11	0.23
April 12	0.31	May 12		June 12	0.53	July 12		August 12	0.04	Sept 12	0.02	Oct 12	0.50
April 13	0.43	May 13		June 13		July 13		August 13	0.04	Sept 13		Oct 13	0.16
April 14	0.23	May 14		June 14	0.35	July 14		August 14		Sept 14	1.11	Oct 14	0.02
April 15	0.30	May 15		June 15	0.01	July 15	0.24	August 15		Sept 15	0.05	Oct 15	
April 16	0.03	May 16		June 16		July 16		August 16		Sept 16		Oct 16	
April 17		May 17		June 17		July 17		August 17		Sept 17		Oct 17	
April 18		May 18		June 18		July 18		August 18		Sept 18		Oct 18	
April 19		May 19	0.05	June 19		July 19		August 19		Sept 19		Oct 19	
April 20	0.08	May 20	0.09	June 20		July 20		August 20		Sept 20		Oct 20	
April 21	0.05	May 21	0.01	June 21	0.66	July 21		August 21		Sept 21	0.16	Oct 21	0.35
April 22	T	May 22	0.01	June 22	0.11	July 22		August 22	0.02	Sept 22	0.01	Oct 22	0.35
April 23		May 23	0.01	June 23	0.12	July 23		August 23		Sept 23		Oct 23	0.24
April 24	0.02	May 24		June 24		July 24	1.44	August 24		Sept 24	0.01	Oct 24	0.13
April 25	0.21	May 25	0.04	June 25	0.97	July 25	0.12	August 25		Sept 25	1.04	Oct 25	0.10
April 26		May 26	0.08	June 26		July 26		August 26	0.01	Sept 26	0.05	Oct 26	0.02
April 27	0.11	May 27	0.01	June 27	0.12	July 27	0.25	August 27		Sept 27	0.03	Oct 27	
April 28	0.10	May 28		June 28	0.01	July 28		August 28	0.22	Sept 28		Oct 28	0.05
April 29		May 29		June 29	0.11	July 29	0.10	August 29	0.23	Sept 29		Oct 29	0.02
April 30	0.15	May 30		June 30	1.44	July 30	0.01	August 30		Sept 30		Oct 30	
		May 31				July 31	0.04	August 31	0.01			Oct 31	
2021 Totals	3.46		1.06		4.87		2.43		1.75		3.22		2.53
Normal	2.44		3.27		3.37		3.58		3.03		4.25		4.74

Marketers	Phone	Web Addresses
Albert Lea Seed	800-352-5247	www.alseed.com
Alforex Seeds	877-560-5181	www.alforexseeds.com
Allied Seed	—	www.alliedseed.com
America's Alfalfa	800-406-7662	www.americasalfalfa.com
Barenbrug USA	800-547-4101	www.barusa.com
Beck's Hybrids	800-937-2325	www.beckshybrids.com
Best Forage	888-836-3697	www.bestforage.com
Blue River Organic Seeds	800-370-7979	www.blueriverorgseed.com
Brett Young Seeds	800-665-5015	www.brettyoung.ca
Byron Seed	800-801-3596	www.byronseeds.net
CISCO Seed	800-888-2986	www.ciscoseeds.com
Channel	—	www.channel.com
Columbia Seed	888-681-7333	www.columbiaseeds.com
CropLan Genetics	—	www.winfieldunited.com
Dairyland Seed Co.	800-236-0163	www.dairylandseed.com
Dekalb	—	www.dekalbasgrowdeltapine.com
DLF Pickseed	800-445-2251	www.dlfpickseed.com
Farm Science	—	www.farmsciencegenetics.com
Hood River Seeds	855-406-2696	www.hoodriverseed.com
La Crosse Forage and Turf	800-647-8873	www.lacrosseseed.com
Legacy Seed	866-791-6390	www.legacyseeds.com
Lewis Seed Co.	541-491-3700	www.lewisseed.com
LG Seeds	989-834-2251	www.lgseeds.com
Monsanto	800-768-6387	www.cropscience.bayer.com
Mountain View Seeds	503-588-7333	www.mtviewseeds.com
Nexgrow	855-463-9476	www.plantnexusgrow.com
Pioneer	800-247-6803	www.pioneer.com
Producers Choice	877-560-5181	www.alforexseeds.com
ProSeeds Marketing	541-928-9999	www.proseedsmarketing.com
Renk Seed	800-289-7365	www.renkseed.com
Seed Research of Oregon	800-253-5766	www.sroseed.com
Smith Seed Services	888-550-2930	www.smithseed.com
S&W Seeds	916-554-5480	www.swseedco.com
TriCal	843-817-2484	www.tricalforage.com
Wilbur-Ellis Seeds	—	http://ag.wilburellis.com
Winfield Solutions	989-845-2093	www.winfieldunited.com
W-L Research	—	www.wlalfalfas.com