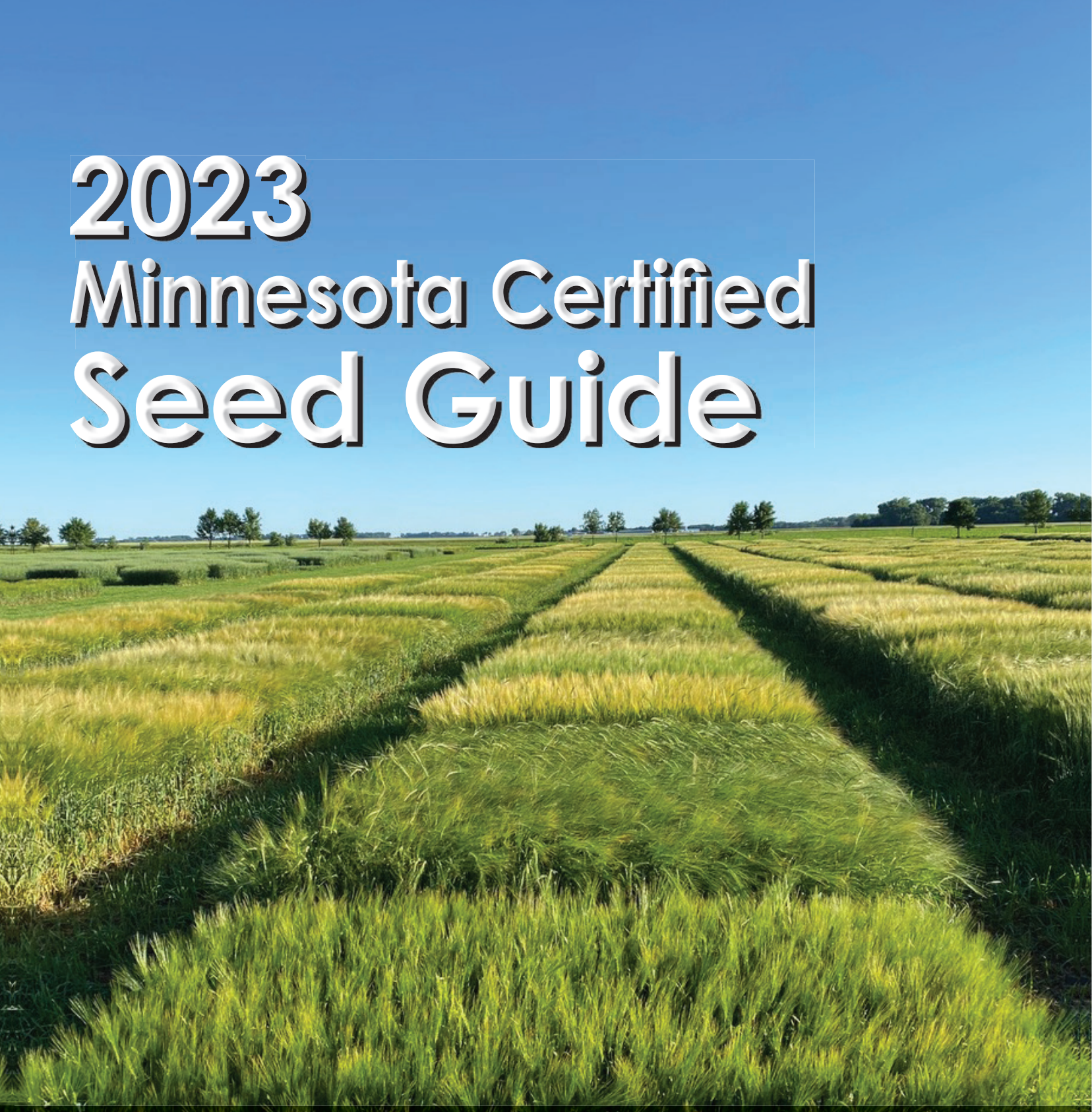
2023 Minnesota Certified Seed Guide



Provided by
Minnesota Crop Improvement Association (MCIA)
Minnesota Agricultural Experiment Station

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MINNESOTA FARM GUIDE

Partners in Agriculture

Welcome to the 2023 Minnesota Seed Guide

Minnesota Crop Improvement Association (MCIA) is one of the most diversified seed certification agencies in the nation. We not only inspect and certify a broad array of crops and native seed species, but also certify forage and mulch, seed conditioning facilities, and administer the Minnesota Department of Transportation's (MnDOT) approved seed vendor program.

MCIA's Organic Services is one of the fastest growing departments at MCIA, with nearly 600 clients. The Foundation Seed Services staff is busily engaged in the increase of the seed of new and old crop varieties. MCIA also serves as the licensing agent for UMN agronomic varieties. We work in tandem with the University of Minnesota's Technology Commercialization office to license University of Minnesota (UMN) varieties to seed companies and growers, both domestically and internationally. Variety licensing fulfills the demands of niche markets around the globe for innovative and nutritious agricultural products. In this capacity, the Foundation Seed Services staff is attuned and responsive to industry trends, providing market-driven feedback to breeders and then licensing varieties to interested parties, often times on a competitive basis.

Iowa State University recently asked MCIA to host a group of scientists, university professors, and academic administrators from Zimbabwe who were seeking to learn about technology transfer and germplasm licensing at American universities. A total of eighteen people, including three professors from Iowa State University, visited the MCIA Office on Oct. 22, 2022.

We explained the technology transfer process and germplasm licensing, provided an overview of MCIA's seed certification programs, and gave a tour of MCIA's seed laboratory and our seed conditioning plant. The group showed keen interest, asking in-depth questions, and left the visit with useful information that can be applied to their own systems.

Fawad Shah
MCIA President/CEO

MCIA has been receiving such capacity-building requests on a regular basis. MCIA has proven to be a leader in educating professionals from other nations. Sharing our knowledge base benefits MCIA by increasing the organization's visibility, domestically and internationally.

The *Minnesota Certified Seed Guide* is a result of the joint efforts of the Minnesota Agricultural Experiment Station, *Minnesota Farm Guide*, and MCIA. It includes informative articles most relevant to Minnesota agriculture, as well as variety testing data on a range of crops. Furthermore, the *Seed Guide* provides information about where to purchase certified seed. Please visit our website, www.mncia.org, to find more information about MCIA programs and services, and to learn how our staff can assist your efforts to increase your profitability and enhance your competitiveness in the marketplace.

We hope you find the *2023 Minnesota Certified Seed Guide* enjoyable and informative. Please let us know your suggestions to further improve this annual publication.

Best wishes for a successful and profitable 2023! ✻

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Produced by Minnesota Farm Guide — Partners in Agriculture

About the Cover ....

University of Minnesota 2022 barley plots at the Northwest Research and Outreach Center, Crookston, Minn. Photo by Roger Wippler.

Capistran receives Achievement in Crop Improvement Award

Wayne Capistran was the recipient this past year of the Minnesota Crop Improvement Association's (MCIA) Achievement in Crop Improvement Award. The award is MCIA's highest honor. It recognizes individuals who have contributed to the betterment of agriculture through their work and service to MCIA and the seed industry. Presented annually since 1972, the award is sponsored by The Farmer magazine.

Wayne Capistran

Wayne Capistran's first seed crop in 1979 was hybrid sunflower seed for Dahlgren Seed in Crookston. He enjoyed that experience and the following year began growing wheat seed for Bruce Hamnes at the Stephen Seed House. That was the beginning of a long and noteworthy career of producing and selling certified seed.

Through the years, Wayne developed a passion for producing high quality seed. He also became a salesperson for AgriPro, which he found to be very enjoyable. David Boehm, formerly of AgriPro, said, "Wayne had a way of connecting with growers and providing information and advice to help with their success."

His customers appreciated his straightforward, honest approach. To learn more about the varieties he sold, he started growing test plots. The test plots of wheat and soybeans have become a staple on the Capistran Farm. They include varieties from many companies and their tours draw a nice crowd.

Wayne's success at sales led to an offer for a franchise with AgriPro wheat. The twist was that he would need to build a seed conditioning plant; it was completed in 1992. The seed plant and storage capacity has been expanded over the years.

Wayne enjoys the challenge of taking a tough looking crop and turning it into a high-quality seed or grain product. He, his son Kevin, and his long-time seed plant manager, Jeff Nicholson, process wheat, barley, oats, soybeans, sunflowers, buckwheat, rye, and peas.

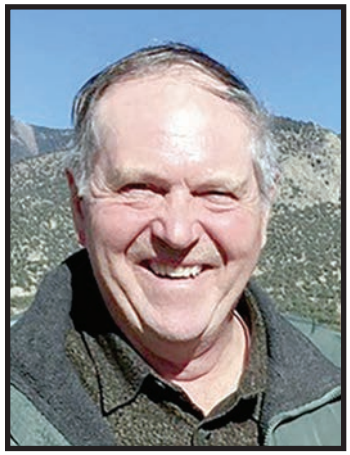
Wayne has represented Minnesota agriculture as part of a People-to-People International tour of China. An active MCIA member, Capistran Seed Company participates in MCIA's seed certification, approved facility, and organic certification programs. The company also produces foundation seed for MCIA. Wayne is a member of Polk County Crop Improvement and is involved in the growers' associations for wheat, soybean, and sugar beet. He has also been involved in various local organizations.

Capistran Seed has been and continues be a family business. Wayne credits them for the success of the farm and seed operation. His desire to produce quality seed is now a family tradition. ✻

Pazderniks, Rivard, Stangler, Tande receive Premier Seed Grower Award

The Premier Seed Grower Award has been presented annually since 1929 to recognize individuals or partners involved in quality seed production, active in the Minnesota Crop Improvement Association (MCIA), and who provide excellent service to the seed industry. This past year, MCIA recognized Duane and John Pazdernik, Larry Rivard, Richard (Dick) Stangler and Harmen Tande as Premier Seed Growers.

Duane Pazdernik



John Pazdernik

Larry Rivard

Dick Stangler

Harmen Tande

Duane and John Pazdernik

The Pazdernik brothers, Duane and John, of Waubun, have been growing and conditioning certified seed for over thirty years. When they began producing seed there were no other seed plants in Mahnomen County. They were also looking to add revenue to their bottom line and gain better access to new varieties.

Growing up on a crop and livestock farm, they learned the value of hard work and applied that work ethic to their seed business. Together, Duane and John have a combined one hundred years of farming experience. John is still active in the farming operation and Duane is recently retired, but still enjoys talking farming.

At the time they started producing certified seed they also built a seed conditioning facility. With a used sieve mill and gravity table, sourced from local elevators, they built their seed plant and began cleaning wheat and barley. Over the years they made many improvements and upgrades and are an MCIA Approved Facility.

One of the greatest benefits of the Pazdernik Farms seed business is that of community. Their customers are neighbors and friends, Duane and John truly value those relationships. Although they may only see some customers once a year, all are welcome to stop by for coffee and conversation.

To stay up to date on the latest production practices and various pest and disease issues the Pazdernik brothers could often be found at field days and meetings. In addition to the MCIA Annual Meeting, one or both would attend the Prairie Grains Conference, Small Grain Updates, the Best of the Best workshops, or a local county crop meeting.

Duane, an Air Force veteran, and John were involved for many years in the local community club. They are also members of the Minnesota Corn Growers and the Minnesota Soybean Growers organizations.

Larry Rivard

Larry Rivard, of Grand Forks, N.D., has been a part of the seed industry for over 50 years. He grew up on a farm west of Argyle, where his father grew and conditioned certified seed. The family owned and operated Rivard's Quality Seeds in Argyle for many years. Following graduation from the Northwest School of Agriculture in Crookston, Larry joined the family business.

Initially, Larry's responsibilities centered on seed conditioning—cleaning and bagging certified seed. Rivard's also mixed and packaged turf grass seed. By the 1990s, this side of the operation had become large enough that it required a full-time manager. Larry took on that responsibility and the business continued to grow with the addition of native seed and Conservation Reserve Program mixes.

By 2006, Larry took the business out on its own, creating Rivard's Turf and Forage. Today, the business serves a wide range of customers in Minnesota and the Dakotas, with turf and forage seed, natives and cover crops, and specialty products. Rivard's also participates in the MnDOT Approved Seed Vendor Program, creating mixes specifically for various road projects. In addition to seed, they also supply fertilizer and chemicals.

Larry has been an active member of MCIA as well as several other seed industry organizations. Locally, he has served on the school board, church finance council, Knights of Columbus, Lions Club, and American Legion.

In his free time, Larry enjoys following the activities of his grandchildren, volunteering, and walking on turf while playing golf.

Dick Stangler

Dick Stangler, of Kilkenny in Le Sueur County, has spent his entire life working with seed. His grandfather Elmer started the family in the certified seed business; his father, Jim, followed. Dick continues the tradition of growing, conditioning, and selling seed. He has seen many changes over the years.

It is still a family business. Much of the farming is done in partnership with Dick's brother Steve and Dick's son Nick and daughter Becky are part of the operation. They produce 1,400 acres of soybeans, oats, and wheat seed in addition they contract 800 acres of seed production. He enjoys building and making improvements to their seed conditioning operation and loves the seed business.

In the 1990s, Dick helped organize the Southern Minnesota Wheat Growers. The group demonstrated practices that improved wheat quality and increased yields in the area.

After working with the local soil and water conservation service to install eight miles of waterways and terraces, Dick saw the benefits of conservation practices on their farm. Today, he offers cover crop mixes to reduce erosion and improve water quality.

As part of MCIA, Dick participates in the Seed Certification, Approved Conditioning Facility, and Noxious Weed Seed-free Forage & Mulch programs. He also served as secretary of the local county crop improvement organization for many years.

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Johnson, Smith receive Honorary Premier Seed Grower Award

The Honorary Premier Seed Grower Award, presented annually since 1930, recognizes individuals not directly involved in the seed industry but who have actively supported the seed industry, the Minnesota Crop Improvement Association (MCIA), and their local community. This past year, MCIA recognized Andrea Johnson and Kevin Smith as Honorary Premier Seed Growers.

Andrea Johnson

Andrea Johnson, of Appleton, Minn., has been writing about agriculture for over 30 years. She grew up on a farm in western Minnesota. There, she gained an appreciation for agriculture and began to cultivate an interest in writing.

A University of Minnesota graduate, Andrea launched her career in agricultural journalism in 1989 when she began writing for *The Land* magazine. In the mid-1990s, she also wrote for *Ag Innovations*. She joined *Farm & Ranch Guide* staff in 1998.

A small group within *Farm & Ranch Guide* built *Minnesota Farm Guide* from the ground up. Its first issue was published in 2002. Andrea served as assistant editor. One of *Minnesota Farm Guide's* projects is the yearly *Minnesota Certified Seed Guide*. Each year, Andrea authors a significant article for the *Seed Guide*. Her work has helped highlight MCIA and the people in Minnesota's seed industry.

Andrea's connection to MCIA began on the home farm: Her father used certified seed to raise high quality crops. She still enjoys taking her two daughters and five grandchildren out to the farm, now operated by her brother and her nephew.

Andrea's volunteer work revolves around teaching music to youth and participating in community bands and choirs. In 2020, Andrea became a Swift County Master Gardener and now shares her passion for growing vegetables and fruit.

Kevin Smith

Dr. Kevin Smith joined the University of Minnesota in 1998, taking over the barley program from longtime breeder Donald Rasmussen. For most of its 100-plus year history, the emphasis of Minnesota's barley breeding has been on six-rowed spring malting types. Kevin's breeding work has expanded over the years to include winter, two-rowed, and hulless barley as well as oats and silflower.

Andrea Johnson

Kevin Smith

His research group has investigated the genetics of disease resistance and malting quality. They have developed and evaluated breeding methods that employ DNA sequencing technology to predict trait performance.

The Smith research group has worked closely with MCIA through the years. Every spring, they plant MCIA seed grow-outs of small grain varieties. The varieties Lacey, Quest, and Rasmussen were released and grown by MCIA members. MN-Equinox, the first winter barley from Minnesota, is the latest release.

About six years ago, Kevin rebooted the UMN oat breeding program. Those efforts resulted in the MN-Pearl variety. Kevin's most recent efforts include breeding a newly domesticated crop, silflower (*Silphium integrifolium*), as a perennial oilseed.

In addition to his research work, Kevin teaches a couple of classes and advises several graduate students each year. He has also hosted Barley U day where craft brewers and maltsters learn what it takes to develop a new malting barley variety. ✻

PREMIER SEED GROWER AWARD:

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Harmen Tande

Harmen Tande, of Moorhead, started growing certified seed to add value to his crop production operation. Over forty years later, he is still raising certified seed. His primary seed crop has been spring wheat, but he has also grown barley and soybean seed. He enjoys the annual rituals of growing a crop and takes great pride in producing high quality seed.

Harmen earned a degree in industrial technology from Moorhead State University. He also served in the U.S. Airforce. He returned home to the crop and livestock farm where he grew up. His first years back were challenging, with flooding one year and drought the next. Over the years, Harmen has added acres to the farm while raising small grains, edible beans, corn, soybeans, and alfalfa. He has also steadily developed his operation, improving buildings and adding drainage tile to the land.

Family has been and continues to be especially important to Harmen. He and his son work together, including on a special hay making operation where they bale up small squares for sale to local horse owners.

Harmen has served on the boards of the Clay County Crop Improvement and the county soybean growers' organization. He also served for many years on the Farmers Union Oil Company board and is a member of the Farm Bureau and the Minnesota wheat and soybean grower's organizations. ✻

MCIA – Providing services that add value for agriculture

Minnesota Crop Improvement Association (MCIA) provides a diverse offering of certification and quality assurance services to a wide array of agricultural and food product producers and handlers. Products certified by MCIA include field crop seed, turf seed, sod, native plant seed, noxious weed seed-free forage and mulch, identity-preserved grains for specialty grain markets, as well as numerous organic crops, livestock, and food products.

MCIA also provides customized quality assurance services such as field inspections, seed and grain facility evaluations, as well as other third-party audit and on-site evaluations. MCIA produces and distributes foundation seed of publicly developed crop varieties and serves as the marketing agent for licensing varieties developed at the University of Minnesota.

MCIA is a 501(c)(5) not-for-profit association funded by service fees. MCIA's offices are located on the Saint Paul campus of the University of Minnesota. MCIA serves just over 750 members with 21 full-time employees, including 4 field supervisors located at various locations throughout the state. In addition, 12 part-time employees and contractors assist with inspections and other seasonal work. MCIA is governed by an 11-member board of directors elected from its membership.

MCIA maintains an affiliation with the Association of Official Seed Certifying Agencies and several other state, national, and international organizations.

History

MCIA has served the agricultural industry in the Upper Midwest for over 100 years. MCIA was founded in 1903 to promote the breeding, growing, and distribution of improved field crop varieties to crop producers throughout the state. A directory of members was first published in 1906 and the publication of a list of those with inspected and approved seed began in 1912. In 1955, the Minnesota Seed Law was amended to officially recognize MCIA as the official seed certifying agency of Minnesota. Over the years, MCIA has expanded its programs and related services to meet the needs of its members and the demands of a changing agricultural and food industry. It was formally designated as the official certification agency in Minnesota for noxious weed seed–free forage and mulch in 1997 and was accredited as an organic certifier under the National Organic Program in 2002.

As an independent third party, MCIA strives to provide superior programs and services to meet the needs of today's changing agricultural world.

Services and Programs

In the pages that follow, you will find descriptions of seven of MCIA's programs that are most relevant to readers of this *Seed Guide*: Seed Certification, Seed Quality Assurance, Approved Facilities, Noxious Weed Seed-free Forage and Mulch Certification, Organic Certification, Native Seed, and the MnDOT Seed Vendor Program. We also provide information about the testing services provided by the MCIA Seed Laboratory.

MCIA offers several other important programs and services, including Foundation Seed, Variety Licensing, Identity Preserved Grain Certification, Quality Assurance, Sod Quality Assurance, Non-GMO Grain Traceability, and Stewardship Assessment and Audit Services.

For more information about any of the services and programs offered by MCIA please call 1-800-510-6242 or visit the MCIA website, www.mncia.org. ✻

MCIA Annual Meeting set for Jan. 12, 2023

The Minnesota Crop Improvement Association (MCIA) will convene its 120th annual meeting on Jan. 12, 2023. The one-day meeting, which all Association members are encouraged to attend, will be held in-person, at the Bigwood Event Center in Fergus Falls, Minn.

The program will include presentations by guest speakers and the announcement of MCIA's Premier and Honorary Premier Seed Growers awards as well as the Achievement in Crop Improvement Award. In addition, the organization will conduct its annual business meeting and hold its board of directors' election. MCIA board members, field supervisors, and administrative staff will be in attendance.

Several speakers will present on topics important to MCIA members and the Minnesota Seed Industry. Meeting topics and guest speakers include:

- Jolene Hadrich, Deputy Directory, Minnesota Agricultural Experiment Station
- Sarah Wilbanks, Chief Executive Officer, AOSCA
- Panel discussion: What is the future of organic agriculture?

For information on how to attend the meeting, please visit the Annual Meeting page of the MCIA website: www.mncia.org/annual-meeting. ✻

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Bringing barley back to Minnesota makes strides

By ANDREA JOHNSON

For 100 years, Minnesota and eastern North Dakota raised a lot of barley, but that changed in the 1990s.

Thirty years later, many within the barley industry hope production can return to the region.

In 2022, North Dakota planted 740,000 acres of barley, while Montana planted 1 million acres, and Idaho planted 560,000 acres to barley. Minnesota planted just 45,000 acres to barley in 2022.

The acreage marks a tremendous drop from 270,000 acres planted in Minnesota in 2000, 1.2 million acres on average annually in the 1980s, and over 2 million acres per year in the 1930s, according to National Ag Statistics.

What caused this dramatic shift away from barley?

The region experienced wet and humid conditions that brought in disease and sprouting issues. The growers could earn a higher gross profit per acre raising corn and soybeans.

Barley production moved west to Montana, western North Dakota, and Idaho where it was drier. In the semi-arid climate, barley growers can use irrigation if needed, and then turn the water off to produce bright, white barley that maltsters like.

Yet, large infrastructure investments remain in Minnesota and eastern North Dakota.

The facilities to make malting barley are not easily rebuilt, so harvested barley is now transported back east 600-1,000 miles for processing.

With the expense of transportation, the barley industry and its many friends would like to see barley production return to Minnesota – closer to the processing sites.

The University of Minnesota is developing new barley varieties that have several uses – some with the quality characteristics and disease resistance to meet malting barley specifications.

Other barley varieties can serve as a winter cover crop with an early grain harvesting date. These varieties may be used for malt, human foods, or pet food. After the barley is harvested, the grower could plant short-season soybeans within the same growing season to increase revenue.

Kevin Smith, Ph.D., University of Minnesota barley breeder, gives a tour of the 2022 barley plots at University of Minnesota, St. Paul Campus. Photo by Jeffrey Thompson.

That's what Colin Cureton, Forever Green Initiative director of adoption and scaling, wants to see – profitable cropping systems incorporating new perennials and winter annuals that either fit into current rotations or offer growers new economic opportunities.

The Forever Green Initiative is currently studying and investing in 16 winter crops, with winter barley being one.

"If our goal is to have winter cover, barley markets already exist whereas for other new crops you have to develop brand new markets, brand new applications," Cureton said.

With barley processing already here, it makes sense to grow barley here, but that's not as easy as it sounds.

A new breeding program

Over a century since its first major variety release (Manchuria, 1918), the University of Minnesota Barley Breeding program has focused on breeding spring-sown six-rowed varieties.

Six-rowed types appear to have a whorl of six florets but have three spikelets at each node instead. Each spikelet has a single floret. Three kernels are formed at each node.

Two-rowed varieties appear to have only two rows of kernels where the central floret develops into a seed and the two laterals do not.

Under the direction of University of Minnesota breeder Donald C. Rasmussen from 1958-2000, several major six-rowed barley varieties were released. These include Morex, 1978; Robust, 1984; Stander, 1993; Lacey, 2000; Rasmussen, 2008; and Quest, 2010.

Six-rowed barleys were favored in Minnesota because they yielded more than two-rowed and were more tolerant of disease pressure. But Europe did not use six-rowed barley to make malt. As United States craft brewers apprenticed under European brew masters, who require two-rowed barley, six-rowed barley was slowly dropped from malting production.

The larger adjunct brewers used a combination of two-rowed from the west area and six-rowed from the Midwest. As acres decreased in the Midwest, they also moved toward six-rowed.

Kevin Smith, Ph.D., joined the University of Minnesota Barley Breeding program in 1998 and is a state and national leader in barley development and testing.

In 2010, Smith began switching the program from six-rowed varieties to two-rowed varieties. That was fortuitous because the American Malting Barley Association (AMBA) began requiring only two-rowed barleys in its testing programs and malt specs in the last half-decade.

It takes about 10 years to develop a new barley variety. So far, Smith has one experimental two-rowed variety that has been approved by the AMBA testing program.

"It is eligible for what we call plant scale evaluation," Smith said. "Any maltster or brewer that is interested in testing it would contact me. Then we would scale up production so they could grow out about 300 acres to do a plant scale test."

When a maltster or brewer decides they want to test a variety, the Varietal Development Fund can help pay for those seed increases, Smith said.

The Variety Development Fund comes from a fee collected on each bushel of certified seed sold from University of Minnesota released varieties. The fee is collected annually by Minnesota Crop Improvement Association (MCIA) seed growers.

The fees vary by crop: oats and barley are 25 cents per bushel and wheat is 75 cents per bushel. The bulk of the fees are returned to the University of Minnesota Ag Experiment Station.

"Those funds are used to help pay the costs of developing new varieties, including winter increases to help speed up the development process," said Roger Wippler, MCIA Foundation seed services manager. Funds are also used to promote new varieties and to purchase equipment needed by the researchers, he added.

Many people are excited about a new winter barley released by the University of Minnesota.

MN-Equinox is a six-rowed barley released in December 2021. The seed can be purchased through the Albert Lea Seed House and planted in spring or fall. So far, MN-Equinox is considered appropriate to overwinter in southern Minnesota and the Twin Cities region.

"We anticipate this is the first in a series of releases of improved winter barley varieties in the upcoming years," Smith said. "The initial market for MN-Equinox is for feed, but research is underway to assess and breed for potential food and beverage applications."

About one-third of U.S. barley production is used in the traditional malt market for the major beer companies. Another third is made

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New University of Minnesota wheat: MN-Rothsay

MN-Rothsay wheat features a great combination of excellent straw strength and very high yields. This new University of Minnesota hard red spring wheat has performed well in 2022 regional variety trials.

"MN-Rothsay has straw strength comparable to Linkert but has about 10 percent higher grain yield," says Jim Anderson, University of Minnesota wheat breeder in the Department of Agronomy and Plant Genetics. "The exceptional straw strength of Linkert was largely responsible for its 5-year reign from 2016-20 as the most popular variety in the state. So, our expectation is that MN-Rothsay's higher grain yields, comparable or higher than other popular varieties, and improved disease resistance compared to Linkert will be attractive to growers."

In addition to high yields, the protein level of MN-Rothsay is higher than other top-yielding varieties along with good test weight and a good pre-harvest sprouting rating. MN-Rothsay has moderate overall disease resistance; with a very good score for leaf and stem rust and a good Fusarium head blight (FHB) rating.

The MN-Rothsay variety has stood out in both state and regional trials. In the Uniform Regional Nursery trials, it consistently finished near the top in grain yield and had the best straw strength of all entries in multiple years of testing.

Jochum Wiersma, University of Minnesota Extension small grains specialist, stresses that, "The value growers place on straw strength cannot be overstated, making MN-Rothsay the logical choice to replace Linkert in the U's line-up."

The new release is named in honor of the city of Rothsay, Minn., in the southern Red River Valley, an area of the state with a long history of wheat production.

MN-Rothsay is added to an impressive list of wheat varieties developed by the University of Minnesota spring wheat breeding program, which began over 100 years ago. Among those varieties is MN-Torgy; released in 2020, it was the most widely planted wheat variety in Minnesota this past year.

'MN-Rothsay' will be distributed through Minnesota Crop Improvement Association members, with seed available for planting in spring 2023. For a list of certified seed producers, visit the MCIA website, www.mncia.org, or contact MCIA at 1-800-510-6242.

For performance data and comparisons of wheat, barley, and oat varieties, visit the Minnesota Agricultural Experiment Station website: varietytrials.umn.edu. ✻

Plan to attend small grain workshops

From University of Minnesota Extension

If you're a farmer or crop consultant already producing small grains or are looking for another crop to add to your rotation, these workshops are for you. Small grain management information will be offered across Minnesota in January and February of 2023. These events will focus on production agronomics, variety selection, and economics, and include time to answer your questions about small grain production.

Dates, locations, times, and contacts follow:

- Monday, Jan. 16, 12-3:30 p.m., Morris, West Central Research and Outreach Center – Contact: Anthony Hanson
- Tuesday, Feb. 21, 9 a.m.-1 p.m., LeCenter, 4H Building, Le Sueur County Fairgrounds – Contact: Shane Bugeja at 515-708-3486
- Thursday, Feb. 23, 1-4:30 p.m., Slayton, Murray County 4H-Building, Event Hall – Contact: Liz Stahl
- Monday, Feb. 27, 1-4:30 p.m., Grand Rapids, North Central Research and Outreach Center – Contact: Troy Salzer at 218-749-7120

Other tentative dates and locations (contact your local Extension office for details):

Southern Minnesota

- Monday, Feb. 20 – Rochester
- Wednesday, Feb. 22 – Cold Spring
- Friday, Feb. 24 – Benson

Northern Minnesota – Small Grain Updates

- Tuesday, Jan. 10, 12:00 p.m. – Dilworth, Dilworth Community Center
- Wednesday, Jan. 11, 8:00 a.m. – Ada, Ada Event Center
- Wednesday, Jan. 11, 1:00 p.m. – Crookston, Crookston Inn
- Thursday, Jan. 12, 8:30 a.m. – Lancaster, Lancaster Community Center
- Thursday, Jan. 12, 3:30 p.m. – Roseau, Gene's Bar & Grill
- Friday, Jan. 13, 8:30 a.m. – St. Hilaire, St. Hilaire Community Center

Clay County Crops Update

- Tuesday, Jan. 17, 9:00 a.m. – Dilworth, TAK Music Venue

For details, visit the Minnesota Wheat Growers website: mnwheat.org/growers. Information may also be found on the events calendar of the MCIA website: www.mncia.org/events. ✻

BRINGING BARLEY BACK: Continued from page 10

into malt for craft beer companies. The last third is used in the petfood industry.

"The pet food industry has been a godsend for the barley industry," said Marv Zutz, Minnesota Barley executive director.

Six-rowed barley can be used for pet food, and in general, the outer skin (hull) of the barley is removed. Smith also has a hull-less barley varietal development program that could prove favorable for both pet food and human consumption.

"If we can come up with barley that requires less processing, perhaps there is an avenue for it to become more valuable to industry," Wippler said. "We've increased a hull-less barley with a grower by Crookston, Minn., to get some hull-less barley production in the ground so it can be evaluated."

Whether Smith is breeding for two-rowed, winter barley, or hull-less barley varieties, there is great support for his breeding program from industry. This includes the maltsters, the brewers, the growers, the pet food industry, National Barley Growers Association, Minnesota Crop Improvement Association, the Forever Green Initiative, organic associations, USDA and more.

"We have exciting barley lines that are coming in our pipeline," Smith said.

With various barley types in the pipeline, there is a potential for Minnesota barley acres to increase in the future. ✻

The importance of seed testing

By FAWAD SHAH
MCIA President/CEO

Seed testing provides crucial information about seed lots, which may vary in value from a few hundred to over a million dollars. Test results contain information about the seeds' ability to germinate, the physical purity, the number of seeds per pound, and possible disease issues. All of these attributes are relevant when assessing how well seed will perform in the field.

While it is safe to say that the use of seed by humans is as old as humanity, most seed testing knowledge and methods were developed during the last century. The motive for testing seed arose from the need to protect consumers from poor quality seed, seed contaminants, and adulterated seed – one kind of seed mixed with another.

Well into the 19th century, buyers had no tools nor were there any seed laws to inform and protect them from buying poor quality seed. They were on their own to judge the seed they bought and could simply hope for good results. The first seed testing laboratory was established in Saxony, Germany, in 1869. The first such lab in the U.S. was established at the Connecticut Agricultural Experiment Station in 1876.

Testing performed according to established rules provides insight into the quality of the seed lot and helps determine its overall value for planting. Since an entire seed lot cannot be tested, a representative sample of the lot is key to the accuracy of testing results.

Accurate test results are then used in labeling seed lots. To legally sell seed in the U.S. it must be properly labeled, with information that includes purity, germination, lot number, origin of seed, date tested, etc. This information is obtained by having the seed tested. In addition, state and federal seed laws require complete records for each seed lot sold, including a record of testing analysis.

Seed testing provides an array of information to seed buyers and sellers. It aids sellers in making decisions such as storage, blending, marketing, and whether a particular seed lot meets contractual requirements. Buyers use this information to estimate the proper seeding rate, planting time, chemical needs, and the like. All-in-all, seed testing provides an inexpensive insurance policy on an otherwise unknown component of an operation in which a number of valuable resources – land, fertilizer, equipment, labor – are in play.

The MCIA Seed Laboratory primarily tests seed lots destined for certification. However, the laboratory also tests non-certified seed samples, often known as common seed, as well as cover crop seed, vegetable seed, and – soon – native seeds. The seed laboratory's staff includes two registered seed technologists. To earn this qualification a seed technologist must have years of experience, pass a complex and exhaustive exam, and complete a yearly proficiency test.

The MCIA Seed Laboratory has an established a quality management system consistent with national standards. It recently acquired USDA Seed Laboratory Accreditation for germination, physical purity, and noxious weed seed examinations of cereals and other crops – grasses; legumes; vegetables, flowers and herbs; and trees and shrubs. The MCIA Seed Laboratory also offers several other tests, such as cold and accelerated aging vigor tests, varietal purity testing, and bulk examinations.

For more information about testing your seed, please call MCIA at 1-800 510-6242 or visit our website, mncia.org. ✻

Unauthorized seed sales hurt crop research

Crop producers, at times, save their protected-variety seed to plant next season's crop and avoid the expense of purchasing seed. This practice is commonly known as 'brown-bagging.' It is important to note that the unauthorized sale or use of protected varieties for reproductive purposes is prohibited by federal law. The illegal use of protected varieties also leads to eventual loss in yield and negatively impacts research efforts.

The University of Minnesota established the Variety Development Fund (VDF) to support variety development and research. The VDF is funded through a fee collected as part of the sale of registered and certified seed of crop varieties developed by the university researchers and protected by the U.S. Plant Variety Protection Act (PVPA).

A sizeable portion of the VDF is reinvested into plant breeding work each year. The benefit of this work is the development of improved crop varieties that are well adapted to our region. Not only do these varieties generate higher yields, they also offer enhanced disease and pest resistance.

U.S. Department of Agriculture statistics show the U.S. wheat seed industry loses up to $677 million per year to brown-bagging. Research funding for public institutions is limited, so reduction in funds like those generated through the VDF hinders crop researchers in achieving better yields and it limits the ability of breeding programs to stay current on new and emerging threats from diseases and pests.

Minnesota Crop Improvement Association is the state's sole seed certifying agency. By law, certified seed is required to pass through field inspections and lab testing to minimize weed-seed contamination and to verify the identity of the variety. Brown-bagged seeds are untested. Impure seed can introduce weeds not known to occur on a certain farm and can lower yields. In addition, crops produced from such seed may require greater chemical use to control weeds, and grain may be subjected to more dockage due to excessive foreign matter.

Dr. Denise Thiede, who serves as Minnesota Department of Agriculture's (MDA) seed control officer said, "Farmers could be bringing in weeds through unlabeled and untested seed, or they may not be getting the type or quality of seed they paid for." Most seed varieties have some form of intellectual property protection that restricts the use and sale of the variety. These may include PVP, plant patents or license agreements. Violators of these protections, both sellers and buyers, can be penalized with stiff fines.

MDA advises farmers who buy seed to make sure the seed has a label and has been tested for noxious weed seeds, including Palmer amaranth. Seed buyers should ask sellers if they have the legal authority to sell that seed. Additionally, they should inquire about the variety of the seed; a PVPA-protected variety may only be sold by variety name and may be required to be sold as a class of certified seed.

The holder of a Plant Variety Protection Act certificate has the right to exclude others from selling, marketing, offering for sale, reproducing, consigning, exchanging, importing, or using a variety in the production of hybrid or different varieties for 20 years. However, there are two exemptions granted on PVPA-protected seed. First, the PVPA Act allows replanting seeds for research and development of new varieties. Secondly, there is a seed-saving exception for farmers who lawfully purchase certified seed, to harvest enough seed to replant on their own property on an area no larger than that initially planted.

The University of Minnesota has partnered with Farmers Yield Initiative (FYI) to help curb the unauthorized sale of UMN crop varieties that are protected under the PVP Act. The staff at FYI investigates complaints of illegal seed sales, collects evidence, tests seed to determine the variety, and files court cases. Recently, federal courts entered significant judgments against two Minnesota farming operations. These cases were brought by the Regents of the University of Minnesota over the unauthorized sale of the University of Minnesota PVPA-protected oat varieties.

In addition to monetary losses that are due to brown-bagging, the practice also creates another lesser-known and negative dynamic; that is, loss of certified acres. The loss of certified acres means loss in revenue for seed certifying agencies like MCIA, a not-for-profit association with limited resources.

Through the sale and use of brown-bagged seed, a grower may save a few dollars but takes on significant legal risks. They also gamble on seed quality; risking poor germination and weed-seed contamination, which affect crop stands, yields, and end-use quality. Plus, it results in reduced funding for on-going crop research. In the end, one must ask, are these risks worth taking? Remember, *"Certified seed doesn't cost, it pays,"* in many different ways. ✻

Seed Certification

Seed certification is an internationally recognized system to preserve the genetic identity and purity of crop varieties. It is a limited generation system based on three seed classes: foundation, registered, and certified.

Certified seed is produced by careful, conscientious growers, according to seed certification standards. Program standards require producers to plant eligible seedstocks, have the growing crop inspected in the field, condition the seed, and perform representative sampling of seed lots, followed by laboratory analysis and product labeling.

A certification agency, such as MCIA, provides third-party verification that producers have complied with these requirements.

FAQ

Why buy certified seed?

Seed certification procedures provide buyers with the best possible assurance of good quality seed of known identity and purity.

What should I look for?

For certification to be valid, buyers must be provided with proof of certification. Seed containers must bear an official certification label. Bulk seed sales must be accompanied by a Bulk Seed Sales Certificate. ✻

Information about the MnDOT Seed Vendor Program

The MnDOT Seed Vendor Program is a quality assurance program that ensures seed supplied to the Minnesota Department of Transportation (MnDOT) for use on its roadside revegetation projects meets the specifications of state and federal audit programs.

MCIA is the official entity that provides an evaluation and approval process, with concurrence from MnDOT, for seed vendors producing its seed mixes.

MCIA audits and inspects MnDOT seed vendors annually to determine their conformance with MnDOT's seed supplier requirements. To be approved, seed vendors must meet minimum requirements for equipment, seed procurement, records, packaging, and labeling appropriate for seed to be sold for MnDOT projects.

FAQ

As a buyer, what should I look for?

Approved MnDOT Seed Vendors are issued "Certificates of Approval" that are to be prominently posted in their place of business. MCIA also provides Approved Facility signs. Approved MnDOT seed mixes must be labeled with an Approved Seed Vendor Tag.

Where do buyers find a list of MnDOT seed vendors?

A current list of approved MnDOT seed vendors can be found on the Where to Buy page of the MCIA website: www.mncia.org/where-to-buy. ✻

CROP VARIETIES UNDER PLANT VARIETY PROTECTION ACT

Varieties listed in the following tables were commonly grown in Minnesota in the last two years. The status of the varieties listed below is current as of October 10, 2022. This is not an all-inclusive list! Check a variety's PVP status at the following web page: https://www.ams.usda.gov/services/plant-variety-protection/application-status.

PLANT VARIETY PROTECTED – TITLE V

To be sold by variety name only as a Class of Certified Seed

BARLEY	*OATS, Continued*	*SOYBEANS, Cont.*	*WHEAT, SPRING, Continued*	*WHEAT, SPRING, Continued*
ABI Cardinal	Deon	ND17009GT	Focus	TCG-Heartland
ND Genesis	Goliath	ND21008GT20*	Forefront	TCG-Spitfire
Pinnacle	Hayden	ND Benson	Glenn	TCG-Wildcat
Quest	Horsepower	ND Bison	Lang-MN	TCG-Wildfire
Rasmusson	MN-Pearl	Traill	LCS Breakaway	TW Starlite
Thoroughbred	Natty	**TRITICALE**	LCS Powerplay	Velva
Tradition	Reins	141	Linkert	WB9479
BARLEY, WINTER	Rushmore	Forage FX 1001	MN-Rothsay*	WB9483
MN-Equinox	Saber	**WHEAT, DURUM**	MN-Torgy	WB9590
FIELD BEANS	Saddle	Alkabo	MN-Washburn	WB9606*
Eclipse Black	SD Buffalo*	Carpio	ND Frohberg	WB9719
ND Falcon*	Shelby 427	Divide	ND Vitpro	**WHEAT, WINTER**
ND Palomino	Stallion	Joppa	Prevail	Branson
ND Twilight Black*	Streaker	ND Riveland	Prosper	Darrell
ND Whitetail	Sumo	**WHEAT**, SPRING	RB07	Emerson
Red Cedar	Warrior	122010W	Rollag	Expedition
Red Hawk	**RYE**	7995104*	Shelly	Ideal
Rosie	KWS Aviator*	Advance	SY 611 CL2	Kaskaskia
Talon	KWS Receptor*	Albany	SY Ingmar	Keldin
Zorro	KWS Serafino	AP Gunsmoke CL2	SY McCloud	Lyman
FIELD PEAS	KWS Tayo	AP Murdock	SY Rowyn	ND Noreen
Agassiz	ND Dylan	AP Smith	SY Soren	NE01643
Matrix	ND Gardner	Barlow	SY Valda	Oahe
Viper	**SOYBEANS**	Bolles	TCG-Climax	Redfield
OATS	Ashtabula	Driver	TCG-Cornerstone	SY Wolf
BetaGene™	ND1100S	Elgin-ND	TCG-Glennville	Thompson
Colt	ND1406HP	Faller		

PLANT VARIETY PROTECTED

Unauthorized seed multiplication prohibited

FIELD PEAS	*OATS, Continued*	*WHEAT, SPRING, Cont.*	*WHEAT, SPRING, Cont.*
Jetset	Souris	Edge	TW Elite
OATS	**TRITICALE**	LCS Buster	TW Olympic
126	815	LCS Dual	Vantage
Antigo	618491724	LCS Hammer AX*	WB9507
Badger	641512175	LCS Iguacu	WB9653
Beach	6977824*	LCS Nitro	WB-Digger
Esker	934271498	LCS Prime	WB-Mayville
Esker2020	**WHEAT, SPRING**	LCS Rebel	**WHEAT, WINTER**
Laker	122001W	LCS Trigger	CDC Falcon
Morton	CAG Reckless	MS-Stingray	WB-Matlock
Newberg	Cannon	Samson	Winner
Rockford	Chevelle	SY Longmire	

**** Plant Variety Protection application contemplated/applied for.***

Seed Quality Assurance

Seed producers of all crop types may use a Quality Assured (QA) program to access a complete service for seed sold as varieties, hybrids, brands, or blends. QA programs can be customized to support an existing quality management system or as part of an AOSCA program.

Quality assured seed has met standards designed to preserve the purity and identity of a crop variety. Standards, similar to those applied in seed certification, enable a company to produce and market seed according to sound quality management practices.

The quality assurance process includes field inspections, laboratory testing, audits of production records, and on-site evaluations of conditioning and treatment facilities. Seed meeting all requirements is eligible to be labeled with the Association of Seed Certifying Agencies (AOSCA) QA logo.

FAQ

Why buy quality assured seed?

Quality assured seed provides assurance to seed buyers that the seed is of known purity and quality as verified by an unbiased third party, such as MCIA.

What should I look for?

Seed meeting QA standards may bear a quality assurance label or be marked with a QA logo. Buyers of bulk quality assured seed may be provided with a QA Bulk Sales Certificate. ✻

Information about MCIA's Approved Facilities Program

MCIA's Approved Facilities Program provides an evaluation and approval process to facilities that process seed and identity-preserved (IP) grain products.

To be approved, facilities must comply with equipment and labeling requirements appropriate for the seed or grain to be processed. Approval is granted on an annual basis for the conditioning, handling, and labeling of specific seed types, or for processing grain products for specified end uses.

Facilities processing and/or handling products sold under MCIA's seed certification, seed Quality Assurance, and IP grain certification programs must be inspected and approved by MCIA.

FAQ

Why use an approved facility?

Third-party approval assures users that a facility complies with the requirements necessary to preserve product identity and quality, and that product processed or handled by the facility is properly labeled.

What should I look for to verify that a facility is approved?

Approved facilities are issued Certificates of Approval annually that are to be prominently posted in their place of business. MCIA also provides approved facilities with signs that they may display. ✻

Noxious Weed Seed-free Forage and Mulch Certification

The intention of this certification program is to limit the spread of noxious weeds. MCIA is the state of Minnesota's official Noxious Weed Seed-free Forage and Mulch certification agency. MCIA's program conforms to standards developed by the North American Invasive Species Management Association, which allows properly labeled forage (hay, cubes, and pellets) and mulch certified by MCIA to be shipped into restricted areas of the United States and Canada.

Certification requires that fields and storage sites be inspected by MCIA within 10 days of harvest. If the fields and sites conform to standards for freedom from noxious and undesirable weeds, the harvested crop will be eligible for certification labels. Producers should apply for field and storage site inspection no later than 30 days prior to crop-cut date.

FAQ

Why buy certified noxious weed seed-free forage and mulch?

Buyers who use certified noxious weed seed-free forage and mulch help minimize the spread of noxious weeds onto private and public lands. In Minnesota, government agencies often use certified mulch for roadside and other revegetation projects. Most public lands in the western United States require that hay transported into those areas be certified noxious weed seed–free.

What should I look for to verify that forage and mulch is noxious weed seed-free?

MCIA issues tags with unique serial numbers for the labeling of certified forage and mulch production. For certification to be valid, an official certification label (tag) must be securely attached to the eligible product (bale) prior to delivery to the buyer.

Where can I find a list of certified noxious weed seed-free forage and mulch producers?

MCIA surveys eligible producers every spring and fall to determine availability. You will find the results of those surveys on the MCIA website, www.mncia.org/where-to-buy. ✻

NOXIOUS WEED SEED-FREE FORAGE & MULCH

Product	County	Name	Address	Phone
Big bluestem	Clay	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Big bluestem	Rice	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Big bluestem/Indiangrass	Isanti	Green Barrie Farms/Dale Barrett	8569 Tennyson Dr NW, Princeton MN 55371	763-389-3351
Blue grama	Clay	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Canada bluejoint	Rice	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Indiangrass	Clay	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Indiangrass	Rice	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Little bluestem	Clay	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Little bluestem	Rice	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Oats	Clearwater	Howard Dickey	24213 470th St, Leonard MN 56652	218-968-2381
Oats	Otter Tail	Greg T Malone	30995 615th Ave, Wadena MN 56482	218-640-0809
Oats	Polk	Naytec Farms	36643 340th St SE, Gully MN 56646	218-230-8547
Rye	Anoka	Hammer Hay	19420 Cleary Rd NW, Anoka MN 55303	763-438-1980
Rye	Carlton	Bruce Heikes	3803 McDowell Rd, Holyoke MN 55749	612-919-9100
Rye	Douglas	Bruce Heikes	3803 McDowell Rd, Holyoke MN 55749	612-919-9100
Rye	Norman	Thomas Chisholm	2538 380th Street, Gary MN 56545	218-280-8002
Rye	Renville	Dean Schroeder	74543 270th St, Renville MN 56284	320-826-2415
Rye	Sherburne	Centre Farms LLC	14248 Appleton Ave NW, Monticello MN 55362	763-772-6701
Rye	Waseca	Russell Farms (Curt & Dave Russell)	26704 120th St, New Richland MN 56072	507-317-4865
Sideoats grama	Clay	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Slender wheatgrass	Rice	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Switchgrass	Clay	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Virginia wildrye	Rice	MNL, Inc.	8740 77th St NE, Otsego MN 55362	763-295-0010
Wheat	Carver	River Bluff Ranch (Robert Olson)	16785 Halsey Ave, Carver MN 55315	952-836-5219
Wheat	Clearwater	Howard Dickey	24213 470th St, Leonard MN 56652	218-968-2381
Wheat	Hennepin	Leuer Farms/Steve Leuer	3312 Red Fox Dr, Hamel MN 55340	763-478-9583
Wheat	Marshall	Blawat Farms	21370 290th St NW, Viking MN 56760	218-684-0750
Wheat	Pennington	Tom Pribyl	21607 165th St SE, Plummer MN 56748	218-465-4005
Wheat	Roseau	Noah Lorenson	13622 Cty Road 109, Greenbush MN 56726	218-684-5001
Winter wheat	Le Sueur	Richard Stangler	44357 Kilkenny Rd, Kilkenny MN 56052	507-595-3331
Winter wheat	Renville	Brian Greenslit	37350 660th Ave, Franklin MN 55333	507-829-8909
Winter wheat	Rice	Richard Stangler	44357 Kilkenny Rd, Kilkenny MN 56052	507-595-3331
Winter wheat	Todd	Paul Sweeney	45928 201st Ave, Bertha MN 56437	218-639-6803
Winter wheat	Wright	Keskey Farms (Roger, Mark, or Thomas Keskey)	111 Newcomb Ave NW, Cokato MN 55321	320-286-2969

Native Seed Certification

MCIA's Native Seed Certification Program is designed to assure that the identity of native grasses and forbs (wildflowers) is maintained through all phases of seed production. Government agencies often require certified seed for the re-vegetation of roadsides and construction sites. It is also used for wildlife habitat and other projects to ensure that planting materials are adapted to Minnesota's diverse climatic conditions.

Certified native seed is produced by careful, conscientious growers according to standards designed to preserve the genetic identity of native plant species.

The certification process consists of several steps, including seed source verification, inspection of seed production sites, and seed conditioning and testing. MCIA issues seed labels or certificates to producers whose production has met all certification standards.

FAQ

Why buy certified native seed?

Certified native seed provides seed buyers with third-party assurance that the genetic identity or source of native grasses and forbs is accurately described on the label.

What should I look for?

Native seed is labeled with tags. Three different germplasm types are possible based on the amount of intentional selection that has taken place. They are:

- Source Identified – yellow certification tag
- Selected – green certification tag
- Tested – blue certification tag

Alternatively, sellers may provide buyers with a Certification Certificate as proof of native seed certification. ✻

Native Seed Producers

Name/Address	Phone
Carlson Prairie Seed Farm, Inc. 2077 360th Ave, Lake Bronson MN 56734	218-754-2693
MNL, Inc. 8740 77th St NE, Otsego MN 55362	763-295-0010
Shooting Star Native Seeds 20740 County Rd 33, Spring Grove MN 55974	507-498-3944

MCIA marks 20 years of organic service: 2002-2022

MCIA marked the year 2022 as the twentieth anniversary of its accreditation as an organic certifier. In 2002, federal regulations, called the National Organic Program (NOP), were implemented that defined the "rules" of organic production and processing. MCIA was among the first group of organizations to apply to become an Accredited Certification Agency (ACA).

The National Organic Program is part of the USDA's Agricultural Marketing Service, but the USDA does not itself provide certification service. It accredits organizations, like MCIA, to provide this service. As MCIA inspects or audits each of its clients every year, the NOP similarly audits MCIA and the other ACAs every two and a half years.

The idea of MCIA becoming an ACA was first raised by a few seed grower members and local coffee companies. They thought organic inspection and certification would be a good fit, citing MCIA's history as an independent, third-party inspection service in the seed industry. They also noted MCIA's experience and understanding of standards and rules related to state and federal seed regulations. In 2001, MCIA's board of directors approved a proposal to add the service.

MCIA applied to the NOP and was provisionally accepted into the program after NOP auditors approved its application and followed its inspectors on the first on-site inspections. MCIA was officially accredited as an ACA on April 29, 2002. MCIA began providing organic services that year to five Minnesota-based clients: Falk Seed, Hanson Seed, Café Imports, Morningstar Coffee, and Alakef Coffee.

In 2003, MCIA certified its first crop producers, six of them. And in 2009, the NOP approved MCIA to certify livestock producers. Today MCIA provides certification under all four scopes recognized by the NOP: crop production, wild crop harvesting, livestock production, and processing/handling.

MCIA's organic clientele has grown steadily, by about 10 percent per year. It reached 100 clients in 2012, and by the start of 2022, MCIA had 582 clients in ten states. MCIA focuses on businesses in Minnesota and surrounding states where it has closer contact with its inspectors and where it has expertise with the types of crops grown.

In the program's early days, most inspections and certifications were done by MCIA field supervisors. In 2007, as the number of organic clients grew, MCIA hired the first full-time, dedicated-organic staff member.

In 2008, MCIA hired Michelle Menken, who now manages an Organic Services department of five organic specialists/inspectors plus an administrative assistant. When needed, MCIA field supervisors provide inspection assistance. MCIA also contracts with independent organic inspectors.

The addition of the organic program has indeed proven to be a good fit for MCIA. The organic program is an example of MCIA's willingness and ability to adapt and offer services needed by today's agricultural producers and consumers. With two decades of experience behind it, MCIA stands ready to meet a future that promises continued and growing demand for certified organic food production. ✻

Robert and Greta Mierau farm in Caledonia, Minn., certified organic by MCIA.

CERTIFIED ORGANIC SEED CONDITIONERS AND SELLERS

State, Producer/Conditioner, Address/Phone, Email/Website, Services Provided, Seed Sold

Illinois – Baird Seed Company
1122 Knox Hwy 18, Williamsfield IL 61489 / 309-639-2248
bsc@mymctc.net
Organic seed conditioner.

Michigan – C3 Seeds
11025 M-140, Niles MI 49120 / 269-362-2059
www.c3seeds.com
Organic seed conditioner.

Michigan – Harrington Seeds, Inc.
2586 Bradleyville Rd, Reese MI 48757 / 989-868-4750
Organic seed conditioner.
Adams and Zenith black bean seed and edible soybeans.

Michigan – Michigan Crop Improvement Association
2905 Jolly Rd, Okemos MI 48864 / 517-332-3546
www.michcrop.com
Organic seed conditioner.
BRC Global Standard for Food Safety certified.

Minnesota – Albert Lea Seed, Inc.
1414 W Main St, PO Box 127, Albert Lea MN 56007 / 800-352-5247
www.alseed.com
Organic seed conditioner.
Full line of organic and non-GMO farm seed including: Viking/Blue River corn, Viking/Blue River soybeans, Viking/Blue River alfalfa, small grains, clovers, forage grasses, summer annual forages, cover crops, and garden seed.

Minnesota – Capistran Seed Company
19380 270th St SW, Crookston MN 56716 / 218-891-7840
Organic seed conditioner.

Minnesota – Falk's Seed Farm
1170 Hwy 9 NE, Murdock MN 56271 / 320-875-4341
www.falkseed.com
Organic seed conditioner.
Full line of organic seed.

Minnesota – Hanson Seeds
68276 County Road 16, Fairfax MN 55332 / 507-828-3728
Organic seed conditioner.
Blue River line of corn, soybeans, silage corn, alfalfa, and grass seed.

Minnesota – Olson, Jonathan
3415 County Rd 9, Cottonwood MN 56229 / 507-829-1225
jofairviewfarms@gmail.com
Oats, wheat, and Viking and IA1029 soybeans.

Minnesota – Sawvell's Seed, Inc.
211 Pine St, Clements MN 56224 / 507-692-2240
sawvellseed@hotmail.com
Organic seed conditioner.
Can obtain organic seed for growers.

Minnesota – Soyko International, Inc.
2493 380th St, Gary MN 56545 / 218-356-8214
www.soykointernational.com
Organic seed conditioner.
AC Greenfix chickling vetch, soybeans, wheat, barley, and rye.

South Dakota – North Central Seed Company
2022 W Havens Ave, Mitchell SD 57301 / 605-996-5451
northcentralseed@gmail.com
Organic seed conditioner.
Alfalfa, bromegrass (meadow, smooth), and clover (red, sweet).

Wisconsin – Chippewa Valley Bean
N2960 730th St, Menomonie WI 54751 / 715-664-8342
www.cvbean.com
Organic seed conditioner.

Six steps to Organic Certification with MCIA

1) Apply
Contact MCIA Organic Services for an application packet or download the *Organic Certification Handbook* and application forms from our web site, www.mciaorganic.org.

2) Read and Submit
Review the National Organic Standards (you will find a link to them on the MCIA website) and the *Organic Certification Handbook*. When you are ready, submit the application and fees to MCIA. The application contains an Organic System Plan and supplemental documents to help describe your Organic System. The application will ask you to provide additional items, such as a map of your field or facility. Contact MCIA if you have any questions.

3) Review
MCIA Organic Services will review your application and may contact you for additional information.

4) Inspection
MCIA Organic Services will arrange for an inspector to conduct an on-site inspection. The inspection must be conducted when an authorized representative of your operation who is knowledgeable about the operation is present and at a time when your land, facilities, and activities demonstrate the operation's compliance with or capability to comply with National Organic Program standards. The inspector will complete an inspection report. MCIA will send you a copy of the report, highlighting any items requested by the inspector, along with a bill for the inspection.

5) Review
MCIA Organic Services will review the inspection report to ensure compliance with National Organic Program standards. There may be additional questions for you or for the inspector.

6) Certificate
After all final issues are satisfied and all fees are paid, MCIA Organic Services will issue an Organic Certificate for the products grown or processed. Note: Organic Certificates do not expire. Certified Organic Operations must renew their certification annually or surrender their certification. ✻

Seed Laboratory Services

The MCIA Seed Laboratory offers a host of tests that can help a seed producer, seller, or buyer assess seed quality. The lab conducts germination, physical purity (including inert, other crop, and weed contaminant percentages) and noxious weed seed exams, varietal verification, vigor, tetrazolium (TZ), and herbicide bioassay tests, as well as other crop-specific tests.

Seed testing is one of the final steps in the seed certification process. Test results will be used to verify that standards have been met for a particular crop and seed class. Seed lots certified by MCIA are required to be tested at the MCIA Seed Laboratory, except for native species, which may be tested at an authorized lab. Testing information can also be used for labeling and/or quality assurance. Service testing is also available for seed that is not in the certification program.

The Seed Laboratory follows testing rules established by the Association of Official Seed Analysts (AOSA). The *AOSA Rules for Testing Seeds*, used by regulatory agencies and commercial labs throughout the U.S., standardizes seed testing procedures for numerous species. Other rules may be applied when testing seed intended for export to foreign markets, such as Canada. The MCIA Seed Laboratory is accredited by the USDA's Accredited Seed Laboratory (ASL) Program and participates in the USDA Canadian Seed Grader Program.

FAQ

How do I submit samples?

Sample bags are available from the MCIA office for submitting your samples. Fill the bag with a representative sample to the top line for large seeded agronomic crops, and to the middle line for most natives, grasses, and small-seeded legumes. If requesting a moisture test, please provide an additional 500 grams. Include an MCIA Sampling Report, available on our website or from the MCIA office, providing seed lot information and indicating the tests to be conducted on your sample.

What should I look for after testing?

Seed tested as part of certification will receive a Seed Certification Report, indicating the test results and a passed or failed lot status. Preliminary samples, carryover seed, and non-certified seed will receive a Laboratory Report of Analysis, which will indicate the results of the tests requested. You can receive preliminary and final results by e-mail, and a final report will be mailed to you. ✻

Planting Rate and Date

Rates are based on seed of normal size and good quality and normal seedbed. Actual rates used will vary widely, depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment.

Crop	Bushel Weight (Pounds)[1]	Seeds / Pound (Number)	Rate / Acre (Pounds)	Rate (Seeds)	Planting Date
Barley	48	14,300	85	28 / sq. ft.	Early spring
Corn	56	—		33,000 / acre	April 15 / May 5
Fieldbean					
Black turtle soup	60	2,300	45	105,000 / acre	May 20 / June 15
Great northern	60	1,000	100	90,000 / acre	May 20 / June 15
Kidney	60	900	90-115	90,000 / acre	May 20 / June 15
Navy	60	2,500	42	105,000 / acre	May 20 / June 15
Navy, rows 6 to 14 in.	60		60	150,000 / acre	May 20 / June 15
Pinto	60	1,300	80	90,000 / acre	May 20 / June 15
Small red	60	1,400	75	100,000 / acre	May 20 / June 15
Small white	60	3,000	35	105,000 / acre	May 20 / June 15
Flax	56	88,000	42	85 / sq. ft.	April 15 / May 15
Forage grasses, perennial					
Bromegrass alone	14	136,000	16	50 / sq. ft.	Early spring or late summer
Bromegrass in mixtures			5	15 / sq. ft.	Use date for legumes
Orchardgrass, alone	14	653,000	10	150 / sq. ft.	Early spring or late summer
Orchardgrass, in mixtures			3	45 / sq. ft.	Use date for legumes
Reed canarygrass alone	46	526,000	7	85 / sq. ft.	Early spring or late summer
Reed canarygrass, in mixtures			5	60 / sq. ft.	Use date for legumes
Tall fescue, alone	25	229,000	15	75 / sq. ft.	Early spring or summer
Tall fescue, in mixtures			5	20 / sq. ft.	Use date for legumes
Timothy	45	1,234,000	3	85 / sq. ft.	Use date for legumes
Forage legumes, perennial					
Alfalfa alone	60	220,000	13	65 / sq. ft.	Late April-early May / Late June-early August
Alfalfa with grass			5 to 10	25 to 50 / sq. ft.	Late April-early May / Late June-early August
Alsike clover	60	653,000	2	30 / sq. ft.	Early spring to August 10
Birdsfoot trefoil alone	60	372,000	8	70 / sq. ft.	Early spring or summer
Birdsfoot trefoil in mixtures			6	50 / sq. ft.	Early spring or summer
Cicer milkvetch	60	122,000	18	50 / sq. ft.	Early spring or summer
Ladino clover	60	784,000	1	18 / sq. ft.	Early spring to August 10
Red clover alone	60	272,000	9	55 / sq. ft.	Early spring to September 1
Red clover with grass			5	30 / sq. ft.	Use date for legumes
Oat	32	16,200	80	28 / sq. ft.	Early spring
Rye	56	18,200	60	25 / sq. ft.	September 1
Sorghum, rows 18 to 40 in.	56	15,000	10	150,000 / acre	May 20 to June 5 for grain
Sorguhum, rows 6 to 14 in.			15	5 / sq. ft.	
Soybean, 7-in. rows	60	2,800	56	2 / ft. of row	May 1 to May 10
10-in. rows				3 / ft. of row	
20-in. rows				6 / ft. of row	
22-in. rows				7 / ft. of row	
30-in. rows				9 / ft. of row	
Sunflower, nonoilseed	24	4,300	4	17,000 / acre	May 1-June 15
Sunflower, oilseed	27	7,700	3	23,000 / acre	May 1-June 15
Wheat, durum	60	12,100	90	25 / sq. ft	Early spring
Wheat, hard red spring[2]	60	14,000	113	28 / sq. ft	Early spring
Wheat, hard red winter	60	14,500	75+	25 / sq. ft	August 20 / September 20
Other Crops					
Annual canarygrass	50	58,000	30	40 / sq. ft.	Early spring
Buckwheat	48	14,900	50	17 / sq. ft.	June 15 / July 20
Canola, *B napus*	50	80,000 to 160,000	3 to 5	6 to 9	Early spring
Crambe	22	65,000	15	23 / sq. ft.	Late April / early May
Fieldpea	60	2,300	180	9 / sq. ft.	Early spring
Fieldpea with 1-1/2 to 2 bu. oat			70	4 / sq. ft.	Early spring
Fababean, medium size	60	1,300	180	5 / sq. ft.	Early spring
Fababean, with 2 bu. oat			60	2 / sq. ft.	Early spring
Lentil, small	60	15,600	55	20 / sq. ft.	Early spring
Millet, foxtail	48	218,000	15	75 / sq. ft.	June 15 / July 15
Millet, proso	56	65,000	20	30 / sq. ft.	June 15 / July 15
Sudangrass, rows 6 to 14 in.	40	44,000	25	25 / sq. ft.	May 20 / June 10
Sweetclover	60	240,000	10	55 / sq. ft.	Early spring
Wildrice (wet)	25	7,900	35	6 / sq. ft.	Late fall

1 U.S. legal bushel weight or, if not established, the weight most widely accepted.
2 See wheat section for best way to calculate hard red spring wheat planting rate.

APPROVED SEED CONDITIONING PLANTS

NAME	ADDRESS, CITY, ZIP CODE	COUNTY	PHONE
A			
Ada Feed & Seed, Inc	12 W Thorpe Ave, Ada, 56510	Norman	218-784-7158
Adams Seed	29245 300th St, Wendell, 56590	Grant	218-458-2151
Agassiz Seed & Supply Inc	3660 Kennebec Dr, Eagan, 55122	Hennepin	651-287-3400
Agassiz Seed & Supply Inc	445 7th St NW, West Fargo, 58078	ND-Cass	701-282-8118
AgReliant Genetics LLC	PO Box 190, Wadena, 56482	Wadena	218-631-2954
AgriMAX	23917 350th Ave SW, Fisher, 56723	Polk	218-891-2211
Albert Lea Seed House, Inc	PO Box 127, Albert Lea, 56007	Freeborn	507-373-3161
Alforex Seeds	16690 Greystone Lane, Jordan, 55352	Scott	952-492-2990
American Crystal Beet Seed Products	PO Box 1227, Moorhead, 56560	Clay	218-236-4773
Anderson Seeds	74151 CSAH 5, Dassel, 55325	Meeker	320-286-2700
Anderson Seeds of St. Peter	37825 Cty Rd 63, Saint Peter, 56082	Nicollet	507-246-5032
Angell Seed Farm	86381 320th St, Blooming Prairie, 55917	Freeborn	507-583-7581
B			
Backman Seeds, Inc	13045 310th Ave, Herman, 56248	Grant	320-677-2231
Bayer Northern Production	PO Box 46, Redwood Falls, 56283	Redwood	507-637-2204
Bayer Northern Production	PO Box 530, Redwood Falls, 56283	Redwood	507-644-2108
Beyer Seed Farm	1730 230th St, Kent, 56553	Wilkin	701-640-2222
Bloomquist Farms, Inc.	1737 130th St, Drayton, 58225	Kittson	218-455-3863
Bonanza Bean LLC	PO Box 164, Morris, 56267	Stevens	320-585-2326
Brad Barth Farms	14701 250th Ave NE, Goodridge, 56725	Pennington	218-681-4236
Brushvale Seed, Inc	1656 280th St, Breckenridge, 56520	Wilkin	218-643-2311
Burkel Grain	20463 State Hwy 11, Greenbush, 56726	Roseau	218-782-2121
C			
Capistran Seed Company	19380 270th St SW, Crookston, 56716	Polk	218-891-7840
CHS, Inc	PO Box 39, Winger, 56592	Polk	218-938-4126
CHS, Inc-Marshall	2712 County Rd 6, Marshall, 56258	Lyon	507-532-3246
CHS Northern Grain	PO Box 246, Greenbush, 56726	Roseau	218-782-2111
C&S Habstritt Inc	PO Box 148, Roseau, 56751	Roseau	218-463-1193
Cummings Ag Inc	PO Box 152, Buxton, 58218	ND-Traill	701-636-5463
D			
Dahlman Seed Co	73504 200th St, Dassel, 55325	Meeker	320-275-2527
Deer Creek Seed, Inc	PO Box 105, Ashland, 54806	WI-Ashland	715-681-0899
DK Farms, Inc	23316 Cty Road 23, Greenbush, 56726	Roseau	218-782-2767
DLF USA DBA La Crosse Seed	PO Box 995, La Crosse, 54603	WI-La Crosse	608-783-9560
E			
Enestvedt Seed Company	75802 Cty Road 12, Sacred Heart, 56285	Renville	320-765-2728
F			
Falk's Seed Farm	1170 Highway 9 NE, Murdock, 56271	Swift	320-875-4341
Farmers Co-op Grain & Seed	PO Box 525, Thief River Falls, 56701	Pennington	218-681-6281
Faust, Kevin	26270 202nd St, Long Prairie, 56347	Todd	320-732-3361
Finish Line Seed, Inc	PO Box 277, Bird Island, 55310	Renville	320-365-3674
Fosston Tri-Coop	PO Box 88, Fosston, 56542	Polk	218-435-6222
Fosston Tri-Coop-McIntosh	PO Box 88, Fosston, 56542	Polk	218-563-3735
Friederichs Seed Farm	2847 390th St, Foxhome, 56543	Wilkin	218-205-8759
Friederichs Seed Inc	PO Box 99, Foxhome, 56543	Wilkin	218-739-3366
G			
Gertens Wholesale/Professional Turf Sply	1980 Seneca Rd, Eagan, 55122	Dakota	651-239-1318
Grain Millers/Specialty Prod Division	1502 Gault St, Saint Peter, 56082	Nicollet	507-934-0210
Grass & Sons Seed, Inc	77249 125th St, LeRoy, 55951	Mower	507-324-5820
Gro Alliance, LLC	520 5th St S, Breckenridge, 56520	Wilkin	218-643-1892
H			
Haas Seed Farm	37459 Ottawa Rd, Le Sueur, 56058	Le Sueur	612-327-5385
Haugrud Seed Plant	3331 130th St, Rothsay, 56579	Wilkin	218-493-4275
I			
Integrated Ag Services	490 29th St NE, Northwood, 58267	ND-Grand Forks	701-620-1762
J			
Jensen Seed Co	41439 330th Ave NW, Stephen, 56757	Marshall	218-478-3397
Joliette Ag Systems, Inc	15866 Highway 5, Pembina, 58271	ND-Pembina	701-454-6221
JSF, Inc (Johnson Seed Farm)	85380 180th St, Sacred Heart, 56285	Renville	320-765-2225
K			
Kennedy Seed Co.	1919 320th Ave, Lake Bronson, 56734	Kittson	218-526-0239
Knewtson Soy Products	17303 State Hwy 22, Good Thunder, 56037	Blue Earth	507-278-4087
Krabbenhoft Seed & Sply LLC	PO Box 16, Sabin, 56580	Clay	218-789-7219
Kukowski, Jim	17485 Cty Road 6, Strathcona, 56759	Roseau	218-781-2478

NAME	ADDRESS, CITY, ZIP CODE	COUNTY	PHONE
L			
Lake Bronson Elevator, Inc	PO Box 40, Lake Bronson, 56734	Kittson	218-754-4200
Lee's Seed Farm	670 50th Ave NE, Benson, 56215	Swift	320-843-2857
M			
Magnusson Farms	PO Box 28, Roseau, 56751	Roseau	218-463-2374
Meyer's Seeds, Inc.	7813 Hwy 247 NE, Elgin, 55932	Olmsted	507-876-2482
Midway Sales	PO Box 285, Argyle, 56713	Marshall	218-820-5587
Midway Seed, LLC	10095 Highway 18, Cavalier, 58220	ND-Pembina	701-265-4224
Millborn Seeds, Inc.	2132 32nd Ave, Brookings, 57006	SD-Brookings	605-697-6306
MNL, Inc.	8740 77th St NE, Otsego, 55362	Benton	763-295-0010
N			
Newfolden Co-op Elevator Assn	PO Box 157, Newfolden, 56738	Marshall	218-874-7465
Nietfeld Farm, Inc	34253 Cty Road 31, Melrose, 56352	Stearns	320-987-3442
Norfarm Seeds, Inc	31154 430th Ave, Roseau, 56751	Roseau	218-463-2119
Northern Excellence Seed LLC	PO Box 186, Williams, 56686	Lake of the Woods	218-783-2228
Northern Tier Seed Co	PO Box 132, Thompson, 58278	ND-Grand Forks	701-599-9065
Northland Farm Supply Inc	5685 County Road 4, Cromwell, 55726	Carlton	218-821-1627
P			
Pazdernik Farms, Inc	1657 290th St, Waubun, 56589	Mahnomen	218-766-9531
Petermann Seeds, Inc	3008 210th St N, Hawley, 56549	Clay	218-483-3302
Pioneer Hi-Bred Int'l Inc	182 Industrial Pkwy, Jackson, 56143	Jackson	800-582-0107
Pioneer Hi-Bred Int'l, Inc	PO Box 93, Wahpeton, 58074	ND-Richland	701-642-5300
Prescher-Willette Seeds	41721 160th St, Delavan, 56023	Faribault	507-854-3595
R			
Radium, Inc	26188 241st St NW, Warren, 56762	Marshall	218-745-5556
Ramy Turf Products	1329 N Riverfront, Mankato 56001	Blue Earth	507-387-4091
Ramy Turf Products-St Paul	731 Prior Ave N, Saint Paul, 55104	Ramsey	651-917-0939
Red River Marketing Co	20145 240th St, Elbow Lake, 56531	Grant	218-685-6100
Remington Seeds, LLC	PO Box 605, Grafton, 58237	ND-Walsh	701-379-1000
Remington Seeds, LLC	302 4th Ave SE, Mapleton, 58059	ND-Cass	701-282-8400
Remington Seeds, LLC	19160 Lillehei Ave, Hastings, 55033	Dakota	651-480-3416
Remington Seeds, LLC	2222 W Lincoln, Olivia, 56277	Renville	320-523-1331
Remington Seeds, LLC	PO Box 118, 105 N 1st St, Olivia, 56277	Renville	320-523-5965
Richland IFC, Inc	100 10th St N, Breckenridge, 56520	Wilkin	218-643-1797
Rivard's Turf & Forage Inc	3150 27th Ave N, Grand Forks, 58203	ND-Grand Forks	701-330-3699
S			
Sawvell's Seed, Inc	211 Pine St, Clements, 56224	Redwood	507-692-2240
Schwitters Brothers Partnership	4040 160th Ave SE, Raymond, 56282	Chippewa	320-894-5006
Shooting Star Native Seeds	20740 Cty Rd 33, Spring Grove, 55974	Houston	507-498-3944
Soyko International, Inc	2493 380th St, Gary, 56545	Norman	218-356-8214
Spronk & Sons Seed Farm, Art	84 130th Ave, Edgerton, 56128	Pipestone	507-442-5334
Stangler Seed Co LLC	44357 Kilkenny Rd, Kilkenny, 56052	Le Sueur	507-595-2883
Star of the North	303 Main Street, Gary, 56545	Norman	218-356-8300
Swenson Seed Farm	29667 State Hwy 92 SE, Brooks, 56715	Red Lake	218-796-5285
Syngenta Seeds, LLC	PO Box 59, Danvers, 56231	Swift	320-567-2141
Syngenta Seeds, LLC	4915 Reardon Ave SW, Cokato, 55321	Meeker	320-286-5511
Syngenta Seeds, LLC	PO Box 38, Amboy, 56010	Blue Earth	507-674-3320
T			
Thalmann Seeds, Inc	2275 80th St, Plato, 55370	McLeod	320-238-2185
Thiel Seed Service	30232 320th St, Wendell, 56590	Grant	218-458-2415
Thunderbird Commodities, Inc	PO Box 217, Mahnomen, 56557	Mahnomen	218-935-2772
Tobolt Seed	1334 50th St S, Moorhead, 56560	Clay	218-287-2904
Trilogy Ag Group	PO Box 952, Alvarado, 56710	Marshall	218-965-4942
Triple J Seed	15 10th St N, Wheaton, 56296	Traverse	320-563-4509
Twin City Seed Company	7265 Washington Ave S, Edina, 55439	Hennepin	952-944-7105
W			
Weinlaeder Seed Company	7162 160th Dr NE, Drayton, 58225	Kittson	701-454-6427
Werner Seed Company	3080 Millersburg Blvd E, Dundas, 55019	Rice	507-645-7995
West Central Ag Services	PO Box 8, Beltrami, 56517	Polk	218-926-5522
Western Integrated Seed	15403 US Highway 12, Cokato, 55321	Wright	320-286-5982
Wigen Seed Farm	200 N Holcombe Ave Apt 306, Litchfield, 55355	Meeker	320-221-8830
Z			
Zabel Seeds	53295 282nd Ave, Plainview, 55964	Wabasha	507-534-2498

2022 Barley field crop trial results

Spring barley varieties were evaluated in 2022 in replicated trials at Crookston, Hallock, Oklee, Perley, Roseau and Stephen in the northern part of the state and Becker, Fergus Falls, Lamberton, Le Center, New Ulm, Rochester and St. Paul in the south. Yield is reported for 2022 and multi-year averages as percent of the mean of the trial. Data collected from these trials should be used to make comparisons only among those varieties included in the trials. The average yield across the 13 testing locations was 101 bu/acre in 2022. The highest yields this year were recorded in Roseau (132 bu/A) while the lowest grain yields were recorded in St. Paul (62 bu/A). LSD numbers beneath the yield columns indicate whether the difference between yields is due to genetics or to other factors, such as variations in environment. If

the yield difference between two entries equals or exceeds the LSD value, the higher-yielding entry probably was superior in yield. A difference less than the LSD value was probably due to environmental factors.

Variety Selection Criteria

Most barley producers in the region grow barley for malt and select varieties approved by the American Malting Barley Association (AMBA). The most important industry specifications for making malting grade are low grain protein (11.5-13.5 percent), kernel plumpness (>80 percent) and low deoxynivalenol or DON content (<2 ppm). DON is the toxin produced by the Fusarium Head Blight (FHB) pathogen. Additional information about FHB can be found at https://scabsmart.org. Please consult the AMBA recommended varieties for the most current information about industry acceptance of malting barley varieties at www.ambainc.org. Variety selection will also be influenced by contracts made available by malting and brewing companies and these vary from year to year.

In addition to yield and acceptable malt quality, disease resistance plays an important role in variety selection. Disease evaluations are carried out in inoculated field and/or greenhouse experiments. Disease ratings are based on the results of two or more experiments and are scored on a 1-9 scale where 1 = most resistant and 9 = most susceptible. For most producers the disease FHB and the presence of DON in harvested grain are the two most important factors limiting production of malting barley in the region. The two-rowed variety Conlon has the lowest DON score (the mycotoxin produced by the Fusarium head blight pathogen) compared to the other varieties grown in the region.

The other diseases listed in the disease reactions table are leaf diseases that can be a problem in Minnesota. Pinnacle is very susceptible to net blotch. All variet-

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Table 1. Agronomic characteristics of malting barley varieties, 2020-2022.

Entry	Origin[1]	Year of Release	PVP Status	Heading (DAP)	Height (inches)	Stem Breakage (%)
2-row						
AAC Connect	AAFC	2017	Yes	58	25	8
AAC Synergy	AAFC	2012	Yes	59	26	6
ABI Cardinal	ABI	2021	Yes	59	25	16
Brewski	ND	2019	NA	58	26	14
Conlon	ND	1996	Yes	54	26	43
ND Genesis	ND	2015	Yes	57	28	18
Pinnacle	ND	2007	Yes	56	26	24
6-row						
Lacey	MN	2000	Yes	55	27	0
Quest	MN	2010	Yes	55	29	47
Rasmusson	MN	2008	Yes	54	26	2
Robust	MN	1984	Expired	55	29	5
Tradition	ABI	2003	Yes	54	27	0
No. of Environments				**8**	**8**	**7**

[1]Agriculture and Agri-Food Canada (AAFC), Anheuser-Busch InBev (ABI), North Dakota State University (ND), University of Minnesota (MN).

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ies have resistance to the dominant race of stem rust (MCCF) and are susceptible to the QCCJ race also known as African stem rust or Ug99. FHB severity and DON can be reduced with fungicides, but they are not always effective. Bacterial leaf streak disease has become more prominent in recent years and tends to become more severe following heavy rain events. This disease cannot be controlled with fungicides.

PVP Status

All varieties shown in tables except Robust, Conlon, and Lacey are covered by the Plant Variety Protection Act, PVP (94). Growers can save seed of PVP protected varieties for their own planting only; it cannot be sold to anyone else, not even a relative or a neighbor

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Table 2. Disease reactions of barley varieties in multiple-year comparisons.

Entry	DON[1,2]	Spot Blotch[1,3]	Net Blotch[1,4]	Stem Rust[1,5]	Bacterial Leaf Streak[1]
2-row					
AAC Connect	5	1	1	4	3
AAC Synergy	8	2	1	5	3
ABI Cardinal	7	5	2	5	5
Brewski	6	3	6	4	4
Conlon	3	9	2	3	6
ND Genesis	5	3	2	6	5
Pinnacle	5	6	9	6	6
6-row					
Lacey	7	1	2	4	5
Quest	5	6	2	4	6
Rasmusson	9	1	2	5	5
Robust	7	1	2	4	5
Tradition	4	2	1	5	6
No. of Environments	**4**	**1**	**2**	**3**	**3**

[1]Trait measured on a scale from 0-9 where 0=resistant and 9=susceptible.

[2]Deoxynivalenol (DON) is the mycotoxin produced by the Fusarium head blight pathogen.

[3]Data is for 2020 only.

[4]Data is for 2020 and 2022 only.

[5]Data is for stem rust pathogen QCCJ. All lines were resistant to stem rust pathogen MCCF in years tested.

Table 3. Relative grain yield of barley varieties in northern Minnesota locations in single-year (2022) and multiple-year comparisons (2020-2022).

	Crookston		Hallock		Oklee		Perley		Roseau		Stephen		Strathcona
Entry	2022	2 Yr[1]	2022	3 Yr	2022	3 Yr	2022	3 Yr	2022	2 Yr[1]	2022	3 Yr	2 Yr[2]
2-row													
AAC Connect	102	103	107	109	92	95	101	105	99	98	113	103	131
AAC Synergy	107	103	107	106	102	103	113	105	97	99	120	113	125
ABI Cardinal	79	94	104	109	105	101	105	100	96	100	108	98	126
Brewski	109	106	106	106	112	111	98	96	108	107	110	99	76
Conlon	87	85	94	95	91	91	86	89	97	100	82	100	67
ND Genesis	116	112	109	99	98	104	104	110	107	106	116	106	89
Pinnacle	91	99	91	96	108	105	99	105	112	112	97	104	110
6-row													
Lacey	98	99	88	86	92	97	89	93	98	99	80	95	97
Quest	106	101	95	89	105	99	100	96	90	86	89	93	101
Rasmusson	111	108	97	103	102	99	102	98	104	106	96	90	111
Robust	96	95	98	95	93	91	97	95	96	90	96	100	79
Tradition	96	94	104	107	100	104	104	108	97	95	94	99	88
Mean (Bu/Acre)	**102**	**95**	**120**	**106**	**108**	**97**	**122**	**110**	**132**	**103**	**103**	**99**	**74**
LSD (0.05)	**20.7**	**19.1**	**11.1**	**14.0**	**17.1**	**11.5**	**11.2**	**14.6**	**14.4**	**10.5**	**10.9**	**19.7**	**51.5**

[1]Trial data is from 2022 and 2021 only.
[2]Trial data is from 2021 and 2020 only.

Table 5. Relative grain yield of barley varieties in a single-year (2022) and multiple-year comparisons (2020-2022).

	State			North			South		
Entry	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr
2-row									
AAC Connect	102	103	103	102	104	105	101	103	101
AAC Synergy	104	102	104	107	105	107	101	98	101
ABI Cardinal	97	99	100	100	101	103	95	95	96
Brewski	104	102	103	107	102	102	100	102	104
Conlon	87	90	88	90	93	91	85	87	85
ND Genesis	104	105	103	108	107	104	100	102	102
Pinnacle	101	103	104	100	103	104	102	104	103
6-row									
Lacey	95	98	98	91	95	94	99	101	101
Quest	101	99	98	97	95	94	105	105	101
Rasmusson	106	106	105	102	102	101	111	109	109
Robust	95	93	93	96	94	93	93	91	92
Tradition	103	101	102	99	98	101	107	103	104
Mean (Bu/Acre)	**101**	**90**	**90**	**113**	**101**	**99**	**90**	**79**	**83**
LSD (0.05)	**6.3**	**4.5**	**4.7**	**8.8**	**6.1**	**7.5**	**8.0**	**6.2**	**5.5**
No. of Environments	**13**	**27**	**38**	**6**	**13**	**18**	**7**	**14**	**20**

BARLEY:

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without specific permission of the applicant for protection.

Authors and Researchers

This report is authored by: Kevin Smith, Ruth Dill-Macky, Jochum Wiersma, Brian Steffenson, Karen Beaubien and Ed Schiefelbein.

Guillermo Velasquez, Curtis Reese, Joseph Wodarek, Mike Leiseth, Steve Quiring and Donn Vellekson supervised and carried out test plot establishment and management. ✻

Barley

Planting Rate and Date

Bushel Weight, Pounds.....48
Seeds/Pound.....14,300
Planting Rate, Pounds/Acre.....85
Planting Rate, Seeds/Sq. Ft.....28
Planting Date.....Early Spring

Table 4. Relative grain yield of barley varieties in southern Minnesota locations in single-year (2022) and multiple-year comparisons (2020-2022).

	Becker		Fergus Falls		Lamberton		Le Center		New Ulm		Rochester		St. Paul	
Entry	2022	2 Yr[1]	2022	3 Yr	2022	3 Yr	2022	3 Yr	2022	3 Yr	2022	3 Yr	2022	3 Yr
2-row														
AAC Connect	103	99	103	104	95	98	109	104	101	104	97	91	96	105
AAC Synergy	102	110	100	100	99	104	89	95	108	95	109	103	103	110
ABI Cardinal	107	111	88	99	99	96	99	95	97	97	76	78	100	104
Brewski	106	118	95	104	99	108	100	99	93	96	104	95	111	121
Conlon	87	81	85	88	76	79	91	94	103	94	76	81	63	69
ND Genesis	88	94	116	105	108	101	93	102	82	98	106	103	102	103
Pinnacle	99	105	107	103	101	97	103	105	100	102	103	106	95	106
6-row														
Lacey	84	86	97	96	103	106	98	99	102	106	109	110	111	102
Quest	112	113	102	97	113	101	104	104	105	101	107	105	92	89
Rasmusson	121	111	113	107	104	111	104	103	105	108	113	118	118	107
Robust	81	76	87	91	96	95	95	92	100	95	99	102	99	88
Tradition	109	96	107	104	108	106	115	109	104	103	100	107	109	98
Mean (Bu/Acre)	**96**	**65**	**125**	**107**	**70**	**66**	**103**	**93**	**82**	**84**	**82**	**91**	**62**	**69**
LSD (0.05)	**14.3**	**20.8**	**12.9**	**14.7**	**9.7**	**13.1**	**16.5**	**10.6**	**16.1**	**16.8**	**13.1**	**16.8**	**12.0**	**13.7**

[1]Trial data is from 2022 and 2021 only.

2022 Canola field crop trial results

The 2022 Canola Production Center (CPC) was located 3 miles west and ½ mile north of Roseau, Minnesota on land owned by Magnusson Farms. Primary tillage was done by the Magnussons.

Final seedbed preparation was done by University of Minnesota personnel. Previous crop was cereal rye. A spring fertilizer rate of 140-20-40-20s was applied and incorporated prior to final seedbed preparation. Spring weather conditions were very cool and wet resulting in a May 28 seeding date. This would be considered several weeks later than ideal. Soil moisture conditions at planting were good and emergence was generally uniform. Early season flea beetle pressure was extremely heavy. An application of 1.5 oz./acre Warrior (permethrin) was applied for control. Premium seed treatments were needed for healthy early season vigor.

The canola variety trial was seeded with a Hege small plot seeder with double disk openers. Plots were rolled with a Brillion cultipacker after planting. Seeding rate was 10-12 pure live seeds (PLS)/ft.2 as provided by the seed company submitting the entry and 10 lbs/acre of spring wheat was planted with canola to aid emergence and lessen potential wind damage. Individual plots were seeded on 6 ft. x 27 ft. centers. Experimental design was four replications in a randomized complete block design. All plots were sprayed with Section 3 at 4 oz. plus Grizzly Too at 1.5 oz./acre on June 10 for grassy weed and flea beetle control. General weed control was done with applications of either Roundup PowerMax at 16 oz. to RR and TruFlex varieties or Liberty at 28 oz. to LL varieties. Labeled adjuvants were com-

CANOLA: Continued on page 26

Submitting companies and contact information

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bined with all herbicides. Proline at 5.7 oz./acre was applied on July 13 targeting sclerotinia control. Plots were swathed on August 16 and combining completed on Aug. 31, 2022.

Test Plot Research Personnel

Dave Grafstrom, Donn Vellekson, and Nancy Ehlke supervised canola variety trial establishment, management, and data summary. ✻

2022 Canola variety trial

Location: Magnusson Farm — 3 miles northwest of Roseau, MN

	Company	Entry	Herbicide Tolerance*	Yield #/Acre[1]	Protein[2] (%)	Oil[2] (%)	Test Weight (#/bu)	Lodging[3]	Harvest Height (in.)	% Ground Cover 21DAP	ESV[4] 21DAP	Flowering Begin Day	Flowering End Day	Flowering # of Days
1	CROPLAN	CP9978TF	TF	2939	19.8	46.4	51.8	3.0	52	63	6.0	4-Jul	30-Jul	26
2	Star Specialty Seed	StarFlex	TF	3466	18.6	46.7	51.8	1.5	49	90	9.0	3-Jul	26-Jul	23
3	Pioneer	45M35	RR	3169	17.0	48.6	51.3	2.5	54	86	8.5	6-Jul	25-Jul	19
4	Nuseed	NC155 TF	TF	3117	20.2	46.9	51.9	1.0	53	76	7.5	3-Jul	25-Jul	22
5	Nuseed	NC471 TF	TF	2648	19.6	47.5	51.7	2.5	55	64	6.0	4-Jul	25-Jul	21
6	Nuseed	NC527CR TF	TF	2899	19.3	47.6	50.0	2.0	52	81	8.0	5-Jul	27-Jul	22
7	BrettYoung	BY 6211TF	TF	3191	19.9	47.3	52.1	1.5	49	84	8.0	4-Jul	27-Jul	23
8	BrettYoung	BY 6217TF	TF	3161	19.6	48.0	51.3	1.0	58	94	9.0	8-Jul	29-Jul	21
9	CANTERRA SEEDS	CS3000 TF	TF	3016	18.0	47.3	51.5	3.0	52	86	8.5	2-Jul	24-Jul	22
10	Wilbur Ellis	Integra 7361RC	RR	3096	19.8	46.8	51.8	3.5	53	70	6.0	6-Jul	26-Jul	20
11	BASF	InVigor LR344PC	LL+RR	2857	19.8	46.8	51.6	3.0	53	60	5.5	7-Jul	26-Jul	19
12	CANTERRA SEEDS	CS4000 LL	LL	2884	19.2	47.9	51.7	4.5	56	79	7.0	6-Jul	23-Jul	17
13	BASF	InVigor L233P	LL	2688	19.3	46.6	51.2	4.0	52	76	7.0	6-Jul	22-Jul	16
14	BASF	InVigor L340PC	LL	2531	19.7	44.8	50.5	3.0	52	86	8.0	5-Jul	23-Jul	18
15	BASF	InVigor L343PC	LL	2747	19.4	45.7	50.4	3.5	51	84	8.0	6-Jul	23-Jul	17
16	BASF	InVigor LR344PC	LL+RR	2704	19.7	46.4	51.6	4.0	54	74	6.5	9-Jul	25-Jul	16
17	BASF	InVigor LR356PC	LL	2922	20.0	46.1	51.3	4.0	55	86	8.0	9-Jul	27-Jul	18
18	CROPLAN	CP7130LL	LL	2529	18.9	48.0	50.6	3.0	54	94	9.0	6-Jul	23-Jul	17
19	CROPLAN	CP7144LL	LL	2588	20.9	47.7	50.4	4.0	53	91	8.5	7-Jul	22-Jul	15
20	Dekalb	DKTFLL21SC	LL+TF	2776	18.7	47.3	51.5	2.0	52	86	8.5	4-Jul	25-Jul	21
21	Dekalb	DKLL82SC	LL	2830	19.6	46.2	51.7	2.5	52	93	8.5	5-Jul	26-Jul	21
22	Dekalb	DKLL83SC	LL	2981	18.3	48.4	51.1	2.5	52	86	9.0	3-Jul	21-Jul	18
23	Pioneer	P506ML	LL	2944	19.3	47.0	50.6	3.5	56	91	9.0	7-Jul	22-Jul	15
			LSD @ 5% Level	**252**	**1.0**	**1.1**	**0.3**	**1.9**	**5**	**14.3**	**1.4**	**1**	**2**	**2**
			LSD @ 10% Level	**210**	**0.9**	**0.9**	**0.2**	**1.6**	**4**	**11.9**	**1.2**	**1**	**2**	**2**
			CV (%)	**6.1**	**3.8**	**1.7**	**0.4**	**49**	**7**	**12**	**13**	**12**	**6.8**	**8**

Experimental Design: RCB w/ 4 reps.
Trial Mean: 2900

Seeding rate=12PLS/Ft.[2] (using company provided PLS/#).
Planting Date: 5/28/2022

*Herbicide Tolerance: LL = Liberty Link, RR = Roundup Ready, and TF = TruFlex.
Trial was blocked by herbicide tolerance. Entries 1-11 were Roundup Ready/TruFlex were sprayed with Roundup PowerMax II and entries 12-23 Liberty.

[1] Clean Seed. Yields corrected to 8.5% moisture.
Trial mean yield = 1825#/acre.
[2] Protein and oil reported on dry matter basis.
[3] Lodging 1 = upright and 9 = flat
[4] ESV (early season vigor) 21 days after planting: 9 = best and 1 = least
Fertilizer application: 140-30-30-20s applied PPI 5/27/22

2022 Corn Grain field crop trial results

The Minnesota Corn Evaluation Program was conducted by the University of Minnesota Agricultural Experiment Station to provide unbiased information for use by corn growers when they choose which brand of corn to buy and grow. The program was financed in part by entry fees from private seed companies that chose to place their entries for testing.

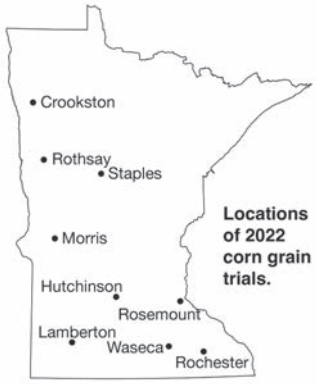
Test Locations

Test zones, locations and maturities are as follows:

• Southern Zone: Lamberton, Rochester and Waseca

o Early Maturity Trial – 102 Relative Maturity (RM) and earlier entries

o Late Maturity Trial – 103 RM and later entries



• Central Zone: Hutchinson, Morris and Rosemount

o Early Maturity Trial – 97 RM and earlier entries

o Late Maturity Trial – 98 RM and later entries

• Northern Zone: Crookston, Rothsay and Staples

Testing Procedure

Entries: Seed corn companies choose their entries for each zone. Entries in each trial were based on the relative maturity provided by the company. The University of Minnesota Corn Testing Committee could also choose entries in each test. All locations tested three replications for each entry.

Presentation of Data

Yields are given for individual locations along with yields and harvest moisture contents averaged across locations for 2022. Reported yields are adjusted to 15.5 percent grain moisture. Entries are ranked within a maturity group by moisture content averaged across locations for 2022. The site at Rochester was inadvertently sprayed with glyphosate herbicide and the hybrids that were not modified to tolerate glyphosate did not survive. Therefore yields from the Rochester site are not reported this year.

Identification of Traits

Genetic modifications of entries will be identified using generic terms to describe the trait without identifying the specific event for genetic modification.

For example Bt will identify genetic modification for corn borer resistance but will not differentiate between the Bt 11 event, the Yield-

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Table 3. Early maturity entries, southern locations, 2022.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Lamberton	Waseca	Average Across Locations Bu/Acre	% Moisture
98 and earlier RM entries							
Anderson Seeds	6909	Conventional	98	180	240	210	13.4
Dairyland Seed	DS-3601AM	Bt, Gly, LL	96	208	270	239	13.8
Enestvedt Seed Co	E670	Conventional	98	187	252	220	13.9
Anderson Seeds	786R	Gly	95	206	243	224	14.2
Anderson Seeds	728TRE	Bt, CRW, Gly, LL	98	200	297	249	14.2
Legacy Seeds	LC474-20	Bt, Gly	97	201	275	238	14.2
Viking	44-98	Bt, CRW, Gly, LL	98	195	239	217	14.3
Dairyland Seed	DS-3727AM	Bt, Gly, LL	97	210	258	234	14.4
Becks Hybrids	4672AM	Bt, Gly, LL	96	207	248	228	14.7
AgriGold	A628-16VT2RIB	Bt, Gly	98	194	265	229	14.7
98 and earlier RM averages:				**199**	**259**	**229**	**14.2**
99 to 103 RM entries							
Anderson Seeds	528TRE	Bt, CRW, Gly, LL	102	200	235	217	14.0
Viking	52-00	Bt, Gly, LL	100	194	253	224	14.3
Viking	46-02	Bt, Gly, LL	102	211	262	236	14.8
Dairyland Seed	DS-4219AM	Bt, Gly, LL	102	207	278	243	15.0
Dairyland Seed	DS-4014Q	Bt, CRW, Gly, LL	100	190	248	219	15.1
Anderson Seeds	5072	Conventional	102	201	266	234	15.1
Enestvedt Seed Co	E539	Conventional	103	208	261	235	15.2
Legacy Seeds	LC511-21	Bt, CRW, Gly, LL	101	198	254	226	15.3
Anderson Seeds	507SRC	Bt, CRW, Gly, LL	102	201	249	225	15.3
Dekalb	DKC49-24	Bt, CRW, Gly, LL	99	180	244	212	15.5
Viking	99-00	Bt, Gly, LL	100	209	230	219	15.6
Dekalb	DKC52-18	Bt, CRW, Gly, LL	102	195	263	229	15.6
Dairyland Seed	DS-3959Q	Bt, CRW, Gly, LL	99	206	251	229	15.6
Dekalb	DKC50-87	Bt, CRW, Gly, LL	100	185	248	216	15.7
AgriGold	A631-90	Conventional	101	209	251	230	15.8
Enestvedt Seed Co	E672	Conventional	100	230	268	249	15.8
AgriGold	A630-04VT2	Bt, Gly	100	189	270	230	15.8
Becks Hybrids	5393V2P	Bt, Gly	103	210	280	245	15.9
Legacy Seeds	LC-5319	Bt, CRW, Gly, LL	103	179	246	212	15.9
AgriGold	A633-14STXRIB	Bt, CRW, Gly, LL	103	210	247	229	17.5
99 to 103 RM averages:				**201**	**255**	**228**	**15.4**
Southern locations, early maturity averages:				**200**	**256**	**228**	**15.0**
LSD (0.20)				**14**	**20**	**12**	**0.6**

CORN GRAIN: Continued from page 27

Guard corn borer event or the Herculex corn borer event.

Identifiers will be:

- Bt = Europeon corn borer resistance
- CRW = corn rootworm resistance
- Gly = glyphosate herbicide resistance
- LL = Liberty herbicide resistance

Least Significant Difference

The LSD (Least Significant Difference) figures at the bottom of the yield columns in the tables are statistical measures of variability in the trials. These values may be used to determine whether the difference between any two entries is likely to be a real difference or just natural variation.

If the yield difference between two entries is equal to or greater than the LSD, then one can be confident that the two entries probably differ in yield potential.

CORN GRAIN: Continued on page 30

Table 1. Companies participating in the 2022 corn grain trials.

Company	Website
AgriGold Hybrids	www.agrigold.com
Anderson Seeds	www.andersonseedsmn.com
Beck's	www.beckshybrids.com
Blue River Organic Seed	www.blueriverorgseed.com
Dairyland Seed	www.dairylandseed.com
DenBesten Brand	www.dakotasbestseedllc.com
Enestvedt Seed Company	www.enestvedtseeds.com
Legacy Seeds	www.legacyseeds.com
REA Hybrids	www.rea-hybrids.com
Viking Seed	www.alseed.com

Table 4. Late maturity entries, southern locations, 2022.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Lamberton	Yield, Bushels/Acre at: Waseca	Average Across Locations: Bu/Acre	Average Across Locations: % Moisture
104 to 106 RM entries							
Legacy Seeds	LC554-21	Bt, Gly	104	214	260	237	15.0
AgriGold	A636-11STXRIB	Bt, CRW, Gly, LL	106	185	267	226	15.5
Dairyland Seed	DS-4510Q	Bt, CRW, Gly, LL	105	201	258	229	15.6
Viking	72-06	Gly	106	216	263	239	15.8
Viking	O.84-04	Bt, Gly, LL	104	221	259	240	16.0
Viking	84-05	Bt, Gly, LL	105	214	267	241	16.2
Becks Hybrids	5699V2P	Bt, Gly	106	204	239	221	16.2
Enestvedt Seed Co	E598	Conventional	106	216	257	237	16.3
DenBesten	DB38-06	Conventional	106	218	263	240	16.4
AgriGold	A636-16	Conventional	106	227	277	252	16.6
Anderson Seeds	504R	Gly	104	227	257	242	16.6
AgriGold	A635-54VT2RIB	Bt, Gly	105	200	255	227	16.6
Anderson Seeds	472SRC	Bt, CRW, Gly, LL	105	187	245	216	16.7
Dyna-Gro	D44SS54	Bt, CRW, Gly, LL	104	193	255	224	16.7
Legacy Seeds	LC541-22	Bt, CRW, Gly, LL	104	193	239	216	16.7
Legacy Seeds	LC551-22	Bt, CRW, Gly, LL	105	218	267	243	17.0
Legacy Seeds	LC564-20	Bt, Gly, LL	105	213	252	232	17.0
Dekalb	DKC56-65	Bt, CRW, Gly, LL	106	193	249	221	17.2
104 to 106 RM averages:				**208**	**257**	**233**	**16.3**
Later than 106 RM entries							
Dyna-Gro	D48VC84	Bt, Gly	108	166	280	223	16.8
DenBesten	DB32-07	Conventional	107	162	258	210	17.1
AgriGold	A639-70STXRIB	Bt, CRW, Gly, LL	109	190	254	222	17.2
Dairyland Seed	DS-5144Q	Bt, CRW, Gly, LL	111	201	252	227	17.3
Dekalb	DKC59-81	Bt, CRW, Gly, LL	109	214	267	240	17.5
Dairyland Seed	DS-4878Q	Bt, CRW, Gly, LL	108	207	247	227	17.6
Legacy Seeds	LC594-21	Bt, Gly	109	217	277	247	17.7
Viking	85-09	Conventional	109	233	278	255	17.8
Dairyland Seed	DS-4917AM	Bt, Gly, LL	109	223	264	243	18.0
Becks Hybrids	5864AM	Bt, Gly, LL	108	219	275	247	18.1
AgriGold	A639-40VT2RIB	Bt, Gly	109	226	266	246	18.9
AgriGold	A641-85STX	Bt, CRW, Gly, LL	111	207	255	231	20.3
Later than 106 RM averages:				**205**	**264**	**235**	**17.9**
Southern locations, late maturity averages:				**207**	**260**	**233**	**17.0**
LSD (0.20)				**16**	**15**	**11**	**0.6**

Table 5. Early maturity entries, central locations, 2022.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Hutchinson	Morris	Rosemount	Average Across Locations Bu/Acre	% Moisture
95 and earlier RM entries								
Dekalb	DKC42-64	Bt, CRW, Gly, LL	92	125	194	190	169	14.9
Anderson Seeds	7865	Conventional	95	111	229	214	185	15.3
Dairyland Seed	DS-3477AM	Bt, Gly, LL	95	139	246	157	180	15.3
Viking	42-92	Conventional	92	130	236	147	171	15.3
Dairyland Seed	DS-3203AM	Bt, Gly, LL	92	103	220	171	165	15.5
Legacy Seeds	LC451-21	Bt, Gly	94	122	231	170	174	15.5
Dekalb	DKC45-74	Bt, CRW, Gly, LL	95	128	228	190	182	15.6
Enestvedt Seed Co	E621	Conventional	94	98	244	174	172	15.6
Dekalb	DKC44-97	Bt, CRW, Gly, LL	94	164	231	217	204	15.7
95 RM and earlier averages:				**125**	**229**	**181**	**178**	**15.4**
96 to 98 RM entries								
Dyna-Gro	D36VC66	Bt, Gly	96	80	230	183	164	15.0
Dairyland Seed	DS-3601AM	Bt, Gly, LL	96	158	229	189	192	15.3
Anderson Seeds	726VT2P	Bt, Gly	98	111	222	206	180	15.3
Legacy Seeds	LC482-21	Bt, Gly	96	105	233	196	178	15.4
Viking	52-96	Conventional	96	112	232	187	177	15.4
Enestvedt Seed Co	E658	Conventional	96	97	244	200	180	15.8
Dekalb	DKC48-34	Bt, CRW, Gly, LL	98	106	239	212	186	15.8
Dekalb	DKC47-84	Bt, CRW, Gly, LL	97	159	216	188	188	15.9
Anderson Seeds	746SRC	Bt, CRW, Gly, LL	98	117	212	124	151	15.9
Viking	44-98	Conventional	98	101	237	158	165	16.1
AgriGold	A628-34VT2	Bt, Gly	98	96	243	175	171	16.2
Dairyland Seed	DS-3727AM	Bt, Gly, LL	97	126	215	188	183	16.4
Legacy Seeds	LC474-20	Bt, Gly	97	122	239	155	172	16.8
AgriGold	A628-16VT2RIB	Bt, Gly	98	126	253	156	178	17.3
96 to 98 RM averages:				**116**	**232**	**180**	**176**	**15.9**
Central locations, early maturity averages:				**119**	**230**	**180**	**177**	**15.7**
LSD (0.20)				**18**	**20**	**30**	**15**	**0.5**

Table 6. Late maturity entries, central locations, 2022.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Hutchinson	Morris	Rosemount	Average Across Locations Bu/Acre	% Moisture
98 to 101 RM entries								
Dekalb	DKC50-87	Bt, CRW, Gly, LL	100	165	224	214	201	15.7
Legacy Seeds	LC-4248	Bt, CRW, Gly, LL	100	127	246	159	177	16.2
Dekalb	DKC49-24	Bt, CRW, Gly, LL	99	167	246	206	206	16.2
Enestvedt Seed Co	E672	Conventional	100	83	221	168	157	16.3
Dairyland Seed	DS-4014Q	Bt, CRW, Gly, LL	100	148	225	168	180	16.4
Anderson Seeds	681SRC	Bt, CRW, Gly, LL	100	161	222	165	183	16.5
Viking	52-00	Conventional	100	141	237	209	195	16.5
Legacy Seeds	LC511-21	Bt, CRW, Gly, LL	101	156	229	232	205	16.8
Anderson Seeds	681VT2P	Bt, Gly	100	104	237	151	164	16.9
DenBesten	DB33-99	Conventional	99	116	237	127	160	17.0
Dairyland Seed	DS-3959Q	Bt, CRW, Gly, LL	99	158	214	197	190	17.5
AgriGold	A630-04VT2	Bt, Gly	100	123	249	185	186	17.7
99 to 101 RM and earlier averages:				**137**	**232**	**182**	**184**	**16.6**
Later than 101 RM entries								
Anderson Seeds	507R	Gly	102	99	251	194	181	16.1
DenBesten	DB32-02	Conventional	102	91	239	177	169	16.3
Enestvedt Seed Co	E539	Conventional	103	89	259	143	164	16.3
Dekalb	DKC52-18	Bt, CRW, Gly, LL	102	134	222	151	169	16.9
Dairyland Seed	DS-4219AM	Bt, Gly, LL	102	165	227	155	182	17.2
Legacy Seeds	LC554-21	Bt, Gly	104	106	246	176	176	17.3
Dyna-Gro	D44SS54	Bt, CRW, Gly, LL	104	160	239	152	184	17.7
Anderson Seeds	5904	Conventional	104	99	215	171	162	17.7
Dairyland Seed	DS-4510Q	Bt, CRW, Gly, LL	105	145	241	175	187	17.7
Dekalb	DKC56-65	Bt, CRW, Gly, LL	106	164	253	155	191	18.2
AgriGold	A633-14STXRIB	Bt, CRW, Gly, LL	103	173	163	101	146	18.5
Later than 101 RM averages:				**130**	**232**	**159**	**174**	**17.3**
Central locations, late maturity averages:				**134**	**232**	**171**	**179**	**16.9**
LSD (0.20)				**28**	**24**	**34**	**16**	**1.0**

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We show LSD values with a 0.2 alpha level, which means that when two entries differ in yield by the LSD value or more one can be 80 percent confident that the two entries differ in yield potential. The higher-yielding one is the better entry from the yield standpoint. If the yield difference between two entries is less than the LSD, the two entries probably do not differ significantly in yield potential. ✻

Table 2. Individual Trial Information, 2022.

Location	Cooperators	Previous Crop	Planting Date	Harvest Date
Lamberton	Steve Quiring	Soybeans	May 23	Oct 20
Rochester	Ryan Miller	Soybeans	May 13	Abandoned
Waseca	Tom Hoverstad	Soybeans	May 6	Oct 24
Hutchinson	School Dist #423	Corn	June 2	Nov 7
Morris	Curt Reese	Soybeans	May 24	Nov 3
Rosemount	Gerry Holz	Soybeans	May 10	Oct 21
Crookston	Mike Leiseth	Wheat	May 26	Oct 11
Rothsay	Troy Larson	Soybeans	May 24	Oct 25
Staples	Hannah Swartzentruber	Soybeans	May 19	Oct 25

Corn Grain

Planting Rate and Date

Bushel Weight, Pounds.....56

Planting Rate, Seeds/Acre....35,000

Planting Date.....May 6-June 2

Table 7. Northern locations, 2022.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Crookston	Rothsay	Staples	Average Across Locations Bu/Acre	% Moisture
86 and earlier RM entries								
REA Hybrids	2B851	Bt, Gly	85	171	224	212	202	15.9
Viking	77-83	Conventional	83	157	214	179	183	16.4
REA Hybrids	83B33	Bt, Gly	83	171	203	204	193	16.5
REA Hybrids	86A94	Bt, CRW, Gly, LL	86	169	217	230	205	16.7
DenBesten	DB31-80	Conventional	80	141	147	189	159	17.0
REA Hybrids	2B863	Bt, Gly	86	170	203	207	193	18.1
DenBesten	DB31-83	Conventional	83	159	162	203	175	18.7
86 and earlier RM entry averages:				**163**	**196**	**203**	**187**	**17.0**
87 to 91 RM entries								
REA Hybrids	3B903	Bt, Gly	90	208	235	248	230	16.4
AgriGold	A620-82VT2RIB	Bt, Gly	90	188	230	214	210	16.8
AgriGold	A619-06RR	Gly	89	178	221	219	206	17.1
Dairyland Seed	DS-3022AM	Bt, Gly, LL	90	192	232	239	221	17.3
Dairyland Seed	DS-2919AM	Bt, Gly, LL	89	150	230	246	209	17.7
Legacy Seeds	LC414-21	Bt, Gly	91	195	228	204	209	17.7
Viking	80-89	Conventional	89	162	213	205	193	17.8
DenBesten	DB31-88	Conventional	88	147	202	190	180	18.6
DenBesten	DB31-90	Conventional	90	146	191	193	177	19.4
87 to 91 RM entry averages:				**174**	**220**	**217**	**204**	**17.7**
92 and later RM entries								
Enestvedt Seed Co	E612	Conventional	92	197	249	213	220	16.9
REA Hybrids	4B944	Bt, Gly	94	153	229	230	204	17.6
Dairyland Seed	DS-3477AM	Bt, Gly, LL	95	186	243	223	217	17.7
Viking	42-92	Conventional	92	182	235	210	209	17.7
Dekalb	DKC42-64	Bt, CRW, Gly, LL	92	172	218	199	196	17.7
AgriGold	A622-65	Conventional	92	176	190	204	190	17.7
Dekalb	DKC44-97	Bt, CRW, Gly, LL	94	200	242	237	226	18.1
Dairyland Seed	DS-3203AM	Bt, Gly, LL	92	193	218	231	214	18.3
Legacy Seeds	LC451-21	Bt, Gly	94	210	241	211	221	18.3
REA Hybrids	92B10	Bt, Gly	92	211	235	236	227	18.4
REA Hybrids	4B958	Bt, Gly	95	187	224	224	212	19.1
REA Hybrids	95A36	Bt, CRW, Gly, LL	95	100	214	211	175	20.3
Dekalb	DKC45-74	Bt, CRW, Gly, LL	95	168	255	231	218	20.3
Dekalb	DKC47-84	Bt, CRW, Gly, LL	97	187	239	182	203	20.4
92 and Later RM entry averages:				**180**	**231**	**217**	**209**	**18.5**
Northern locations averages:				**174**	**219**	**214**	**203**	**17.9**
LSD (0.20)				**23**	**20**	**17**	**13**	**1.1**

2022 Corn Silage trials

The Minnesota Hybrid Corn Silage Evaluation Program evaluates silage potential of the corn hybrids in Minnesota. The goal of the program is to provide unbiased forage yield and forage quality information for educational and marketing programs.

The program is financed in part by entry fees from private seed companies that choose to enter hybrids for testing, which are listed below. Results are presented from the two corn silage performance trials, Southeast (SE) located in Rochester; and Central (CE) located in Hutchinson. Entries from the southeast and central sites are also evaluated at Waseca in trials designated as Waseca SE and Waseca CE. Trials at each location were split into early and late corn hybrid maturities, to facilitate harvesting the corn silage at about 65 percent whole plant moisture.

Test Procedures

Plots were established at each test site in a randomized complete block design with four replications.

Planting and harvesting dates were (location, planting date, early harvest, and late harvest):

- Waseca CE, May 6, Sept 7, Sept 13
- Waseca SE, May 6, Sept 13, Sept 15
- Rochester SE, May 13, Sept 16, Sept 19
- Hutchinson CE, June 2, Abandoned due to dry conditions

The Hutchinson site sufffered from drought conditions and plots were too dry to get meaningful silage data and harvest was abandoned.

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Companies Participating in 2022 Hybrid Corn Silage Performance Trials.

AgriGold Hybrids	www.agrigold.com
Bayer Crop Science	www.dekalbasgrowdeltapine.com
Dairyland Seed	www.dairylandseed.com
Dakota's Best Seed	www.dakotasbestseedllc.com
Golden Harvest	www.goldenharvestseeds.com
Legacy Seeds	www.legacyseeds.com
Viking Seed	www.alseed.com

Table 1. Relative maturity (RM), whole plant moisture, dry matter (DM), silage yield and quality traits for SE zone early RM corn hybrids planted at Rochester, MN in 2022.

No	Source	Brand	Traits[1]	RM	Moisture %	Yield, Tons/Acre[2] Silage	DM
1	Dairyland Seed	HiDF-4073Q	Bt, CRW, Gly, LL	100	64.6	34.8	12.3
2	Dairyland Seed	HiDF-4545Q	Bt, CRW, Gly, LL	105	67.8	37.9	12.2
3	Legacy Seeds	LC-4248	Bt, CRW, Gly, LL	100	65.5	34.1	11.7
4	Dekalb	DKC56-65	Bt, CRW, Gly, LL	106	66.2	33.9	11.5
5	Dairyland Seed	HiDF-3855Q	Bt, CRW, Gly, LL	98	63.6	31.1	11.3
6	Dekalb	DKC52-18	Bt, CRW, Gly, LL	102	65.4	32.3	11.2
7	Legacy Seeds	LC511-21	Bt, CRW, Gly, LL	101	66.0	32.6	11.1
8	Dekalb	DKC50-87	Bt, CRW, Gly, LL	100	63.5	29.8	10.9
9	Legacy Seeds	LC555-21	Bt, CRW, Gly, LL	105	67.2	32.7	10.8
			Mean		**65.5**	**33.2**	**11.4**
			LSD (0.20)		**1.7**	**2.6**	**1.1**

[1]Bt,CRW,Gly,LL, traits contain genes for resistance to European corn borer, Corn rootworm, glyphosate herbicide, and Liberty herbicide, respectively.
[2]Silage yield is whole-plant corn yield at harvest moisture, DM is whole plant corn yield at 100% dry matter.

Table 2. Relative maturity (RM), whole plant moisture, dry matter (DM), silage yield, and quality traits for SE zone late RM corn hybrids planted at Rochester, MN in 2022.

No	Source	Brand	Traits[1]	RM	Moisture %	Yield, Tons/Acre[2] Silage	DM
1	Legacy Seeds	LC623-21	Bt, CRW, Gly, LL	112	67.0	39.5	13.2
2	Golden Harvest	G13Z50-5122	Bt, CRW, Gly, LL	113	67.3	39.1	13.2
3	Legacy Seeds	LC594-21	Bt, Gly	109	67.2	38.1	12.5
4	Golden Harvest	G12S75-5122	Bt, CRW, Gly, LL	112	66.8	33.5	11.2
5	Dekalb	DKC59-81	Bt, CRW, Gly, LL	109	64.7	31.5	11.1
6	Dairyland Seed	HiDF-5202Q	Bt, CRW, Gly, LL	112	70.3	36.8	11.1
7	AgriGold Hybrids	A645-16STXRIB	Bt, CRW, Gly, LL	115	66.6	32.8	11.0
8	Golden Harvest	G07G73-5122	Bt, CRW, Gly, LL	107	65.4	30.4	10.6
9	Dairyland Seed	HiDF-4999Q	Bt, CRW, Gly, LL	109	70.6	35.5	10.3
10	AgriGold Hybrids	A639-40VT2RIB	Bt, Gly	109	65.6	29.9	10.3
11	Golden Harvest	G10D21-5332	Bt, CRW, Gly, LL	110	64.6	29.0	10.3
12	Dairyland Seed	HiDF-5000Q	Bt, CRW, Gly, LL	110	69.1	32.3	10.0
13	AgriGold Hybrids	A639-70STXRIB	Bt, CRW, Gly, LL	109	67.4	30.3	9.8
14	AgriGold Hybrids	A640-65-5222EZ	Bt, CRW, Gly, LL	110	66.9	29.0	9.6
15	AgriGold Hybrids	A641-85STX	Bt, CRW, Gly, LL	111	66.0	28.1	9.5
			Mean		**67.0**	**33.1**	**10.9**
			LSD (0.20)		**1.8**	**3.5**	**1.4**

[1]Bt,CRW,Gly,LL, traits contain genes for resistance to European corn borer, Corn rootworm, glyphosate herbicide, and Liberty herbicide, respectively.
[2]Silage yield is whole-plant corn yield at harvest moisture, DM is whole plant corn yield at 100% dry matter.

Table 3. Relative maturity (RM), whole plant moisture, dry matter (DM), silage yield, and quality traits for SE zone early RM corn hybrids planted at Waseca, MN in 2022.

No.	Source	Brand	Traits[1]	RM	Moisture %	Yield, Tons/Acre[2] Silage	DM
1	Legacy Seeds	LC-4248	Bt, CRW, Gly, LL	100	57.9	26.8	11.3
2	Dairyland Seed	HiDF-4545Q	Bt, CRW, Gly, LL	105	61.8	29.3	11.2
3	Dekalb	DKC52-18	Bt, CRW, Gly, LL	102	57.6	26.4	11.2
4	AgriGold	A636-16	Conventional	106	63.5	30.6	11.1
5	Dekalb	DKC50-87	Bt, CRW, Gly, LL	100	56.7	25.7	11.1
6	Dairyland Seed	HiDF-3855Q	Bt, CRW, Gly, LL	98	56.9	25.5	11.0
7	Dairyland Seed	HiDF-4073Q	Bt, CRW, Gly, LL	100	57.4	25.0	10.7
8	Legacy Seeds	LC511-21	Bt, CRW, Gly, LL	101	61.0	26.5	10.3
9	DenBesten	DB42-06-OR	Conventional	106	64.3	28.4	10.1
10	Viking	51-04	Conventional	104	60.2	25.4	10.1
11	Dekalb	DKC56-65	Bt, CRW, Gly, LL	106	60.2	23.8	9.5
12	Legacy Seeds	LC555-21	Bt, CRW, Gly, LL	105	59.8	23.6	9.5
			Mean		**59.8**	**26.4**	**10.6**
			LSD (0.20)		**2.0**	**2.3**	**1.1**

[1]Bt,BL,CRW,GLY,LL,WBC traits contain genes for resistance to European corn borer, broad spectrum lepidopteran, Corn rootworm, glyphosate herbicide, Liberty herbicide and Western bean cutworm, respectively.
[2]Silage yield is whole-plant corn yield at harvest moisture, DM is whole plant corn yield at 100% dry matter.

Table 4. Relative maturity (RM), whole plant moisture, dry matter (DM), silage yield, and quality traits for SE zone late RM corn hybrids planted at Waseca, MN in 2022.

No.	Source	Brand	Traits[1]	RM	Moisture %	Yield, Tons/Acre[2] Silage	DM
1	Golden Harvest	G12S75-5122	Bt, CRW, Gly, LL	112	61.7	32.7	12.6
2	Dairyland Seed	HiDF-5202Q	Bt, CRW, Gly, LL	112	61.7	32.6	12.5
3	Legacy Seeds	LC623-21	Bt, CRW, Gly, LL	112	61.7	31.2	11.9
4	Dakotas Best Seed	DB39-10	Conventional	110	60.2	29.8	11.9
5	Albert Lea Seed	23-11GS	Conventional	111	62.1	30.9	11.7
6	Albert Lea Seed	O.82-14	Conventional	114	63.9	32.8	11.7
7	AgriGold Hybrids	A640-65-5222EZ	Bt, CRW, Gly, LL	110	62.0	30.2	11.5
8	AgriGold Hybrids	A639-40VT2RIB	Bt, Gly	109	57.2	26.3	11.3
9	AgriGold Hybrids	A641-85STX	Bt, CRW, Gly, LL	111	60.5	28.3	11.2
10	AgriGold Hybrids	A645-16STXRIB	Bt, CRW, Gly, LL	115	63.2	30.3	11.1
11	Golden Harvest	G13Z50-5122	Bt, CRW, Gly, LL	113	61.3	28.7	11.1
12	Legacy Seeds	LC594-21	Bt, Gly	109	60.0	27.4	11.0
13	Dairyland Seed	HiDF-4999Q	Bt, CRW, Gly, LL	109	62.4	29.2	11.0
14	Dairyland Seed	HiDF-5000Q	Bt, CRW, Gly, LL	110	64.8	30.3	10.7
15	Golden Harvest	G10D21-5332	Bt, CRW, Gly, LL	110	61.9	27.9	10.6
16	Golden Harvest	G07G73-5122	Bt, CRW, Gly, LL	107	60.4	26.8	10.6
17	Dekalb	DKC59-81	Bt, CRW, Gly, LL	109	62.2	27.5	10.4
18	AgriGold Hybrids	A639-70STXRIB	Bt, CRW, Gly, LL	109	62.5	27.1	10.1
19	Albert Lea Seed	48-08	Conventional	108	59.2	20.3	8.3
			Mean		**61.5**	**29.0**	**11.1**
			LSD (0.20)		**2.0**	**2.9**	**1.3**

[1]Bt,CRW,Gly,LL, traits contain genes for resistance to European corn borer, corn rootworm, glyphosate herbicide, and Liberty herbicide, respectively.
[2]Silage yield is whole-plant corn yield at harvest moisture, DM is whole plant corn yield at 100% dry matter.

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Hybrid entries were planted at 35,000 seeds per acre with a 30-inch row spacing. Plant nutrients and herbicides were applied according to University of Minnesota recommendations.

Plots were harvested and whole-plant herbage sampled for determination of dry matter content and forage quality.

Test sites were harvested when the average whole-plant moisture across entries was estimated to be 65 percent.

Results Provided

Tables 1-6 summarize hybrid yield and forage quality results from Hutchinson, Rochester, and Waseca.

Moisture content, whole-plant dry matter (DM) yield, and silage yield at harvest moisture are listed. Hybrids are ranked in descending order of milk yield per acre (Milk Yield, lb/acre).

Genetic trait information is supplied by companies entered in the hybrid corn silage performance trials.

Forage quality data were not yet available at the time of printing this publication. It will be available at varietytrials.umn.edu/corn-silage.

Whole-plant forage quality characteristics tested include moisture (percent), crude protein (CP, percent DM), neutral detergent fiber (NDF, percent DM), undigestible NDF at 240 hour (uNDF, percent NDF), total tract NDF digestibility (TTNDFD, percent of NDF), starch concentration (percent DM), and in situ rumen degradable starch at 7 hours (StarchD, percent of starch). All forage quality variables were predicted using Near-Infrared Reflectance Spectroscopy calibrated using laboratory procedures (Rock River Laboratory; https://rockriverlab.com).

Milk production potential per ton (lb milk/ton forage) and per acre (lb milk/acre) of forage was calculated using the MILK2006 model developed by the University of Wisconsin.

MILK2006 approximates animal performance based on a standard cow weight and milk production level (1,350 lb body weight and 90 lb/day at 3.8 percent fat).

For MILK2006 predictions, we assumed that kernel processing occurred. Milk production (lb milk/ton and lb milk/acre) values

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can be used as a quick reference for comparison of hybrids within test locations.

How to Use Results

NDF is a negative indicator of forage intake potential; higher NDF concentration generally implies lower intake potential. NDFD estimates digestibility of the NDF fiber fraction.

Starch content, a grain component, is positively associated with overall forage digestibility because of its high digestibility. Relatively higher starch concentrations generally predict greater animal performance potential. TTNDFD (total tract NDF digestibility) is an advanced research validated model to predict forage digestibility in dairy cattle rations. It combines both rate of digestion and indigestibility of NDF. Milk yield per acre represents the combined effects of silage yield and quality.

Corn hybrids differed in yield, forage quality parameters and milk production potential at all sites. Means and least significant difference (LSD) values at the 20 percent probability level are shown for each parameter. Where the difference between the two hybrids for a particular yield or quality trait is greater than the LSD value, there is a 80 percent probability that there is a significant difference between the two hybrids for that parameter (i.e., moisture, yield, quality concentration or milk production). A difference less than the LSD value probably is due to environmental factors.

Figures 1-8 summarize the relationship between silage dry matter yield and milk per ton for test sites at Hutchinson, Rochester, and Waseca. The figures also highlight those entries at each site that have a combination of high silage dry matter yields and milk production per ton.

Authors and Researchers

Thomas Hoverstad, Wade Ihlenfeld and Craig Sheaffer. ✻

Location	Planting Date	Early Harvest	Late Harvest
Waseca CE	May 6	Sept 7	Sept 13
Waseca SE	May 6	Sept 13	Sept 15
Rochester SE	May 13	Sept 16	Sept 19
Hutchinson CE	June 2	*Abandoned due to dry conditions*	

Table 5. Relative maturity (RM), whole plant moisture, dry matter (DM), silage yield, and quality traits for Central zone early RM corn hybrids planted at Hutchinson, MN in 2022.

No.	Source	Brand	Traits[1]	RM	Moisture %	Yield, Tons/Acre[2] Silage	DM
1	Golden Harvest	G99A37-5222	Bt, CRW, Gly, LL	99	61.2	28.0	10.9
2	Dairyland Seed	HiDF-4073Q	Bt, CRW, Gly, LL	100	61.5	27.5	10.6
3	Legacy Seeds	LC-4248	Bt, CRW, Gly, LL	100	60.5	26.7	10.6
4	Dekalb	DKC50-87	Bt, CRW, Gly, LL	100	59.6	26.2	10.6
5	Golden Harvest	G99E68-5122	Bt, CRW, Gly, LL	99	62.7	28.1	10.5
6	Dekalb	DKC47-84	Bt, CRW, Gly, LL	97	59.2	25.0	10.2
7	Dairyland Seed	HiDF-3855Q	Bt, CRW, Gly, LL	98	60.2	25.2	10.0
8	Dekalb	DKC49-24	Bt, CRW, Gly, LL	99	57.8	23.4	9.8
9	AgriGold	A630-04VT2	Bt, Gly	100	62.7	25.5	9.5
10	Viking	O.62-93	Conventional	93	59.9	23.6	9.5
11	Viking	42-92	Conventional	92	55.9	20.9	9.2
12	DenBesten	DB31-90	Conventional	90	54.6	17.2	7.8
			Mean		**59.6**	**24.8**	**9.9**
			LSD (0.20)		**1.7**	**1.9**	**0.7**

[1]Bt,CRW,Gly,LL, traits contain genes for resistance to European corn borer, corn rootworm, glyphosate herbicide, and Liberty herbicide, respectively.
[2]Silage yield is whole-plant corn yield at harvest moisture, DM is whole plant corn yield at 100% dry matter.

Table 6. Relative maturity (RM), whole plant moisture, dry matter (DM), silage yield, and quality traits for Central zone late RM corn hybrids planted at Hutchinson, MN in 2022.

No.	Source	Brand	Traits[1]	RM	Moisture %	Yield, Tons/Acre[2] Silage	DM
1	Dairyland Seed	HiDF-5000Q	Bt, CRW, Gly, LL	110	62.1	30.5	11.6
2	Dairyland Seed	HiDF-4545Q	Bt, CRW, Gly, LL	105	62.6	30.2	11.2
3	Legacy Seeds	LC511-21	Bt, CRW, Gly, LL	101	57.2	26.1	11.2
4	Golden Harvest	G07G73-5122	Bt, CRW, Gly, LL	107	61.5	28.5	11.0
5	Dairyland Seed	HiDF-4999Q	Bt, CRW, Gly, LL	109	62.8	28.9	10.7
6	Legacy Seeds	LC-5217	Bt, Gly	102	56.4	24.4	10.6
7	Legacy Seeds	LC555-21	Bt, CRW, Gly, LL	105	58.7	24.8	10.3
8	AgriGold	A633-14STXRIB	Bt, CRW, Gly, LL	103	59.6	25.4	10.3
9	Golden Harvest	G02K39-5122	Bt, CRW, Gly, LL	102	57.5	23.7	10.1
10	AgriGold	A631-90	Bt, Gly	101	57.8	23.8	10.1
11	Dairyland Seed	HiDF-3802Q	Bt, CRW, Gly, LL	102	60.9	25.6	10.0
12	Dekalb	DKC56-65	Bt, CRW, Gly, LL	106	58.6	24.2	10.0
13	Dekalb	DKC52-18	Bt, CRW, Gly, LL	102	58.2	23.6	9.9
14	Viking	O.69-01	Bt, CRW, Gly, LL	101	59.7	24.3	9.8
15	Viking	51-04	Bt, CRW, Gly, LL	104	56.7	22.4	9.7
			Mean		**59.3**	**25.8**	**10.4**
			LSD (0.20)		**1.8**	**2.3**	**1.0**

[1]Bt,CRW,Gly,LL, traits contain genes for resistance to European corn borer, corn rootworm, glyphosate herbicide, and Liberty herbicide, respectively.
[2]Silage yield is whole-plant corn yield at harvest moisture, DM is whole plant corn yield at 100% dry matter.

2022 Oat field crop trial results

Oat varieties were sown in trials plots in 2022 at Becker Lamberton, Le Center and Waseca in Southern Minnesota (south of I-94). In northern Minnesota (north of I-94), trials were conducted in Crookston, Fergus Falls, Roseau and Stephen. Yield performance from single years should be viewed cautiously as environmental variability may significantly affect the yields in single locations or years. Maturity, height, and test weight data are presented as statewide averages from 2020-22 except where noted. Straw strength data is also a statewide average from the same period, but only from locations where lodging was present. Grain protein, oil and beta-glucan content are presented based on data from at least four trials from 2020. In addition, entries were evaluated for disease resistance to crown rust, barley yellow dwarf virus (BYDV), and loose smut in specific inoculated nurseries. The severe drought in 2021 prevented crown rust development in our screening nursery, so ratings are based on data from 2020 and 2022.

Variety Selection

While yield is an important selection criterion, grain quality and disease resistance should also be considered. Millers have grain quality and variety preferences which can be considered if that is the intended target. Crown rust continues to be a major limiting factor to oat production in Minnesota that must be managed to achieve optimal yield. Rust in all yield trials was managed through treatment with a propiconazole-based fungicide when the flag leaf was fully extended (Feekes 9) to evaluate the yield potential without disease infection. All disease scores are on a "1-9" scale where "1" is very resistant and "9" is very susceptible. Crown rust resistance was evaluated in the Buckthorn Nursery in St. Paul by the USDA-ARS

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Table 1. Origin and agronomic characteristics of oat varieties in Minnesota in multiple-year comparisons (2020-2022).

Entry	Origin	Year of Release	Legal Status	Seed Color	Days to Heading (days)	Plant Height (inches)	Straw Strength[4] (1-9)	Test Weight (lbs/bu)	Grain Protein[5,6] (%)	Grain Oil[5,6] (%)	Grain Beta-glucan[5,6] (%)
Antigo	WI	2017	PVP(94)	Yellow	53.7	29.2	2.0	36.6	14.5	7.3	4.3
CS Camden[1]	Meridian Seeds	2013	PVP(94)	White	59.8	30.0	2.1	31.6	12.4	6.6	4.4
Deon	MN	2014	PVP(94)	Yellow	59.9	32.8	2.9	35.0	12.2	7.1	3.8
Esker 2020	WI	2020	PVP(94)	Yellow	55.4	29.9	2.2	32.4	12.6	6.2	4.2
George[2]	WI	2021	Pending	Yellow	62.6	33.8	4.0	32.0	-	-	-
Hayden	SD	2015	PVP(94)	White	58.6	32.2	2.9	34.8	11.9	7.3	4.5
MN Pearl	MN	2018	PVP(94)	White	57.8	31.5	4.2	35.0	11.2	7.4	4.1
ND Heart	ND	2020	PVP(94)	White	57.9	32.0	3.5	34.2	13.9	6.7	5.0
Reins	IL	2016	PVP(94)	White	54.1	24.2	0.9	35.7	13.8	6.3	4.2
Rushmore	SD	2020	PVP(94)	White	56.0	31.0	2.0	36.4	13.2	6.2	4.1
Saddle	SD	2018	PVP(94)	White	53.5	27.9	1.0	33.5	13.5	5.9	4.0
SD Buffalo	SD	2021	NA	White	56.5	31.7	2.3	34.8	12.6	7.2	4.5
Shelby 427	SD	2011	PVP(94)	White	55.1	31.8	2.2	35.7	12.5	7.2	4.1
Streaker[3]	SD	2016	PVP(94)	Hulless	56.1	31.1	4.2	44.0	13.3	7.4	4.2
Sumo	SD	2017	PVP(94)	White	51.6	29.7	2.0	35.0	14.5	6.0	3.8
Warrior	SD	2019	PVP(94)	White	56.6	29.5	1.4	35.0	12.8	6.5	4.1
WIX10305-4	WI	2022	NA	Yellow	59.8	29.3	1.4	32.0	14.6	6.8	4.4

[1]Line developed by Lantmannen Seed in Sweden.
[2]Line tested in 2021 and 2022.
[3]Hulless oat.
[4]1-9 scale where 1=most resistant, 9=most susceptible
[5]12% grain moisture.
[6]Trait measured for 3 locations in 2020.

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using an exceptionally aggressive crown rust population. The most economical way of controlling crown rust is through resistant varieties; however, application of fungicide to a variety with rating of "4" or greater is prudent if crown rust is present in the lower canopy at Feekes 9.

Other important diseases include BYDV and smut, which were evaluated in inoculated nurseries at the University of Illinois and the University of Minnesota, respectively. Varieties susceptible to BYDV (rating > 3) should be selected with caution particularly in Southern Minnesota, where aphid disease transmitters are more common early in the season. A seed treatment and certified seed should be used to manage smut. Disease resis-

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Table 2. Disease characteristics of oat varieties.

Entry	Crown Rust[2] (1-9)	Loose Smut[3] (1-9)	BYDV[4] (1-9)
Antigo	4	3	4
CS Camden	5	2	4
Deon	5	1	4
Esker 2020	4	1	3
George[1]	4	3	-
Hayden	5	2	3
MN Pearl	3	1	4
ND Heart[1]	4	6	4
Reins	5	1	4
Rushmore	4	2	4
Saddle	4	1	4
SD Buffalo	3	2	-
Shelby 427	5	1	4
Streaker	4	3	4
Sumo	4	2	4
Warrior	3	2	4
WIX10305-4	4	2	-

[1]Line tested in 2021 and 2022.
[2]Tested in 2020, 2021, and 2022 with a mixed race population of crown rust; 1 = most resistant, 9 = most susceptible. Dta is from 2020 and 2022 only; 2021 trial failed due to drought
[3]Tested in 2020 and 2021; 1 = most resistant, 9 = most susceptible. Dta based on 2020 trial; 2021 trial had very low disease pressure due to drought.
[4]Tested in 2021; 1 = most resistant, 9 = most susceptible.

Table 3. Relative grain yield of oat varieties in Minnesota in single-year (2022) and multiple-year comparisons (2020-2022).

Entry	Northern Minnesota			Southern Minnesota			Statewide		
	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr
	% of mean								
Antigo	82	83	84	93	94	94	87	88	89
CS Camden	112	111	111	105	104	102	109	108	107
Deon	107	110	108	105	107	107	106	108	108
Esker 2020	102	101	100	109	106	105	105	104	102
George[1]	95	98	-	99	96	-	97	97	-
Hayden	111	110	112	108	111	110	110	110	111
MN Pearl	114	114	114	98	102	107	107	108	111
ND Heart	90	94	97	94	93	94	92	94	95
Reins	96	91	94	87	91	94	92	91	94
Rushmore	108	107	110	101	102	106	105	105	108
Saddle	102	98	97	99	95	96	100	97	96
SD Buffalo	113	111	111	110	109	110	111	110	110
Shelby 427	89	92	93	94	99	98	91	95	96
Streaker[2]	78	77	77	74	76	76	76	76	77
Sumo	89	88	83	91	92	93	90	90	88
Warrior	107	108	107	104	103	103	106	105	105
WIX10305-4	106	108	101	125	117	105	115	112	103
Mean (Bu/Acre)	**172**	**141**	**141**	**118**	**106**	**113**	**142**	**122**	**126**
LSD (0.05)	**20.3**	**13.3**	**11.1**	**16.1**	**10.4**	**9.2**	**13.4**	**8.5**	**7.3**
# of Environments	**4**	**8**	**12**	**5**	**10**	**15**	**9**	**18**	**27**

[1]Line was tested in 2022 and 2021 only.
[2]Hulless oat.

Table 4. Relative grain yield of oat varieties in Northern Minnesota locations in single-year (2022) and multiple-year comparisons (2020-2022).

Entry	Crookston		Fergus Falls		Roseau		Stephen	
	2022	3 Yr	2022	2 Yr	2022	3 Yr	2022	3 Yr
	% of mean							
Antigo	88	91	61	81	82	76	94	87
CS Camden	104	112	112	112	115	104	118	116
Deon	109	107	107	100	112	118	98	108
Esker 2020	107	108	90	91	112	103	96	97
George[1]	88	-	104	-	94	-	98	-
Hayden	110	113	116	113	111	113	106	107
MN Pearl	114	113	124	118	114	113	106	113
ND Heart	97	102	94	98	87	92	82	94
Reins	98	93	84	92	94	95	105	97
Rushmore	104	103	102	107	113	116	112	115
Saddle	100	93	93	92	101	102	111	101
SD Buffalo	113	109	113	111	111	113	113	112
Shelby 427	88	93	81	93	86	89	97	98
Streaker[2]	76	73	89	91	77	76	72	72
Sumo	80	78	97	80	84	88	97	87
Warrior	113	107	135	121	97	105	90	98
WIX10305-4	110	106	97	100	110	98	105	99
Mean (Bu/Acre)	**187**	**157**	**135**	**124**	**189**	**136**	**177**	**149**
LSD (0.05)[3]	**29.8**	**20.2**	**27.4**	**24.8**	**28.5**	**21.7**	**30.6**	**24.1**

[1]Line was tested in 2022 and 2021 only.
[2]Hulless oat.
[3]A large LSD suggests large variability from year to year for the specific location.

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tance may be a driving factor if pesticides are not economical or if the intended production system is organic.

PVP Status

The U.S. Plant Variety Protection Act (PVP) status is listed for all varieties tested. PVP(94) notation indicates that seed of that variety may not be sold by a grower without the permission of the variety's owner. If the PVP is pending, consider the variety as having PVP(94) protection.

Authors and Researchers

This report is authored by: Kevin Smith, Ruth Dill-Macky, Dimitri von Ruckert, Karen Beaubien and Jochum Wiersma.

Dimitri von Ruckert, Curtis Reese, Mike Leiseth, Steve Quiring and Donn Vellekson supervised and carried out test plot establishment and management. ✻

Oat
Planting Rate and Date

Bushel Weight, Pounds.....32
Seeds/Pound.....16,200
Planting Rate, Pounds/Acre.....80
Planting Rate, Seeds/Sq. Ft.....28
Planting Date.....Early Spring

Table 5. Relative grain yield of oat varieties in Southern Minnesota locations in single-year (2022) and multiple-year comparisons (2020-2022).

	Becker[3]		Lamberton		Le Center		Rochester		St. Paul[4]	Waseca	
Entry	2022	2 Yr	2022	3 Yr	2022	3 Yr	2022	2 Yr	2020	2022	3 Yr
Antigo	110	97	89	91	101	101	86	98	85	78	85
CS Camden	124	118	106	100	105	104	84	85	101	121	120
Deon	86	90	118	114	104	105	115	111	111	93	107
Esker 2020	105	108	109	111	104	97	115	103	102	111	109
George[1]	90	100	103	-	86	-	112	-	-	103	-
Hayden	107	111	116	103	113	113	108	112	120	92	105
MN Pearl	90	95	97	108	97	101	103	102	130	104	119
ND Heart	87	90	101	99	99	98	83	91	92	106	88
Reins	102	97	87	93	95	97	69	86	103	88	97
Rushmore	87	92	95	103	103	109	107	111	100	114	110
Saddle	110	102	94	89	98	100	104	103	98	89	79
SD Buffalo	114	109	103	112	101	103	128	117	106	100	109
Shelby 427	93	100	91	86	96	103	104	106	105	81	91
Streaker[2]	65	67	75	73	81	81	69	73	78	82	82
Sumo	98	97	93	102	94	91	91	93	81	75	89
Warrior	118	112	100	108	104	97	99	100	114	104	98
WIX10305-4	114	114	121	109	121	100	124	107	75	157	114
Mean (Bu/Acre)	**100**	**91**	**125**	**114**	**136**	**130**	**149**	**137**	**126**	**80**	**82**
LSD (0.05)[5]	**21.4**	**19.9**	**19.4**	**21.1**	**27.4**	**16.9**	**28.4**	**22.2**	**13.0**	**16.7**	**19.8**

[1]Line was tested in 2022 and 2021 only.
[2]Hulless oat.
[3]Location was tested in 2022 and 2021.
[4]Line was tested in 2020 only.
[5]A large LSD suggests large variability from year to year for the specific location.

Thank you for reading the 2023 Minnesota Certified Seed Guide!

2022 Soybean field crop trial results

Each year Minnesota Agricultural Experiment Station scientists conduct performance tests of appropriately adapted public and private soybean entries. Companies are charged a fee for each entry they enter to partially cover the costs of conducting these tests. One of the stipulations of the testing program is that the company is marketing or intends to begin marketing the entry in the next growing season. This information is also available electronically at www.soybeans.umn.edu and varietytrials.umn.edu/soybean.

It is hard to generalize the weather of the 2022 growing season across the whole states. Many pockets of southern Minnesota experienced abnormally dry or drought conditions for at least a short window during the season. The most consistently dry area was near the Twin Cities. The variety trials testing location most impacted by drought conditions was Rosemount where yields were reduced. Yield data, however, was still of suitable quality and used in the 2022 report. This year we lost two locations. Thief River Falls was not planted because of excessive rainfall during May and June, preventing us from getting in the field until the end of June, which was too late. Shelly was also lost due to poor stand establishment. This was caused by wet planting conditions followed by a very dry and hot period, dramatically reducing emergence. All other locations experienced good to optimal weather conditions and returned quality yield and compositional data. Our iron deficiency chlorosis nursery experienced strong stress pressure, and thus ratings this year are a little higher than normal and nicely separate the entries.

Locations of 2022 soybean trials.

Tables 1 to 4 provide results from tests of available conventional, special-purpose, and transgenic entries adapted to the far northern, northern, central, and southern production zones. The map shows test locations and zone boundaries. All of these tests were planted between May 10 and June 3 at planting rates of 174,000 seeds/acre.

Herbicides were used as necessary for good weed control. Row spacings were 24 inches at Crookston and 30 inches at all other locations. Plots were machine harvested using a small plot combine.

Table 5 displays results from greenhouse tests conducted by the Nematology Laboratory at the University of Minnesota Southern Research and Outreach Center in Waseca, MN. Plants were grown in soil inoculated with an HG type 7 (race 6) population of soybean cyst nematode in 2021.

To better understand and use the data provided in these tables, please carefully read the following additional information.

Seed Treatments and Transgenic Traits

Entrants were allowed to enter treated seed in 2022. The type of seed treatment, as provided by the originator, is designated as follows:

AC = Acceleron

AMS = Agrishield Max + Saltro

CMV = Cruiser Maxx + Vibrance

CMVC = Cruiser Maxx + Vibrance + Clariva pn

FVM = Fortenza Vibrance Maxx

LI = Lumigen+Ilevo

OPVI = Obvious Plus, Poncho/Votivo+ILeVO

OPVRI = Obvius Plus, Poncho/Votivo, Relenya, ILEVO.

Research indicates that under some conditions seed treatments can affect the final yield. The exact situations are not always clear but when comparing entries note if a seed treatment was used on the seed being tested.

In some tables the transgenic trait is indicated in a separate column using the following designations:

CV = conventional variety (non-transgenic)

E3 = Enlist E3 (glyphosate, glufosinate, and 2,4-D tolerant)

LLGT27 = glyphosate, glufosinate, and HPPD/Group 27 herbicide tolerant

R2-Xt = glyphosate and dicamba tolerant

XF = Xtendflex (dicamba, glyphosate and glufosinate tolerant).

Relative Maturity and Calendar Dates of Maturity

Soybeans are photoperiod sensitive; that is, they respond to changing day length. The actual calendar date of maturity achievement is affected by latitude. Each entry has a narrow range (about 100 miles) of north-south adaptation. Soybean yield and quality are best achieved when physiological maturity occurs before a hard frost. Maturity is determined visually by noting the calendar date when 95 percent of the pods show their genetically programmed mature color. The dates for 2022 are provided in the tables under the column heading "Maturity Date". Harvest dates are typically 7-14 days later depending upon drying conditions. Almost all entries were essentially mature before a hard frost.

Relative maturity ratings are also provided for each entry. These ratings consist of a number for the maturity group designations (000, 00, 0, 1, 2) followed by a decimal and another number, ranging from 0-9, which

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Names and email addresses of seed company representatives that entered varieties into the 2022 trials.

Company	Rep Name	Contact Email
Albert Lea Seed/Viking Seed	Jake Hansen	jake@alseed.com
Anderson Seeds	Kelsey Kenke	kelsey.anderson528@gmail.com
BASF	Nick Weidenbenner	nick.weidenbenner@basf.com
Bayer Crop Science	Harmon Wilts	harmon.wilts@bayer.com
Brushvale Seed, Inc.	Travis Meyer	travis@brushvaleseed.com
Credenz Soybean Seed	Nick Weidenbenner	nick.weidenbenner@basf.com
Dairyland Seed	Rodney Moran	rmoran@dairylandseed.com
GDM Seeds	Grant Schmieg	gschmieg@gdmseeds.com
LG Seeds	Tim Beninga	tim.beninga@lgseeds.com
Minnesota Ag Experiment Station (Minnesota AES)	Roger Wippler	wippl002@umn.edu
Proseed, Inc.	Karmen Hardy	karmen.hardy@proseed.net
Richland IFC, Inc.	Paul Meindl	paul@richlandifc.com
Sevita International	John Van Herk Jr	johnv@sevita.com

Location	2022 Planting Date
Waseca CE	May 6
Becker	May 10
Crookston	May 27
Danvers	June 3
Glyndon	May 25
Lamberton	May 23
Moorhead	May 28
Morris	May 25
Roseau	May 27
Rosemount	May 19
Waseca	May 16

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indicates a ranking within each maturity group. For example, the entry MN0101 indicates a 0.1, making it an early group 0, while MN0901, with a 0.9 rating, is the latest group 0. The values for public entries are developed after observing them for several years in many locations. Relative maturity ratings for private entries in these tables were provided by their originators and were developed in a similar manner.

Yield

Because maturity is a very important attribute, entries are ordered in the tables according to their actual 2022 calendar date of maturity for where maturity date data was available. Otherwise, they are ordered by their reported relative maturity.

Later maturing entries usually can be expected to have higher yields than earlier maturing types. If you wish to compare yields, do so only between entries with similar calendar dates of maturity, usually within 3-5 days. More reliable comparisons can be made using yields from several consecutive years. All yield determinations were made from replicated tests harvested with a plot combine. Multi-location data are necessary for determining true differences between varieties, and therefore only multi-location averages are reported in this report, but data for individual locations can be found at https://varietytrials.umn.edu/soybean.

The yield information is presented as a percent of the mean of the test. The actual mean value is given at the bottom of each table. Values over 100 indicate the entry had a yield greater than the mean while those less than 100 have a yield less than the mean.

LSD values associated with data in these tables are measures of variability within the trials. The LSD numbers beneath the yield columns indicate whether the difference between yields is due to genetics or other factors, such as environmental variation and measurement error. If yield differences between two entries equals or exceeds the LSD value, the higher-yielding entry probably was superior in yield. A difference less than the LSD value is probably due to environmental and/or measurement factors. The LSD values are given on the percent of mean data, not the actual yields. A 25 percent level of significance is used in all tables contained in this report. This means that there is a 25 percent probability that yield differences exceeding the stated LSD are not true yield differences.

Chlorosis

Iron deficiency chlorosis (IDC) is a yield-limiting condition of soybeans grown in alkaline soils with high calcium carbonate or calcium sulfate ions present, making iron unavailable and causing soybean plants to turn yellow. This yellowing is visually scored on a 1-5 scale, where 1 indicates no yellowing and 5 indicates severe yellowing and necrosis that may even include death of the plant.

Research has shown that for every unit increase in chlorosis, a 20 percent reduction in yield may occur. For example, a plot rated as a 3 may yield 20 percent less than a plot given a rating of 2. All IDC ratings in tables are from tests conducted on high lime (high pH) soils near Danvers, Minn., in 2022.

Comparing chlorosis scores of entries allows you to estimate how well they perform relative to each other. Actual chlorosis ratings can vary depending on the specific site, year of test, and location in the field. Because of this high level of variability, it is usually very difficult to identify

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the best performing entries. Varieties should be compared for IDC ratings relative to one another within a single trial only and not across trials. Producers with a known history of IDC problems should at least avoid entries with the most severe (4 or 5) IDC ratings. Different organizations may use different scales or descriptions. The below table provides some general rules for a trial with moderate stress able to produce ratings ranging from 1-5.

Numerical Score	Rating
1 to 2	Tolerant (T)
2.1 to 3	Moderately Tolerant (MT)
3.1 to 4	Moderately Susceptible (MS)
4.1 to 5	Susceptible (S)

Protein and Oil

Protein and oil values were determined from mature seed using near infrared reflectance spectroscopy. The tabled values are for the 2021 season only. Protein and oil results are presented on a percent of the mean for each test. The actual mean values, expressed on a 13 percent moisture basis, are given at the bottom of each table. Values over 100 indicate the protein and/or oil contents of the entry are greater than the mean value while those less than 100 have protein and/or oil contents less than the mean. Absolute values of protein and oil can vary from year to year. The following formula is used to adjust the protein and oil values to another moisture basis.

$$\frac{\text{100-desired moisture}}{87} \times \text{protein or oil value given in the table}$$

The value of a bushel of soybeans (APV) based on its oil and protein content can be calculated by:

$$APV = 60\,[Po\,(X) + \frac{Pm}{.44}\,(Y)]$$

Where:

APV = Approximate value of a bushel of soybeans

Po = soybean oil price (in $ per pound)

Pm = price of 44% meal (in $ per pound)*

X = oil content at 13% moisture (in decimals)

Y = protein content at 13% moisture (in decimals)

And:

$$\frac{\text{*price of meal \$ / ton}}{2{,}000} = \text{\$ / pound}$$

The value of an acre of soybeans can be calculated by multiplying the APV by the yield in bushels per acre.

Phytophthora

Phytophthora root rot is a soil-borne disease that occurs in heavy wet soils. Infection generally occurs during germination. Phytophthora root rot can cause significant yield reductions if susceptible varieties are planted in poorly drained, infested fields. Variety selection is the best defense against this yield reducing pathogen. There are many known pathotypes (races) of this fungus, and therefore it is important to know which are present in a particular field. Genes can be incorporated into varieties to provide resistance to races present in a field. Soybean varieties that have specific resistance genes (or gene) provide some level of protection, but race-specific resistance genes do not guarantee protection against infection and yield loss because so many different races exist. Research indicates that Rps3a and Rps6 provide the broadest protection to Phytophthora races currently present in soybean fields in the Midwest.

Some published information refers to Phytophthora "tolerance" or "field resistance", which is not race-specific and should not be confused with race-specific resistance. It is possible that a certain level of field tolerance can provide yield protection even when the race-specific genes are not effective. Reliable tests for tolerance have not yet been fully developed.

Tables included in this report indicate which race-specific Phytophthora gene or genes is/are present in each entry. This information was provided by the originator. A "S" indicates a variety is expected to be susceptible to all races. A "--" indicates that a Phytophthora gene was not specified by the originator.

Soybean Cyst Nematode

Soybean Cyst Nematode (SCN) is a microscopic round worm that infects and reproduces in soybean roots. It was first identified in Minnesota in 1978 and is now known to occur in most Minnesota counties where soybeans are grown. Both the area of infestation and number of nematodes per unit of soil appear to be increasing. Several races of this pest are known to occur in Minnesota. When SCN numbers are high (> than 5,000 eggs/100 cc soil), significant yield losses can occur. Rotations to non-host crops and planting of resistant varieties can assist in reducing nematode populations as well as reducing the SCN's impact on yield.

The source for SCN resistance for each entry was provided by the originator. In Table 5 the resistance ratings were given based on a greenhouse bioassay with five replicates using an HG Type 0 (Race 3) SCN population. Each container (one plant) was inoculated with 4000 SCN eggs. After 30 days a female index (FI) was calculated for each entry using Lee 74 as the susceptible check. FI = (# of cysts on entry/# of cysts on Lee 74) x100. If the FI was < 10 percent, an entry was considered R. If the FI was 10 – 30 percent, it was considered MR. If the FI was 30-60 percent, it was considered MS, and greater than 60 percent S. These are fairly arbitrary cutoffs, and thus it is important to look at the actual FI values to judge the level of resistance. Comparison to varieties known to have a good level of resistance is also advisable.

For proper management of fields with SCN, it is recommended that entries with an R rating be planted. If the SCN population numbers are relatively low (<1500 eggs/100 cm3) an entry with an MR rating might be considered. Entries with S and MS ratings should not be considered for planting in fields where SCN is present at levels greater than 200 eggs/100 cm3. Some entries are rated as tolerant, however no data from the northern United States has verified the usefulness of tolerant entries in maintaining yield and reducing SCN numbers.

Management information is available from the web site www.soybeans.umn.edu or from the Minnesota Soybean Research and Promotion Council, 151 St. Andrews Court, Suite 710, Mankato, Minn., 56001, 1-888-896-9678, www.mnsoybean.org

White Mold

White mold, also known as Sclerotinia stem rot, develops in infested fields when high relative humidity and moderate temperatures occur during soybean flowering. Planting less susceptible entries in wider row spacings or at lower populations is the most effective method of reducing the severity of white mold. Accurate ratings for resistance to white mold are difficult to obtain because both infection and disease development are dependent on weather conditions. Because of this variability, performance can change

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significantly among locations and years depending on the interaction of plant development, precipitation, relative humidity, and temperature. White mold severity also tends to be greater if lodging occurs. Growers concerned about performance in the presence of white mold should select varieties that show consistently less white mold during several years of testing.

Brown Stem Rot

Brown stem rot (BSR) is a fungal disease that can cause yield losses in certain situations. The disease occurs most frequently when soybeans follow soybeans but can occur where soybeans are planted every other year. Resistant entries, or longer rotations, assist in the management of this disease. MN0304, MN0902CN, MN1302, Freeborn, and IA2008R are available public varieties with resistance to BSR. Some information refers to "tolerance" or "field resistance." Reliable tests for tolerance or field resistance have not yet been developed.

Special-Purpose Entries

There continues to be interest in producing soybeans with special characteristics important to specialty food product manufac-

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Table 1. Performance and characteristics of transgenic, conventional and special-purpose soybean entries evaluated in the far northern zone. Trial was conducted in Crookston and Roseau.

Entry	Originator	Maturity Rating	Maturity Date	Yield % of Mean 2021	Yield % of Mean 2022	% of Mean Protein	% of Mean Oil	Seeds/lb	Hilum Color	Phyto. Gene	Chlorosis Score	SCN Rating	Seed Treat.	Trans. Trait
EL80-093N	Proseed	00.9	9/19	101	88	97	102	3071	Buff	Rps1a	2.5	MR	CMV	E3
XF30-082	Proseed	00.8	9/19	-	98	98	100	2568	Black	Rps1k	3.5	S	CMV	XF
XF30-092N	Proseed	00.9	9/21	-	111	100	100	2722	Black	Rps1c	3.5	MR	CMV	XF
LGS00838XF	LG Seeds	00.8	9/22	-	92	104	101	2525	Black	Rps1c	3.8	MR	AMS	XF
LGS0111RX	LG Seeds	0.1	9/23	-	105	104	100	2511	Black	Rps1c	3.0	S	AMS	R2-Ext
EL30-03N	Proseed	00.3	9/24	-	110	102	99	2823	Yellow	Rps1c	2.0	MR	CMV	E3
EL30-13	Proseed	0.1	9/25	-	98	100	100	2877	Yellow	Rps1a+Rps3a	2.5	S	CMV	E3
AG04XF2	Bayer Crop Science - Asgrow	0.4	9/29	-	91	98	97	2841	Black	Rps1k	3.0	-	AC	XF
M13-250056	Minnesota AES	0.8	9/30	-	106	98	102	2841	Buff	Rps1c	3.8	R	None	CV
Mean			**9/23**	**35 bu/a**	**51 bu/a**	**34%**	**18%**	**2833**			**3.1**			
LSD 25%			**1d**	**8%**	**8%**	**1%**	**1%**	**97.6**			**0.7**			

LSD numbers beneath yield columns indicate whether the difference between yield is due to genetics or other factors, such as variations in environment.
If a yield difference between two entries equals or exceeds the LSD value, the higher yielding entry probably was superior in yield.
A difference less than the LSD value is likely due to environmental factors.
— indicates "not specified."
Maturity date data collected from both locations.

Table 2. Performance and characteristics of transgenic, conventional and special-purpose soybean entries evaluated in the northern zone. Trial was conducted in Crookston, Moorhead and Glyndon.

Entry	Originator	Maturity Rating	Maturity Date	Yield % of Mean 2021	Yield % of Mean 2022	% of Mean Protein	% of Mean Oil	Seeds/lb	Hilum Color	Phyto. Gene	Chlorosis Score	SCN Rating	Seed Treat.	Trans. Trait
XO 0311E	BASF	0.3	9/23	-	95	97	101	3270	Buff	S	3.3	R	OPVRI	E3
XO 0101E	BASF	0.1	9/24	-	93	100	99	3247	Buff	Rps1k+Rps3a	1.5	S	OPVRI	E3
LGS0338E3	LG Seeds	0.3	9/24	-	100	98	100	3179	Buff	S	2.0	MR	AMS	E3
Utica	Sevita International	0.4	9/24	-	90	105	99	2296	Yellow	S	3.0	S	FVM	CV
DSR-0645E	Dairyland Seed	0.4	9/26	101	108	96	104	2806	Buff	Rps1k+Rps3a	3.0	R	LI	E3
DSR-0220E	Dairyland Seed	0.2	9/26	-	101	101	102	2643	Brown	Rps1k	4.0	R	LI	E3
DSR-0660E	Dairyland Seed	0.6	9/26	100	102	100	95	2806	Yellow	S	3.5	R	LI	E3
XO 0213E	BASF	0.2	9/27	-	99	99	103	3030	Buff	Rps1a+Rps3a	2.5	S	OPVRI	E3
XO 0573E	BASF	0.5	9/27	-	98	100	101	2914	Imperfect Black	Rps1k+Rps3a	3.5	S	OPVRI	E3
LGS0400RX	LG Seeds	0.4	9/28	-	109	95	104	2643	Brown	Rps1c	2.3	S	AMS	R2-Ext
M12-395086	Minnesota AES	0.5	9/28	-	89	109	95	1848	Yellow	S	3.5	S	None	CV
LGS0550E3	LG Seeds	0.5	9/29	-	98	102	100	2895	Buff	Rps1k+Rps3a	2.5	MR	AMS	E3
XO 0731E	BASF	0.7	10/01	-	106	99	100	2643	Imperfect Black	Rps1c+Rps3a	2.8	R	OPVRI	E3
XO 0602E	BASF	0.6	10/01	104	115	99	97	2772	Buff	S	4.3	R	OPVRI	E3
LGS0660XF	LG Seeds	0.6	10/01	-	96	101	99	2583	Gray	Rps1c+Rps3a	4.0	MR	AMS	XF
Mean			**9/27**	**31 bu/a**	**58 bu/a**	**35%**	**18%**	**2789**			**3.0**			
LSD 25%			**2d**	**7%**	**3%**	**1%**	**1%**	**71.9**			**1.5**			

LSD numbers beneath yield columns indicate whether the difference between yield is due to genetics or other factors, such as variations in environment.
If a yield difference between two entries equals or exceeds the LSD value, the higher yielding entry probably was superior in yield.
A difference less than the LSD value is likely due to environmental factors.
Maturity date data collected from Crookston and Glyndon.

Table 3. Performance and characteristics of transgenic, conventional and special-purpose soybean entries evaluated in the central zone. Trial was conducted in Becker, Danvers and Morris.

Entry	Originator	Maturity Rating	UAS Mat. Date*	Yield % of Mean		% of Mean		Seeds/ lb	Hilum Color	Phyto. Gene	Chloro- sis Score	SCN Rat- ing	Seed Treat.	Trans. Trait
				2021	2022	Protein	Oil							
DSR-0757E	Dairyland Seed	0.7	9/12	-	75	98	104	2355	Brown	Rps1c	1.5	S	LI	E3
Finch	Sevita International	0.7	9/16	-	68	110	95	2597	Yellow	Rps1c	2.8	S	FVM	CV
SVX21T0S15	Sevita International	0.7	9/16	-	68	102	98	2539	Yellow	Rps1a+Rps3a	1.3	MR	FVM	CV
XO 0731E	BASF	0.7	9/17	103	96	100	101	2457	Imperfect Black	Rps1c+Rps3a	2.5	R	OPVRI	E3
Dunham	Sevita International	0.7	9/17	-	70	111	94	2273	Yellow	Rps1c	2.5	MR	FVM	CV
MN0810CN	Minnesota AES	0.8	9/12	-	91	105	96	2877	Yellow	S	1.3	R	None	CV
M13-118036	Minnesota AES	0.8	9/15	-	96	99	101	2738	Yellow	S	1.8	R	None	CV
0821N	Albert Lea Seed House / Viking Seed	0.8	9/16	117	113	100	97	2331	Brown	S	1.0	R	None	CV
MN0811CN	Minnesota AES	0.8	9/16	-	103	100	101	2755	Black	S	1.5	R	None	CV
M13-250056	Minnesota AES	0.8	9/16	-	127	95	106	2674	Buff	Rps1c	2.8	R	None	CV
XO 0993E	BASF	0.9	9/17	-	114	98	104	2722	Buff	Rps1k+Rps3a	3.3	R	OPVRI	E3
AG09XF3	Bayer Crop Science - Asgrow	0.9	9/18	-	113	95	99	2971	Brown	Rps1c	3.5	R	AC	XF
XO 1041E	BASF	1.0	9/15	-	99	103	97	2722	Gray	S	2.0	R	OPVRI	E3
DSR-0920E	Dairyland Seed	1.0	9/16	-	116	101	98	2431	Imperfect Black	S	1.3	R	LI	E3
MK41	Richland IFC	1.1	9/14	81	90	107	92	2612	Yellow	S	2.5	MR	None	CV
Skyline	Sevita International	1.1	9/15	-	67	106	98	2690	Yellow	Rps1a+Rps3a	2.8	MR	FVM	CV
MK9101	Richland IFC	1.1	9/16	87	73	105	98	2405	Black	S	2.3	S	None	CV
AG11XF2	Bayer Crop Science - Asgrow	1.1	9/16	96	107	99	100	2895	Brown	Rps3a	1.5	R	AC	XF
DSR-1121E	Dairyland Seed	1.1	9/18	-	103	94	108	2990	Imperfect Black	S	1.5	R	LI	E3
Odessa	Sevita International	1.1	9/18	-	74	108	97	2261	Yellow	S	2.5	S	FVM	CV
1223N	Albert Lea Seed House / Viking Seed	1.2	9/15	-	92	97	101	2331	Black	S	2.5	MR	None	CV
DSR-1290E	Dairyland Seed	1.2	9/16	104	103	97	103	2658	Imperfect Black	S	1.5	R	LI	E3
O.1202N	Albert Lea Seed House / Viking Seed	1.2	9/16	100	93	102	97	2331	Brown	Rps1k	3.3	MR	None	CV
XO 1212E	BASF	1.2	9/17	116	101	100	101	2484	Imperfect Black	Rps1c	1.8	R	OPVRI	E3
BS1146	Brushvale Seed, Inc.	1.2	9/18	-	101	104	98	2597	Yellow	S	3.0	MR	OPVI	CV
AG13XF3	Bayer Crop Science - Asgrow	1.3	9/18	-	105	100	97	2772	Brown	Rps1c+Rps3a	2.5	R	AC	XF
XO 1372E	BASF	1.3	9/19	113	107	97	106	2418	Imperfect Black	S	3.3	R	OPVRI	E3
CZ1331GTLL	BASF	1.3	9/21	-	104	98	103	2511	Brown	Rps1k	3.0	-	OPVRI	LLGT27
V1323S	GDM Seeds	1.3	9/21	-	91	97	102	2841	Yellow	Rps1k+Rps3a	1.0	S	CMVC	CV
BS1512	Brushvale Seed, Inc.	1.4	9/16	-	78	103	100	2841	Yellow	Rps1k	2.0	MR	OPVI	CV
Barton	Sevita International	1.4	9/19	-	93	100	102	2806	Yellow	S	1.0	MR	FVM	CV
XO 1451E	BASF	1.4	9/22	-	110	98	102	2674	Imperfect Black	Rps1k	2.3	R	OPVRI	E3
SVX4005-P1	Sevita International	1.5	9/17	-	82	101	102	2597	Yellow	S	1.5	MR	FVM	CV
1518N	Albert Lea Seed House / Viking Seed	1.5	9/21	91	86	100	98	2952	Brown	S	1.3	S	None	CV
DSR-1505E	Dairyland Seed	1.5	9/22	-	117	103	96	2674	Brown	Rps1k	1.5	R	LI	E3
XO 1632E	BASF	1.6	9/19	112	124	99	101	2470	Buff	Rps1k+Rps3a	3.3	R	OPVRI	E3
M13-250046	Minnesota AES	1.6	9/19	-	115	101	100	2418	Buff	Rps1c	2.0	R	None	CV
AG16XF3	Bayer Crop Science - Asgrow	1.6	9/20	-	107	97	101	3179	Brown	Rps1c	2.0	R	AC	XF
V1621	GDM Seeds	1.6	9/21	-	114	99	96	2755	Yellow	Rps1c	1.8	MR	CMVC	CV
O.1718N	Albert Lea Seed House / Viking Seed	1.7	9/20	112	103	94	103	2933	Brown	Rps1k	1.3	MR	None	CV
XO 1761E	BASF	1.7	9/22	108	115	97	102	2539	Imperfect Black	Rps1k	3.0	R	OPVRI	E3
MN1807CN	Minnesota AES	1.8	9/18	-	112	99	99	2706	Buff	S	1.8	R	None	CV
XO 1822E	BASF	1.8	9/21	112	109	98	102	2539	Buff	Rps1k+Rps3a	2.5	R	OPVRI	E3
V1821	GDM Seeds	1.8	9/23	117	109	98	97	2755	Yellow	Rps1c	2.3	MR	CMVC	CV
XO 1971E	BASF	1.9	9/23	113	109	99	98	2392	Imperfect Black	S	2.3	R	OPVRI	E3
DSR-1919E	Dairyland Seed	1.9	9/23	-	130	94	103	2706	Black	Rps1k	1.5	R	LI	E3
AG19XF3	Bayer Crop Science - Asgrow	1.9	9/23	-	118	98	104	2457	Brown	Rps1c	1.3	R	AC	XF
MK373	Richland IFC	2.0	9/20	74	63	105	92	2057	Yellow	S	1.3	S	None	CV
XO 2181E	BASF	2.1	9/22	-	116	97	104	2895	Imperfect Black	Rps1k	3.0	R	OPVRI	E3
DSR-2188E	Dairyland Seed	2.1	9/22	-	115	94	107	2952	Brown	Rps1k	1.5	R	LI	E3
XO 2282E	BASF	2.2	9/24	-	114	96	100	2755	Buff	S	1.5	R	OPVRI	E3
Mean			**9/18**	**49 bu/a**	**56 bu/a**	**35%**	**18%**	**2670**			**2.1**			
LSD 25%			**2d**	**8%**	**6%**	**2%**	**2%**	**196.0**			**1.0**			

LSD numbers beneath yield columns indicate whether the difference between yield is due to genetics or other factors, such as variations in environment.
If a yield difference between two entries equals or exceeds the LSD value, the higher yielding entry probably was superior in yield.
A difference less than the LSD value is likely due to environmental factors.
— indicates "not specified."
* UAS maturity dates were estimated through analyiss of images collected by an unmanned aerial vehicle. This is an experimental approach. Intprepret results cautiously.

SOYBEAN: Continued from page 41

turers, such as tofu, natto, miso, and soy milk. Soybean scientists previously developed some of these special-purpose entries, which were general releases, but more recently entries have been released under exclusive or nonexclusive licenses to specific companies who then contract with growers for production. For further information contact Minnesota Crop Improvement Association at web site www.mncia@tc.umn.edu or telephone number 612-625-7766.

Test Plot Research

Michael Leiseth, Gerald Holz, Tom Hoverstad, Steve Quiring, Curtis Reese, and Donn Vellekson supervised test plot establishment and management. Special thanks are due to Chris Goblirsch of Riverton Research Inc. for planting, managing, and harvesting the Glyndon location. We appreciate our farm cooperators who provided access to on-farm land. The farm cooperators in 2022 were Keith Christensen (Thief River Falls), Elizabeth Johnson (Westbrook), Mike and Patrick O'Leary (Danvers), David Swanson (Moorhead), and David and Craig Swenson (Shelly). ✻

Table 4. Performance and characteristics of transgenic, conventional and special-purpose soybean entries evaluated in the southern zone. Trial was conducted in Waseca, Lamberton and Rosemount.

Entry	Originator	Mat. Rating	Mat. Date	Yield % of Mean 2021	Yield % of Mean 2022	% of Mean Protein	% of Mean Oil	Seeds/ lb	Hilum Color	Phyto. Gene	Chlorosis Score	SCN Rating	Seed Treat.	Trans. Trait
MK41	Richland IFC	1.1	9/13	77	88	106	96	2185	Yellow	S	2.5	MR	None	CV
DSR-1290E	Dairyland Seed	1.2	9/21	-	93	99	104	2367	Imperfect Black	S	2.5	R	LI	E3
M13-250046	Minnesota AES	1.6	9/21	-	91	100	101	2444	Buff	Rps1c	2.3	R	None	CV
MN1807CN	Minnesota AES	1.8	9/22	-	93	100	99	2568	Buff	S	2.3	R	None	CV
XO 1451E	BASF	1.4	9/23	-	103	100	105	2484	Imperfect Black	Rps1k	2.5	R	OPVRI	E3
DSR-1505E	Dairyland Seed	1.5	9/23	-	96	106	94	2612	Brown	Rps1k	2.0	R	LI	E3
A172E3	Anderson Seeds	1.7	9/24	-	100	99	102	2658	Buff	Rps1k	3.5	R	None	E3
XO 1372E	BASF	1.3	9/24	98	94	99	102	2114	Imperfect Black	S	2.8	R	OPVRI	E3
O.1718N	Albert Lea Seed House / Viking Seed	1.7	9/24	102	102	98	101	2568	Brown	Rps1k	2.5	MR	None	CV
M13-266011	Minnesota AES	1.6	9/24	-	94	104	97	2239	Yellow	S	2.8	R	None	CV
A151E3	Anderson Seeds	1.5	9/25	104	99	101	101	2418	Buff	Rps1k+Rps3a	3.3	MR	None	E3
XO 1632E	BASF	1.6	9/25	106	104	101	101	2307	Buff	Rps1k+Rps3a	3.0	R	OPVRI	E3
XO 1822E	BASF	1.8	9/25	103	107	100	100	2367	Buff	Rps1k+Rps3a	3.0	R	OPVRI	E3
SVX21T2S27	Sevita International	2.0	9/25	-	98	103	93	2319	Yellow	Rps1c	3.3	R	FVM	CV
A1821XF	Anderson Seeds	1.8	9/26	105	107	98	99	2484	Buff	S	2.0	MR	None	XF
XO 1761E	BASF	1.7	9/26	101	95	102	100	2284	Imperfect Black	Rps1k	3.3	R	OPVRI	E3
MN1901CN	Minnesota AES	1.9	9/26	-	93	98	106	2457	Imperfect Black	S	3.0	R	None	CV
A200E3	Anderson Seeds	2.0	9/27	114	108	98	101	2405	Imperfect Black	Rps1k	2.5	MR	None	E3
XO 1971E	BASF	1.9	9/27	99	102	99	98	2154	Imperfect Black	S	2.3	R	OPVRI	E3
DSR-1919E	Dairyland Seed	1.9	9/27	-	110	93	105	2583	Black	Rps1k	2.3	R	LI	E3
V2122	GDM Seeds	2.1	9/27	-	108	99	102	2134	Brown	Rps1k+Rps3a	3.3	S	CMVC	CV
Candor	Sevita International	1.9	9/27	-	83	108	93	1871	Yellow	Rps1k+Rps3a	4.0	S	FVM	CV
A182E3	Anderson Seeds	1.8	9/28	-	105	99	101	2331	Black	Rps1k	3.0	MR	None	E3
O.2244AT	Albert Lea Seed House / Viking Seed	2.2	9/28	99	89	101	96	2175	Mixed	S	1.8	MR	None	CV
MK373	Richland IFC	2.0	9/28	69	83	104	92	2029	Yellow	S	2.4	S	None	CV
AG19XF3	Bayer Crop Science - Asgrow	1.9	9/28	-	104	101	101	2250	Brown	Rps1c	1.8	R	AC	XF
XO 2181E	BASF	2.1	9/29	100	103	98	103	2484	Imperfect Black	Rps1k	2.5	R	OPVRI	E3
2022N	Albert Lea Seed House / Viking Seed	2.0	9/29	-	111	96	100	2405	Black	Rps1k	3.8	MR	None	CV
AG21XF3	Bayer Crop Science - Asgrow	2.1	9/29	-	102	101	97	2261	Brown	Rps3a	3.5	R	AC	XF
AG22XF3	Bayer Crop Science - Asgrow	2.2	9/29	-	103	102	98	2392	Brown	Rps1c	4.3	R	AC	XF
DSR-2188E	Dairyland Seed	2.1	9/30	-	107	97	110	2597	Brown	Rps1k	3.0	R	LI	E3
2340KN	Albert Lea Seed House / Viking Seed	2.3	9/30	100	105	98	101	2457	Buff	Rps1k	1.8	R	None	CV
A2121XF	Anderson Seeds	2.0	10/01	107	107	104	99	2431	Imperfect Black	Rps1k+Rps3a	2.5	MR	None	XF
XO 2323E	BASF	2.3	10/01	-	106	99	101	2470	Black	Rps1c	2.3	R	OPVRI	E3
XO 2282E	BASF	2.2	10/01	-	102	98	101	2367	Buff	S	2.8	R	OPVRI	E3
XO 2472E	BASF	2.4	10/02	-	102	95	108	2539	Buff	Rps1k	3.8	R	OPVRI	E3
2155N	Albert Lea Seed House / Viking Seed	2.1	10/02	107	95	99	96	2498	Brown	S	2.5	S	None	CV
V2423	GDM Seeds	2.4	10/02	-	102	100	101	2307	Brown	Rps1k	2.3	MR	CMVC	CV
2418N	Albert Lea Seed House / Viking Seed	2.4	10/04	116	106	100	95	2343	Black	Rps1c	2.5	MR	None	CV
Mean			**9/27**	**65 bu/a**	**82 bu/a**	**34%**	**19%**	**2374**			**2.8**			
LSD 25%			**1d**	**3%**	**3%**	**2%**	**2%**	**113.6**			**1.0**			

LSD numbers beneath yield columns indicate whether the difference between yield is due to genetics or other factors, such as variations in environment.
If a yield difference between two entries equals or exceeds the LSD value, the higher yielding entry probably was superior in yield.
A difference less than the LSD value is likely due to environmental factors.
Maturity date data collected from Waseca and Rosemount.

Table 5. Results of soybean cyst nematode greenhouse bioassay performed on soybean entries grown in 2022 and which were not tested in previous years. If an entry in the 2022 trials is not listed here, go back to previous trial results in the archive which can be found at varietytrials.umn.edu/soybean.

			Greenhouse Test HG Type 7 (Race 6)	
Entry	Originator	SCN Resistance Source[1]	FI	SCN Rating[2]
0821N	Albert Lea Seed House / Viking Seed	PI 88788	8	R
1223N	Albert Lea Seed House / Viking Seed	PI 88788	12	MR
1518N	Albert Lea Seed House / Viking Seed	PI 88788	96	S
2022N	Albert Lea Seed House / Viking Seed	PI 88788	10	MR
2155N	Albert Lea Seed House / Viking Seed	PI 88788	105	S
2340KN	Albert Lea Seed House / Viking Seed	Peking	3	R
2418N	Albert Lea Seed House / Viking Seed	PI 88788	13	MR
O.1202N	Albert Lea Seed House / Viking Seed	PI 88788	16	MR
O.1718N	Albert Lea Seed House / Viking Seed	PI 88788	26	MR
O.2244AT	Albert Lea Seed House / Viking Seed	PI 88788	11	MR
A151E3	Anderson Seeds	PI 88788	15	MR
A172E3	Anderson Seeds	Peking	2	R
A1821XF	Anderson Seeds	PI 88788	16	MR
A182E3	Anderson Seeds	PI 88788	18	MR
A200E3	Anderson Seeds	PI 88788	16	MR
A2121XF	Anderson Seeds	PI 88788	24	MR
XO 0311E	BASF	PI 88788	0	R
XO 0602E	BASF	PI 88788	0	R
XO 0731E	BASF	PI 88788	0	R
XO 0993E	BASF	Peking	0	R
XO 1041E	BASF	PI 88788	0	R
XO 1212E	BASF	PI 88788	0	R
XO 1372E	BASF	PI 88788	0	R
XO 1451E	BASF	PI 88788	0	R
XO 1632E	BASF	PI 88788	0	R
XO 1761E	BASF	PI 88788	0	R
XO 1822E	BASF	PI 88788	0	R
XO 1971E	BASF	PI 88788	0	R
XO 2181E	BASF	PI 88788	0	R
XO 2282E	BASF	PI 88788	0	R
XO 2323E	BASF	PI 88788	0	R
XO 2472E	BASF	PI 88788	0	R
AG09XF3	Bayer Crop Science - Asgrow	PI 88788	0	R
AG11XF2	Bayer Crop Science - Asgrow	PI 88788	0	R
AG13XF3	Bayer Crop Science - Asgrow	PI 88788	0	R
AG16XF3	Bayer Crop Science - Asgrow	PI 88788	0	R
AG19XF3	Bayer Crop Science - Asgrow	PI 88788	1	R
AG21XF3	Bayer Crop Science - Asgrow	PI 88788	0	R
AG22XF3	Bayer Crop Science - Asgrow	PI 88788	0	R
BS1146	Brushvale Seed, Inc.	PI 88788	17	MR
BS1512	Brushvale Seed, Inc.	PI 88788	21	MR
DSR-0220E	Dairyland Seed	PI 88788	0	R
DSR-0645E	Dairyland Seed	PI 88788	0	R
DSR-0660E	Dairyland Seed	PI 88788	0	R
DSR-0920E	Dairyland Seed	PI 88788	0	R
DSR-1121E	Dairyland Seed	PI 88788	0	R
DSR-1290E	Dairyland Seed	PI 88788	0	R
DSR-1505E	Dairyland Seed	PI 88788	0	R
DSR-1919E	Dairyland Seed	Peking	0	R
DSR-2188E	Dairyland Seed	Peking	0	R
V1621	GDM Seeds	PI 88788	12	MR
V1821	GDM Seeds	PI 88788	13	MR
V2423	GDM Seeds	PI 88788	21	MR
LGS00838XF	LG Seeds	PI 88788	15	MR
LGS0338E3	LG Seeds	PI 88788	14	MR
LGS0400RX	LG Seeds	PI 88788	92	S
LGS0550E3	LG Seeds	PI 88788	19	MR
LGS0660XF	LG Seeds	PI 88788	24	MR
EL30-03N	Proseed	PI 88788	27	MR
EL80-093N	Proseed	PI 88788	26	MR
XF30-092N	Proseed	PI 88788	19	MR
MK41	Richland IFC	PI 88788	28	MR
Alinova	Sevita International	PI 88788	11	MR
Barton	Sevita International	PI 88788	12	MR
Dunham	Sevita International	PI 88788	26	MR
Navan	Sevita International	PI 88788	15	MR
Rowan	Sevita International	PI 88788	9	R
Skyline	Sevita International	PI 88788	30	MR

[1] Resistance source provided by originator. NS = SCN source not specified by provider.
[2] SCN resistance rating: R = resistant (FI less than or equal to 10%); MR = moderately resistant (FI 11-30%); MS = moderately susceptible (FI 31-60%); S = susceptible (FI greater than 60%).
Female index (FI) was calculated using Williams 82 as the susceptible check.

2022 Hard Red Spring Wheat field crop trial results

Spring wheat varieties were sown in trial plots at Becker, Crookston, Lamberton, Morris, Roseau, St. Paul, and Waseca and on-farm sites near Benson, Fergus Falls, Hallock, Le Center, Oklee, Perley, Stephen and Strathcona. These plots are handled so that the factors affecting yield and other characteristics are as nearly the same for all varieties at each location as possible, but seed providers are allowed to choose a preferred seeding rate for each variety. The standard seeding rate is designed to achieve a desired stand of 1.3 million plants/acre, assuming a 10 percent stand loss and adjusting for the germination percentage and seed weight of each variety. These hard red spring wheat trials are not designed for crop (species) comparisons, because the various crops are grown on different fields or with different management. The data should only be used to compare varieties within a table. All locations are set up as randomized complete blocks with 3 replications. Spatial analysis is used to adjust plot yields for each location. Tested hard red spring wheat varieties are listed in alphabetical order in the tables.

Variety Selection Criteria

While grain yield is an important economic trait, return per acre is also affected by grain quality. Because Fusarium Head Blight (FHB), or scab, can reduce grain quality and yield dramatically, it is an important consideration. Disease ratings are on a 1-9 scale where 1 = most resistant and 9 = most susceptible. Rating differences of 2 or more should be considered significant.

Leaf and stripe rust pressure throughout Minnesota has been low the past five seasons. The majority of varieties are

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Hard red spring wheat seeding rate calculator.

Calculating and seeding the appropriate amount of seed is an important first step towards maximizing yield. The seeding rate is a function of the number of kernels per pound of seed, the percent germination of the lot, the expected stand loss as a function of the quality of the seedbed and the desired stand. In Minnesota, an average optimum stand for hard red spring wheat when planted early is between 28 to 30 plants per square foot or approximately 1.3 million plants per acre. This number should increase by 1 to 2 plants per square foot for every week planting is delayed past the early, optimum, seeding date. Expected stand loss even under good seedbed conditions is between 10% to 20% and will increase with a poor seedbed or improper seed placement due to poor depth control.

The general formula for calculating a seeding rate is:

$$\text{Seeding Rate (Pounds/Acre)} = \frac{\text{Desired Stand (Plants/Acre)} \div (1 - \text{Expected Stand Loss})}{\text{(Seeds/Pound)} \times \text{Percentage Germination}}$$

Calculate the seeding rate for every single seed lot and calibrate the drill accordingly.

Example: Early variety.

Desired Stand, (Plants/Acre)	Expected Stand Loss	Seeds Per Pound	Percentage Germination	Seeding Rate, (lb/Acre)
1.3 million	0.10	14,000	0.95	109

Table 1. Origin and agronomic characteristics of hard red spring wheat varieties in Minnesota in single-year (2022) and multiple-year comparisons.

Entry	Origin[1]	Legal Status	Desired Stand (Plants/Acre)[2]	Days to Heading[3]	Height Inches[3]	Straw Strength[4]
AP Gunsmoke CL2[5]	2021 AgriPro/Syngenta	PVP (94)	1.3	49.0	26.5	5
AP Murdock	2020 AgriPro/Syngenta	PVP (94)	1.3	48.8	25.0	5
AP Smith	2021 AgriPro/Syngenta	PVP (94)	1.3	51.7	24.3	2
Ascend-SD	2021 SDSU	PVP (94) pending	1.3	50.0	29.4	5–6
Bolles	2015 MN	PVP (94)	1.3	51.3	28.1	4
CAG Justify	2021 Champions Alliance Group	PVP (94)	1.2	51.1	27.5	5
CAG Reckless	2021 Champions Alliance Group	PVP (94)	1.3	49.8	28.2	5
CAG Recoil	2022 Champions Alliance Group	PVP (94) pending	1.3	55.2	27.2	3–4
CP3099A	2020 CROPLAN	PVP (94) pending	1.3	53.8	28.6	4–5
CP3119A	2021 CROPLAN	PVP (94) pending	1.3	54.8	27.9	2–3
CP3188	2020 CROPLAN	PVP (94) pending	1.3	50.2	28.3	5
CP3530	2015 CROPLAN	Patented	1.3	50.8	29.5	5
CP3915	2019 CROPLAN	PVP (94) pending	1.3	49.9	26.4	3
CPX39120	2023 CROPLAN	PVP (94) pending	1.3	57.6	29.5	5
Driver	2020 SDSU	PVP (94)	1.3	50.5	28.9	4
Dyna-Gro Ambush	2016 Dyna-Gro	PVP (94)	1.5	50.6	27.8	5
Dyna-Gro Ballistic	2018 Dyna-Gro	PVP (94)	1.5	48.2	27.4	5
Dyna-Gro Commander	2019 Dyna-Gro	PVP (94)	1.5	48.5	26.7	4
Lang-MN	2017 MN	PVP (94)	1.3	50.9	27.8	4
LCS Ascent	2022 Limagrain Cereal Seeds	PVP (94)	1.4	47.3	27.9	5
LCS Buster	2020 Limagrain Cereal Seeds	PVP (94)	1.3	52.8	27.5	4–5
LCS Cannon	2018 Limagrain Cereal Seeds	PVP (94)	1.4	46.8	27.8	4
LCS Dual	2021 Limagrain Cereal Seeds	PVP (94)	1.4	48.3	28.1	3–4
LCS Trigger	2016 Limagrain Cereal Seeds	PVP (94)	1.3	53.3	27.4	5
Linkert	2013 MN	PVP (94)	1.3	49.5	25.8	2
MN-Rothsay	2022 MN	PVP (94) pending	1.3	51.4	25.4	3
MN-Torgy	2020 MN	PVP (94)	1.3	50.7	26.1	4
MN-Washburn	2019 MN	PVP (94)	1.3	50.8	26.8	3
MS Barracuda	2018 Meridian Seeds	PVP (94)	1.3	46.8	26.6	3
MS Charger	2023 Meridian Seeds	PVP (94) pending	1.3	48.2	26.7	4–5
MS Cobra	2022 Meridian Seeds	PVP (94)	1.3	48.6	26.7	3–4
MS Ranchero	2020 Meridian Seeds	PVP (94)	1.3	53.3	28.5	6
ND Frohberg	2020 NDSU	PVP (94)	1.3	49.5	28.7	5
ND Heron	2021 NDSU	PVP (94) pending	1.3	47.7	28.7	5–6
Prosper	2011 NDSU	PVP (94)	1.3	50.8	27.5	6
Shelly	2016 MN	PVP (94)	1.3	50.9	25.7	5
SY 611 CL2[5]	2019 AgriPro/Syngenta	PVP (94)	1.3	48.6	24.9	4
SY Longmire[6]	2019 AgriPro/Syngenta	PVP (94)	1.3	50.0	26.3	3
SY McCloud	2019 AgriPro/Syngenta	PVP (94)	1.3	49.3	26.6	4
SY Valda	2015 AgriPro/Syngenta	PVP (94)	1.3	50.4	25.2	5
TCG-Heartland	2019 21st Century Genetics	PVP (94), Patent pending	1.6	47.8	24.4	3
TCG-Spitfire	2016 21st Century Genetics	PVP (94)	1.5	51.7	27.5	3
TCG-Wildcat	2020 21st Century Genetics	PVP (94), Patent pending	1.5	50.3	26.5	3
WB9479	2017 WestBred	Patented, PVP (94)	1.3	48.6	24.7	3
WB9590	2017 WestBred	Patented, PVP (94)	1.3	48.6	23.9	3
Mean				**50.3**	**27.0**	

[1]Abbreviations: MN = Minnesota Agricultural Experiment Station; NDSU = North Dakota State University Research Foundation; SDSU = South Dakota Agricultural Experiment Station

[2]Our standard seeding rate is designed to achieve a desired stand of 1.3 million plants/acre, assuming a 20% stand loss and adjusting for the germination percentage and seed weight of each variety.

[3]2022 data.

[4]1-9 scale in which 1 is the strongest straw and 9 is the weakest. Based on 2014-2022 data. The rating of newer entries may change by as much as one rating point as more data are collected.

[5]AP Gunsmoke CL2 and SY 611 CL2 have tolerance to Beyond® herbicide.

[6]SY Longmire has solid stems.

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resistant or moderately resistant, but a few are moderately susceptible. Stripe rust can be very damaging when temperatures remain unseasonably cool into early July. Carefully consider a variety's rating for leaf and stripe rust and plan to use a fungicide if a variety is rated 5 or higher and disease levels warrant treatment.

Varieties with ratings of 4 or better should not experience economic levels of damage in most years. Stem rust ratings are included in the disease tables because there are differences in variety reaction. However, the levels of this disease have been very low in production fields in recent years, even on susceptible varieties.

Bacterial leaf streak was assessed at five locations in 2022. This data, in combination with data from past years was used to assign a rating to all varieties. This disease cannot be controlled with fungicides. Selection of more resistant varieties is the only recommended practice at this time to reduce losses caused by this disease. The rating of newer varieties may change by as much as one rating point once more data is collected.

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Table 2. Grain quality of hard red spring wheat varieties in Minnesota in single-year (2022) and multiple-year comparisons.

Entry	Test Weight (lb/Bu) 2022	Test Weight (lb/Bu) 2 Yr	Protein (%)[1] 2022	Protein (%)[1] 2 Yr	Baking Quality[2]	Pre-Harvest Sprouting[3]
AP Gunsmoke CL2	58.7	59.7	15.7	15.3	5	3
AP Murdock	59.4	60.2	14.2	14.5	5	1
AP Smith	58.8	60.2	15.5	15.2	3	4
Ascend-SD	59.1	60.3	15.2	14.8	–	4
Bolles	58.9	60.1	16.8	16.7	1	1
CAG Justify	58.2	58.7	13.8	13.9	–	3
CAG Reckless	59.9	61.1	15.1	15.0	–	4
CAG Recoil	59.2	–	14.6	–	–	1
CP3099A	57.0	58.1	13.1	13.0	6	1
CP3119A	54.5	55.8	13.9	13.6	–	3
CP3188	57.3	58.5	13.8	13.6	–	1
CP3530	59.5	60.1	15.2	15.1	3	1
CP3915	59.0	60.6	15.2	15.1	4	1
CPX39120	52.6	–	13.9	–	–	2
Driver	60.5	61.8	14.8	14.4	6	3
Dyna-Gro Ambush	58.6	60.5	14.4	14.6	2	3
Dyna-Gro Ballistic	60.2	60.6	14.9	14.5	5	3
Dyna-Gro Commander	59.1	60.6	15.2	15.0	6	1
Lang-MN	59.9	60.8	15.2	15.1	3	1
LCS Ascent	59.8	–	14.6	–	–	2
LCS Buster	56.8	57.9	12.6	12.7	7	4
LCS Cannon	60.8	62.1	14.8	14.7	4	3
LCS Dual	59.2	–	14.6	–	–	2
LCS Trigger	59.4	60.2	13.1	13.3	7	2
Linkert	60.0	61.3	15.6	15.7	1	1
MN-Rothsay	59.5	60.7	14.8	14.8	5	2
MN-Torgy	59.5	61.0	15.1	15.2	4	1
MN-Washburn	58.8	60.2	14.8	14.6	3	1
MS Barracuda	58.6	60.4	15.9	15.4	4	3
MS Charger	58.9	–	13.6	–	–	1
MS Cobra	58.9	60.6	15.1	14.9	–	4
MS Ranchero	56.9	59.0	15.0	14.5	6	4
ND Frohberg	59.8	61.0	15.0	14.9	3	4
ND Heron	60.5	–	15.3	–	–	1
Prosper	59.4	60.2	14.1	14.2	5	1
Shelly	58.9	60.6	14.7	14.4	5	1
SY 611 CL2	59.1	60.7	15.1	14.9	6	2
SY Longmire	58.0	60.0	15.8	15.3	3	3
SY McCloud	60.7	61.8	15.4	15.5	3	2
SY Valda	59.1	60.5	14.7	14.4	6	2
TCG-Heartland	59.2	60.9	15.6	15.5	2	1
TCG-Spitfire	58.2	59.5	14.3	14.2	3	4
TCG-Wildcat	60.0	61.1	15.2	15.0	4	1
WB9479	58.6	60.3	16.1	15.9	2	1
WB9590	58.8	60.4	15.7	15.5	4	1
Mean	**58.5**	**60.1**	**14.9**	**14.8**		
No. of Environments	**6**	**17**	**6**	**17**		

[1]12% moisture basis.
[2]2014-2021 crop years, where applicable.
[3]1-9 scale in which 1 = best and 9 = worst. Values of 1-2 should be considered as resistant.

Table 3. Disease reactions[1] of hard red spring wheat varieties in Minnesota in multiple-year comparisons.

Entry	Leaf Rust	Stripe Rust[2]	Stem Rust[3]	Bacterial Leaf Streak[4]	Other Leaf Diseases[5]	Scab
AP Gunsmoke CL2	3	–	1	8	7	5
AP Murdock	3	–	1	4	6	7
AP Smith	6	–	1	4	5	6
Ascend-SD	3	–	1	2–3	6	4
Bolles	2	1	2	4	4	5
CAG Justify	3	–	2	4–5	4	4
CAG Reckless	1	–	1	3	5	4
CAG Recoil	2	–	2	2–3	5	–
CP3099A	6	–	8	6–7	4	5–6
CP3119A	5	–	2	6–7	4	5–6
CP3188	1	–	6	6–7	6	5
CP3530	7	3	1	3	6	4
CP3915	1	–	1	2	5	4
CPX39120	7	–	6	4–5	3	–
Driver	3	–	1	3	4	4
Dyna-Gro Ambush	4	–	2	4	4	4
Dyna-Gro Ballistic	4	–	3	3	4	5
Dyna-Gro Commander	2	–	1	4	6	5
Lang-MN	1	–	2	3	4	3
LCS Ascent	4	–	1–2	6–7	5	–
LCS Buster	3	–	1	4	3	3
LCS Cannon	4	–	2	5	7	5
LCS Dual	3	–	1–2	5	4	–
LCS Trigger	1	–	2	2	3	3
Linkert	3	1	1	5	5	5
MN-Rothsay	4	–	2	4	3	4
MN-Torgy	3	–	1	3	4	3
MN-Washburn	1	2	1	3	4	4
MS Barracuda	6	–	2	7	5	5
MS Charger	–	–	2	5	6	–
MS Cobra	2	–	1	4–5	4	5
MS Ranchero	3	–	1	6	3	4
ND Frohberg	3	–	1	3	5	5
ND Heron	5	–	1–2	5	4	–
Prosper	6	5	2	4	5	5
Shelly	5	1	2	6	4	4
SY 611 CL2	4	–	5	4	4	4
SY Longmire	5	–	1	3	5	7
SY McCloud	3	–	1	6	6	4
SY Valda	4	2	1	4	5	4
TCG-Heartland	3	–	2	5	6	6
TCG-Spitfire	4	–	2	3	5	6
TCG-Wildcat	3	–	3	6	7	7
WB9479	6	–	2	6	6	7
WB9590	6	–	2	6	6	7

[1]1-9 scale where 1 = most resistant, 9 = most susceptible.
[2]Based on natural infections in 2015 at Kimball, Lamberton, and Waseca.
[3]Stem rust levels have been very low in production fields in recent years, even on susceptible varieties.
[4]Bacterial leaf streak symptoms are highly variable from one environment to the next. The rating of entries may change as more data is collected.
[5]Combined rating of tan spot and septoria.

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The "Other Leaf Diseases" rating represents a combined reaction to two different Septoria leaf blotches and tan spot. Although varieties may differ for their response to each of those diseases, the rating does not differentiate among them. Consequently, the rating should be used as a general indication and only for varietal selection in areas where these diseases have been a problem or if the previous crop was wheat or barley. Control of fungal leaf diseases with fungicides may be warranted, even for varieties with an above-average rating.

MN-Torgy was the no. 1 variety grown in Minnesota in 2022, on 21.7 percent of the 1.2 million acres. The next most seeded varieties were WB9590 (19.4 percent), SY Valda (11.0 percent), WB9479 (7.9 percent), AP Murdock (7.6 percent) and Linkert (6.3 percent).

Varieties tested for the first time in 2022 were CAG Recoil, CPX39120, LCS Ascent, LCS Dual, MS Charger and ND-Heron. Ascend-SD (released in 2021) and MN-Rothsay (released in 2022) were both tested in previous years under their experimental designations and 2- and 3-year averages are reported, respectively. WestBred did not submit any HRSW varieties for testing, but WB9479 and WB9590 were both tested in 2022 because each occupied more than 5 percent of the state's acreage in 2021. LCS Rebel and PFS-Buns were tested in 2021 but not 2022.

Since 2004 we have been conducting an "intensive" management trial in which

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fungicides are applied at the time of herbicide application (Feekes 5), flag leaf emergence (Feekes 9), and at the onset of flowering (Feekes 10.51). The practice of three fungicide applications during the growing season is not recommended. This fungicide regime was implemented to measure the varieties' performance when fungal diseases were controlled to the maximum extent possible. Decisions regarding fungicide applications should be based on the available decision support systems and used only if and when disease levels are forecasted to reach economically damaging levels. The additional performance evaluations were carried out adjacent to the conventional (no fungicides applied) trials, so results can be compared directly. Data from trials conducted in Crookston, Lam-

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Table 4. Relative grain yield of hard red spring wheat varieties in northern Minnesota locations in single-year (2022) and multiple-year comparisons (2020-2022).

	Crookston			Fergus Falls			Hallock			Oklee			Perley			Roseau			Stephen			Strathcona		
Entry	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr
AP Gunsmoke CL2	95	100	102	102	101	101	99	100	101	102	105	110	82	94	93	101	101	101	94	97	98	102	104	101
AP Murdock	108	102	103	89	89	92	90	91	94	103	94	102	117	108	108	103	99	102	110	100	106	113	105	111
AP Smith	101	100	100	91	98	98	92	96	94	120	110	105	102	101	99	91	93	97	99	100	102	93	98	95
Ascend-SD	102	97	–	111	109	–	99	101	–	91	100	–	101	99	–	113	107	–	117	111	–	120	109	–
Bolles	96	94	94	91	96	94	90	89	91	89	90	91	89	96	97	91	95	95	100	94	94	87	88	88
CAG Justify	96	94	–	99	105	–	115	112	–	96	101	–	102	104	–	120	110	–	105	104	–	115	108	–
CAG Reckless	91	100	–	95	101	–	101	103	–	93	98	–	97	100	–	106	105	–	104	105	–	104	104	–
CAG Recoil	106	–	–	101	–	–	97	–	–	93	–	–	113	–	–	86	–	–	98	–	–	95	–	–
CP3099A	119	107	–	115	118	–	114	113	–	122	131	–	103	103	–	121	115	–	106	111	–	115	107	–
CP3119A	93	100	–	100	108	–	109	104	–	119	117	–	79	85	–	101	112	–	89	105	–	111	105	–
CP3188	105	108	–	90	99	–	91	96	–	98	102	–	95	101	–	107	106	–	98	103	–	106	105	–
CP3530	97	88	90	94	97	97	109	101	105	96	93	96	102	99	100	117	111	106	107	106	104	112	107	109
CP3915	97	93	96	96	96	98	98	102	99	100	97	94	105	103	101	99	95	103	103	96	98	117	110	102
CPX39120	66	–	–	106	–	–	95	–	–	105	–	–	84	–	–	74	–	–	70	–	–	96	–	–
Driver	105	103	102	107	108	107	102	102	107	108	114	112	106	107	108	116	108	105	99	100	103	102	103	100
Dyna-Gro Ambush	92	102	103	103	105	103	110	103	104	112	101	103	94	98	101	103	103	100	112	101	104	107	105	106
Dyna-Gro Ballistic	99	98	101	103	105	106	100	101	102	94	105	105	87	92	96	95	98	106	107	105	107	104	102	100
Dyna-Gro Commander	102	103	100	87	93	96	97	97	99	100	98	99	106	104	101	99	101	101	98	97	101	102	105	105
Lang-MN	105	104	103	102	98	99	102	100	101	92	91	93	94	95	95	99	93	97	98	100	97	95	94	102
LCS Ascent	97	–	–	95	–	–	105	–	–	104	–	–	91	–	–	110	–	–	105	–	–	105	–	–
LCS Buster	113	104	104	110	109	112	112	109	110	107	109	116	107	108	111	99	100	109	107	107	110	100	99	104
LCS Cannon	97	93	95	96	94	96	87	94	93	99	100	102	104	104	107	109	109	104	104	105	102	104	106	105
LCS Dual	102	–	–	102	–	–	105	–	–	84	–	–	102	–	–	97	–	–	99	–	–	98	–	–
LCS Trigger	111	106	108	107	102	108	117	109	116	119	110	114	125	115	118	116	105	110	110	108	110	114	107	110
Linkert	100	104	100	84	88	91	88	95	96	88	83	87	89	89	89	91	89	90	93	96	92	91	94	90
MN-Rothsay	106	111	110	98	100	103	114	107	106	107	107	107	105	107	106	108	104	105	109	104	105	100	100	102
MN-Torgy	105	105	105	99	99	102	106	102	100	82	88	95	103	103	101	103	97	100	116	108	111	93	96	99
MN-Washburn	101	97	97	113	102	101	99	100	100	80	88	92	103	101	100	93	98	90	106	98	99	101	97	90
MS Barracuda	97	91	92	97	96	96	90	96	96	92	101	102	94	97	93	100	102	98	93	92	93	92	100	103
MS Charger	116	–	–	108	–	–	106	–	–	109	–	–	101	–	–	110	–	–	97	–	–	109	–	–
MS Cobra	102	101	–	90	100	–	99	100	–	99	94	–	93	98	–	97	101	–	95	94	–	94	97	–
MS Ranchero	86	101	101	110	104	101	111	106	107	94	97	100	90	95	97	96	101	105	87	88	97	109	105	113
ND Frohberg	88	100	98	94	95	99	97	93	92	86	95	97	88	92	92	105	102	99	84	88	88	89	95	96
ND Heron	94	–	–	96	–	–	94	–	–	99	–	–	86	–	–	111	–	–	94	–	–	93	–	–
Prosper	92	93	98	115	113	112	106	104	105	109	106	108	94	101	101	98	102	105	109	110	111	104	99	99
Shelly	102	100	102	105	107	108	109	106	108	99	100	103	102	97	96	115	107	102	105	103	101	107	105	108
SY 611 CL2	98	96	98	107	110	108	93	99	97	108	105	108	113	106	104	107	104	105	103	98	101	97	99	98
SY Longmire	94	93	95	92	97	97	98	97	96	93	96	95	97	98	98	84	90	90	96	100	100	103	101	92
SY McCloud	106	107	102	99	98	99	92	97	100	94	97	99	99	97	97	102	104	103	92	91	88	95	97	99
SY Valda	91	92	96	106	101	103	108	107	108	105	107	105	113	105	106	102	105	103	107	107	111	97	99	102
TCG-Heartland	94	97	98	93	93	96	89	91	90	91	93	94	94	87	94	77	90	92	93	89	96	80	88	88
TCG-Spitfire	108	103	105	101	109	109	96	100	98	101	97	100	111	113	111	91	94	97	106	105	103	92	97	98
TCG-Wildcat	108	100	101	88	97	99	99	99	99	99	100	99	100	103	103	109	104	107	105	98	104	105	107	106
WB9479	100	99	103	89	90	92	97	94	97	93	95	99	96	98	94	91	92	92	96	92	96	105	104	104
WB9590	100	99	104	105	104	103	102	98	105	106	98	101	95	97	100	102	101	103	97	92	93	104	102	105
Mean (Bu/Acre)	**96.1**	**76.9**	**74.6**	**83.9**	**79.1**	**80.1**	**82.3**	**77.3**	**72.8**	**71.8**	**70.8**	**73.5**	**96.9**	**91.1**	**83.1**	**80.8**	**86.0**	**86.0**	**89.5**	**79.8**	**77.1**	**83.8**	**72.3**	**71.3**
LSD (0.10)	**9.0**	**9.5**	**6.2**	**14.6**	**6.4**	**4.3**	**20.0**	**6.0**	**5.1**	**18.9**	**7.5**	**5.7**	**7.9**	**7.4**	**5.9**	**10.6**	**7.2**	**6.2**	**11.4**	**7.0**	**5.6**	**19.3**	**9.1**	**7.1**

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berton, Morris, and Roseau are included in the 2022 and multi-year summaries. In the two northern locations, the fungicide regime as applied in these trials increased grain yield on average by 12.1 bu/acre in 2022 and by 6.4 bu/acre over the past three years. The two southern locations, Lamberton and Morris, averaged 7.0 bu/acre higher grain yield when fungicide protected in 2022 and 5.3 bu/acre higher from 2010-2022. Rather than the average increases in grain yield, the responses of individual varieties provide the most useful information; varieties rated susceptible to leaf rust, stripe rust, and other fungal leaf diseases usually benefited most from fungicide applications.

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Table 5. Relative grain yield of hard red spring wheat varieties in southern Minnesota locations in single-year (2022) and multiple-year comparisons (2020-2022).

	Becker			Benson[1]	Le Center			Lamberton			Morris			St Paul			Waseca[2]	
Entry	2022	2 Yr	3 Yr	2 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr
AP Gunsmoke CL2	106	105	105	100	98	103	104	114	110	99	118	111	109	108	98	97	101	103
AP Murdock	95	99	99	93	102	98	102	100	99	101	115	103	104	80	94	100	110	113
AP Smith	102	98	98	104	98	100	99	99	101	101	94	99	104	96	100	97	103	101
Ascend-SD	121	115	–	–	104	103	–	111	108	–	133	124	–	97	99	–	123	–
Bolles	95	88	89	100	90	90	89	88	89	94	95	98	98	88	94	95	96	95
CAG Justify	104	97	–	–	105	97	–	114	107	–	133	130	–	110	108	–	115	–
CAG Reckless	112	118	–	–	96	96	–	109	104	–	118	110	–	113	111	–	99	–
CAG Recoil	75	–	–	–	107	–	–	93	–	–	106	–	–	87	–	–	104	–
CP3099A	94	98	–	–	110	101	–	116	118	–	96	115	–	93	92	–	112	–
CP3119A	90	104	–	–	114	110	–	90	100	–	76	100	–	92	91	–	101	–
CP3188	99	103	–	–	103	106	–	90	106	–	114	119	–	97	102	–	98	–
CP3530	98	97	97	107	107	108	107	101	100	100	107	101	100	108	105	103	108	101
CP3915	101	104	105	94	94	95	96	106	103	105	89	93	96	116	97	92	85	87
CPX39120	63	–	–	–	121	–	–	106	–	–	84	–	–	75	–	–	74	–
Driver	107	106	106	103	103	102	100	107	113	112	111	108	108	122	112	107	96	103
Dyna-Gro Ambush	109	102	102	104	106	108	107	111	103	100	110	88	96	104	110	109	112	112
Dyna-Gro Ballistic	92	101	101	105	99	101	103	105	101	104	105	106	106	113	99	101	104	104
Dyna-Gro Commander	96	103	103	112	96	101	102	90	93	96	107	104	109	110	113	110	112	117
Lang-MN	95	97	97	95	93	96	96	92	94	94	99	99	101	102	108	104	106	104
LCS Ascent	115	–	–	–	101	–	–	99	–	–	112	–	–	117	–	–	97	–
LCS Buster	106	114	115	105	108	104	105	104	103	108	99	97	104	100	105	103	111	116
LCS Cannon	123	114	114	101	98	104	107	106	104	104	116	93	101	137	126	123	111	113
LCS Dual	118	–	–	–	97	–	–	106	–	–	107	–	–	99	–	–	120	–
LCS Trigger	98	105	106	118	109	112	112	110	114	117	112	118	124	100	110	107	116	123
Linkert	104	102	102	97	89	94	93	97	95	94	96	93	93	109	105	102	90	87
MN-Rothsay	101	105	105	107	93	97	98	87	89	95	94	98	104	89	97	99	111	104
MN-Torgy	107	107	107	102	101	103	105	106	101	105	92	98	102	64	87	92	105	100
MN-Washburn	97	96	96	93	99	99	102	103	100	101	100	105	102	101	101	96	84	97
MS Barracuda	113	105	105	95	98	103	105	94	97	99	92	82	85	126	121	116	99	103
MS Charger	124	–	–	–	107	–	–	113	–	–	113	–	–	121	–	–	116	–
MS Cobra	110	105	–	–	98	101	–	103	102	–	87	94	–	116	115	–	104	–
MS Ranchero	83	87	87	102	91	96	95	81	89	91	68	79	87	78	90	99	78	92
ND Frohberg	103	102	103	104	89	95	96	97	97	98	104	103	105	111	106	104	105	105
ND Heron	109	–	–	–	90	–	–	93	–	–	95	–	–	121	–	–	98	–
Prosper	97	103	104	105	102	103	105	105	101	107	118	119	115	96	92	97	92	96
Shelly	91	94	94	107	97	101	104	110	106	104	96	103	107	107	112	105	95	96
SY 611 CL2	116	111	112	98	96	96	93	97	99	97	99	96	95	103	96	97	106	97
SY Longmire	78	90	90	94	95	96	95	89	98	103	89	101	99	98	81	83	77	76
SY McCloud	107	97	97	93	100	102	100	101	100	94	96	89	90	104	98	100	78	84
SY Valda	101	98	99	102	110	108	107	100	102	101	102	100	101	115	108	103	106	107
TCG-Heartland	101	97	97	95	98	98	98	88	93	94	86	87	87	107	99	99	105	104
TCG-Spitfire	112	110	111	109	113	110	107	111	115	119	108	106	114	110	102	100	108	100
TCG-Wildcat	115	112	112	96	103	103	104	104	109	109	123	114	111	92	100	100	104	102
WB9479	100	96	96	92	94	98	98	99	93	92	93	89	90	105	99	97	102	102
WB9590	107	98	99	98	99	100	103	88	96	99	98	92	94	112	104	105	100	103
Mean (Bu/Acre)	**58.8**	**50.5**	**50.4**	**72.7**	**82.7**	**76.8**	**77.0**	**60.3**	**60.1**	**60.8**	**57.0**	**55.8**	**52.6**	**52.4**	**50.5**	**58.8**	**38.1**	**42.2**
LSD (0.10)	**18.9**	**10.9**	**7.6**	**6.6**	**11.8**	**6.0**	**3.6**	**12.8**	**7.0**	**5.9**	**18.4**	**13.2**	**8.6**	**15.8**	**12.2**	**7.8**	**13.9**	**6.7**

[1]2022 was abandoned due to early season flooding. 2 year data is 2020-2021.
[2]2021 Waseca was discarded due to excessive within trial variation. 2 year is the mean of 2020 and 2022.

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Table 6. Relative grain yield of hard red spring wheat varieties in Minnesota in single-year (20222) and multiple-year comparisons (2020-2022).

	State			North			South		
Entry	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr	2022	2 Yr	3 Yr
AP Gunsmoke CL2	100	101	101	97	100	101	107	104	102
AP Murdock	103	98	102	104	99	102	100	98	101
AP Smith	98	100	99	98	99	99	98	100	100
Ascend-SD	109	106	–	107	104	–	114	110	–
Bolles	92	93	93	92	93	93	92	93	94
CAG Justify	108	106	–	106	105	–	113	108	–
CAG Reckless	102	103	–	99	102	–	107	105	–
CAG Recoil	98	–	–	99	–	–	96	–	–
CP3099A	111	110	–	114	113	–	104	106	–
CP3119A	98	104	–	99	104	–	95	102	–
CP3188	99	104	–	99	102	–	100	107	–
CP3530	104	101	102	104	100	101	105	103	103
CP3915	101	98	98	102	99	99	99	97	96
CPX39120	88	–	–	86	–	–	91	–	–
Driver	106	106	105	105	105	105	108	107	105
Dyna-Gro Ambush	105	102	103	104	102	103	108	103	104
Dyna-Gro Ballistic	100	101	103	99	100	103	102	101	104
Dyna-Gro Commander	100	101	102	99	100	100	101	104	106
Lang-MN	98	97	98	98	97	98	97	98	98
LCS Ascent	103	–	–	101	–	–	107	–	–
LCS Buster	106	105	109	107	106	109	105	105	107
LCS Cannon	105	103	103	100	101	100	114	108	109
LCS Dual	102	–	–	99	–	–	107	–	–
LCS Trigger	112	109	113	115	108	112	107	112	115
Linkert	93	94	93	91	92	92	97	96	96
MN-Rothsay	102	103	104	106	105	105	95	98	101
MN-Torgy	100	100	102	101	100	102	96	100	102
MN-Washburn	99	98	97	100	98	96	98	99	99
MS Barracuda	97	98	98	94	97	97	103	100	101
MS Charger	110	–	–	107	–	–	115	–	–
MS Cobra	98	99	–	96	98	–	102	102	–
MS Ranchero	92	96	99	97	99	102	81	90	94
ND Frohberg	94	97	97	91	95	95	100	101	102
ND Heron	97	–	–	96	–	–	100	–	–
Prosper	103	103	105	103	103	105	102	103	105
Shelly	103	103	103	105	103	103	100	102	103
SY 611 CL2	103	102	101	103	102	102	102	100	98
SY Longmire	93	95	94	95	96	95	89	93	93
SY McCloud	98	98	97	98	99	98	99	96	95
SY Valda	104	103	104	104	103	104	106	103	103
TCG-Heartland	92	92	94	89	91	94	97	95	96
TCG-Spitfire	104	105	105	101	103	103	111	109	109
TCG-Wildcat	103	103	103	102	101	102	107	106	105
WB9479	97	95	96	96	95	97	98	95	95
WB9590	101	99	101	101	99	102	100	98	100
Mean (Bu/Acre)	**73.9**	**69.8**	**69.9**	**85.6**	**79.2**	**77.3**	**58.2**	**57.2**	**59.9**
LSD (0.10)	**3.1**	**2.2**	**1.6**	**3.6**	**2.6**	**2.0**	**5.3**	**3.7**	**2.6**
No. of Environments	**14**	**28**	**42**	**8**	**16**	**24**	**6**	**12**	**18**

Table 7. Grain yield (bushels per acre) of hard red spring wheat varieties grown under conventional and intensive management.

	North						South						State					
	2022		2 Yr		3 Yr		2022		2 Yr		3 Yr		2022		2 Yr		3 Yr	
Entry	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int
AP Gunsmoke CL2	86.6	103.3	81.6	93.4	81.4	90.4	68.0	71.9	64.2	71.2	58.8	64.8	77.3	87.6	72.9	82.3	70.1	77.6
AP Murdock	93.4	108.4	81.6	89.8	82.6	90.4	62.8	65.3	58.7	63.4	58.1	60.6	78.1	86.8	70.1	76.6	70.3	75.5
AP Smith	85.2	97.7	78.4	85.7	78.9	82.8	56.5	65.0	58.1	66.5	57.8	61.4	70.8	81.3	68.2	76.1	68.4	72.1
Ascend-SD	94.4	104.2	83.5	95.5	–	–	71.4	75.3	67.3	72.9	–	–	82.9	89.7	75.4	84.2	–	–
Bolles	82.7	95.5	76.8	85.2	76.0	81.1	53.8	60.1	54.1	60.7	54.4	59.2	68.2	77.8	65.4	72.9	65.2	70.1
CAG Justify	94.8	108.5	83.3	98.6	–	–	72.2	68.4	68.5	69.3	–	–	83.5	88.4	75.9	84.0	–	–
CAG Reckless	86.4	94.1	83.5	88.0	–	–	66.4	68.1	62.2	64.6	–	–	76.4	81.1	72.8	76.3	–	–
CAG Recoil	86.0	95.3	–	–	–	–	58.3	61.2	–	–	–	–	72.2	78.2	–	–	–	–
CP3099A	106.1	116.2	90.5	102.2	–	–	62.3	68.7	67.4	78.1	–	–	84.2	92.4	79.0	90.2	–	–
CP3119A	85.6	104.2	86.4	102.6	–	–	49.0	58.4	58.1	68.0	–	–	67.3	81.3	72.3	85.3	–	–
CP3188	93.7	106.6	87.1	97.9	–	–	59.7	66.3	65.2	70.0	–	–	76.7	86.5	76.1	84.0	–	–
CP3530	93.7	103.3	81.5	89.6	78.9	88.3	60.9	59.9	58.4	62.2	56.7	60.4	77.3	81.6	70.0	75.9	67.8	74.4
CP3915	86.6	103.1	76.7	92.2	80.4	90.3	57.2	64.9	56.9	66.3	57.2	62.8	71.9	84.0	66.8	79.3	68.8	76.6
CPX39120	61.2	92.4	–	–	–	–	55.8	62.7	–	–	–	–	58.5	77.6	–	–	–	–
Driver	97.1	103.1	85.8	95.6	83.1	88.1	63.8	68.1	64.1	66.9	62.4	62.8	80.5	85.6	75.0	81.2	72.8	75.5
Dyna-Gro Ambush	85.6	101.0	83.3	89.7	81.4	85.3	64.6	72.9	55.4	68.6	55.8	64.0	75.1	86.9	69.3	79.2	68.6	74.6
Dyna-Gro Ballistic	85.9	99.5	79.8	93.4	83.0	89.3	61.4	67.5	59.9	67.2	59.7	66.0	73.7	83.5	69.8	80.3	71.4	77.6
Dyna-Gro Commander	88.8	101.0	83.0	92.0	80.8	87.1	57.9	63.3	57.2	64.1	58.0	61.8	73.3	82.2	70.1	78.1	69.4	74.5
Lang-MN	90.3	98.5	80.0	85.9	79.9	83.9	55.9	62.8	55.7	63.9	55.0	61.3	73.1	80.6	67.9	74.9	67.5	72.6
LCS Ascent	91.3	104.8	–	–	–	–	61.7	71.9	–	–	–	–	76.5	88.3	–	–	–	–
LCS Buster	94.2	107.6	83.3	97.7	85.5	94.0	59.6	69.0	58.2	73.8	60.4	70.2	76.9	88.3	70.8	85.7	73.0	82.1
LCS Cannon	90.5	102.8	82.8	92.6	80.1	87.9	65.1	69.9	57.1	70.8	58.1	66.2	77.8	86.4	70.0	81.7	69.1	77.1
LCS Dual	88.5	98.8	–	–	–	–	62.6	67.8	–	–	–	–	75.6	83.3	–	–	–	–
LCS Trigger	100.4	111.2	85.8	97.0	87.9	92.9	65.2	75.6	67.0	76.4	67.8	74.8	82.8	93.4	76.4	86.7	77.9	83.9
Linkert	84.9	93.4	78.4	81.5	76.2	80.8	56.4	64.1	54.7	65.2	53.1	60.5	70.6	78.8	66.5	73.4	64.7	70.7
MN-Rothsay	94.6	106.8	87.3	92.8	86.2	89.0	52.9	60.8	54.1	64.7	56.4	61.0	73.7	83.8	70.7	78.8	71.3	75.0
MN-Torgy	92.3	101.6	82.1	87.6	82.3	85.4	58.2	66.1	57.5	66.4	58.9	61.9	75.2	83.8	69.8	77.0	70.6	73.7
MN-Washburn	86.4	100.0	79.4	87.3	75.1	88.3	59.4	67.3	59.4	66.7	57.7	61.9	72.9	83.6	69.4	77.0	66.4	75.1
MS Barracuda	87.1	104.0	78.9	92.0	76.4	85.0	54.6	63.2	51.9	62.3	52.6	58.4	70.9	83.6	65.4	77.1	64.5	71.7
MS Charger	100.3	108.9	–	–	–	–	66.3	73.0	–	–	–	–	83.3	90.9	–	–	–	–
MS Cobra	88.3	98.0	82.1	89.2	–	–	55.9	62.5	56.7	64.6	–	–	72.1	80.2	69.4	76.9	–	–
MS Ranchero	79.9	85.2	82.2	83.4	82.8	81.5	44.0	60.8	48.9	62.3	50.6	56.9	62.0	73.0	65.5	72.9	66.7	69.2
ND Frohberg	84.5	90.7	82.1	85.8	79.3	81.7	58.7	65.6	57.9	63.8	57.9	61.0	71.6	78.2	70.0	74.8	68.6	71.4
ND Heron	90.0	94.6	–	–	–	–	55.1	65.4	–	–	–	–	72.5	80.0	–	–	–	–
Prosper	84.0	105.2	79.6	94.4	81.5	91.6	65.1	71.7	63.5	71.7	62.6	68.3	74.6	88.4	71.6	83.0	72.1	80.0
Shelly	95.4	106.7	84.5	94.7	81.9	92.6	60.8	64.6	60.6	69.0	59.9	63.0	78.1	85.6	72.5	81.8	70.9	77.8
SY 611 CL2	90.6	102.1	81.5	90.9	81.7	88.3	57.4	64.3	56.7	65.0	54.8	60.7	74.0	83.2	69.1	77.9	68.3	74.5
SY Longmire	79.4	92.0	74.5	84.4	74.1	82.9	52.1	52.5	57.8	60.8	57.4	59.0	65.8	72.3	66.1	72.6	65.7	70.9
SY McCloud	92.0	100.8	85.8	86.9	82.2	83.9	58.0	65.4	54.8	64.5	52.4	58.7	75.0	83.1	70.3	75.7	67.3	71.3
SY Valda	85.1	102.1	80.4	93.1	79.8	90.2	59.2	72.3	58.7	72.1	57.2	66.0	72.1	87.2	69.6	82.6	68.5	78.1
TCG-Heartland	76.2	92.8	75.7	84.1	76.4	83.6	51.2	61.2	52.2	65.1	51.4	58.9	63.7	77.0	63.9	74.6	63.9	71.2
TCG-Spitfire	88.3	103.5	80.1	94.7	80.8	92.9	64.3	69.6	64.1	72.3	66.5	70.6	76.3	86.5	72.1	83.5	73.7	81.8
TCG-Wildcat	95.9	107.6	83.5	94.6	83.5	91.5	66.4	75.4	64.8	69.2	62.3	65.3	81.1	91.5	74.1	81.9	72.9	78.4
WB9479	84.9	97.1	77.5	85.2	77.8	82.6	56.3	64.4	52.8	63.6	51.8	58.5	70.6	80.8	65.2	74.4	64.8	70.6
WB9590	89.1	105.4	81.8	94.2	83.2	91.9	54.5	66.4	54.6	63.4	54.9	60.8	71.8	85.9	68.2	78.8	69.0	76.4
Mean (Bu/Acre)	**88.4**	**100.5**	**81.4**	**90.6**	**80.3**	**86.7**	**58.7**	**65.7**	**58.0**	**66.5**	**56.8**	**62.1**	**73.6**	**83.1**	**69.7**	**78.5**	**68.5**	**74.4**
LSD (0.10)	**6.2**	**5.3**	**4.8**	**4.1**	**3.5**	**3.4**	**4.3**	**4.3**	**4.0**	**3.9**	**2.8**	**2.9**	**3.9**	**3.4**	**3.1**	**2.8**	**2.3**	**2.2**
No. of Environments	**2**	**2**	**4**	**4**	**6**	**6**	**2**	**2**	**4**	**4**	**6**	**6**	**4**	**4**	**8**	**8**	**12**	**12**

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We travel around the country to YOU!

Certified Seed Directory of Growers

The crops and varieties listed in this portion of the *Seed Guide* were grown by members of the Minnesota Crop Improvement Association. Varieties listed are those applied for by Oct. 1, 2022. Certification of field crops is not complete until the fields have passed inspection, a representative cleaned seed sample has met standards based on complete laboratory analysis, and the seed is properly labeled. The certification tag on the bag or a bulk sale certificate is the buyer's assurance that seed so represented has met all certified seed standards. Seed sold without proper certification markings is not certified seed.

Under the columns for acreage, Registered and Certified classes are designated as follows:

R = Registered

C = Certified

Not all certifiable crops and varieties are included. Varieties intended for export and some private varieties are not included, by choice of the owner.

Protected crop varieties

Most varieties listed in the directory portion of the *Seed Guide* are protected by the U.S. Plant Variety Protection Act or by license agreements with the owner of the variety. Crop varieties for which applications have been filed or certificates issued for protection under the Plant Variety Protection Act (PVPA) have been noted elsewhere in this publication. PVPA Title V specifies the seed of the variety may be sold only as a class of certified seed. In addition, for varieties noted as PVP(94), you may save seed only for your own planting. You may not provide/sell/barter/exchange it to a neighbor or another party without specific permission of the variety owner. Some protected crop varieties need not be sold as a class of certified seed; owners of those varieties are responsible for informing growers of restrictions regarding seed production.

The information in the *Seed Guide* is not an all-inclusive PVP list! Call MCIA if you are unsure of a variety's PVP status or you can check PVP status on the Internet at https://www.ams.usda.gov/services/plant-variety-protection/application-status.

Notice to buyers

The Minnesota Crop Improvement Association can assume no financial responsibility for seed or other products listed in this directory or for disagreements over sales which may arise from this list. However, complaints about certified seed addressed to the association will be investigated. Should there be a claim over seed performance involving the Minnesota Crop Improvement Association, it must be addressed as provided in the Minnesota Department of Agriculture Rules for Arbitration of Seed Performance Disputes.

Inquiries for seed should be directed to applicants and conditioners listed. It is the applicant's (seller's) responsibility to supply seed representative of the samples submitted and approved for certification by the Minnesota Crop Improvement Association. Buyers should insist on certification being complete (including attachment of certified seed tags to bags or obtaining a bulk sale certificate when purchasing seed). ✻

Barley

County	Producer	City	Phone	R	C
ABI CARDINAL					
Polk	AgriMAX,	Fisher	218-891-2211	152	
Polk	LaPlante, Craig	Fisher	218-289-4506	133	
EXCELSIOR GOLD					
Grant	Kapphahn, John M	Elbow Lake	218-685-4604		52
LACEY					
Carlton	Northland Farm Supply Inc.	Cromwell	218-821-1627		65
Grant	Adams Seed	Wendell	218-458-2151		105
Mahnomen	Spring Creek Seed & Consulting	Ulen	218-261-1647		20
Norman	Star of the North	Gary	218-356-8300		40
Polk	Fosston Tri-Coop	Fosston	218-435-6222		146
Polk	Novak Farms	Angus	701-740-2008		93
Red Lake	Miller, Daniel S	Mentor	701-741-1189		75
Todd	Faust, Kevin	Long Prairie	320-732-3361		37
ND GENESIS					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	30	
Lake of the Woods	Northern Excellence Seed LLC	Williams	218-783-2228		
Marshall	Kowalski, John & Darrin	Stephen	218-478-4119		20
Pennington	Scholin Farms	Thief River Falls	218-964-5268	45	
QUEST					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		143
RASMUSSON					
Polk	Capistran Seed Company	Crookston	218-891-7840	40	45
ROBUST					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		75
Meeker	Peterson, Russell M	Grove City	320-877-7793		
ROYAL					
Wabasha	Zabel Seeds	Plainview	507-534-2498		96
TRADITION					
Clay	Olek, Bradley	Felton	218-494-3440		60
Kittson	Kirkeby, Aaron	Kennedy	701-899-3215		116

Barley, Winter

County	Producer	City	Phone	R	C
MN-EQUINOX					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		31

Beans

County	Producer	City	Phone	R	C
ECLIPSE BLACK					
Grant	Kapphahn, John M	Elbow Lake	218-685-4604	72	
ND TWILIGHT BLACK					
Grant	Kapphahn, John M	Elbow Lake	218-685-4604	80	
Norman	Star of the North	Gary	218-356-8300	40	
ND WHITETAIL WHITE KIDNEY					
Norman	Star of the North	Gary	218-356-8300		40
ROSIE LIGHT RED KIDNEY					
Norman	Star of the North	Gary	218-356-8300	40	
TALON DARK RED KIDNEY					
Norman	Star of the North	Gary	218-356-8300	40	

Kentucky bluegrass

County	Producer	City	Phone	R	C
PARK					
Roseau	C&S Habstritt Inc	Roseau	218-463-1193	20	290
Roseau	Elton, Marlin	Roseau	218-689-7528		200
Roseau	Erickson, Douglas	Roseau	218-469-2660	10	291
Roseau	Olafson, Mark	Roseau	218-242-2216		270
Roseau	Slater, Bridget	Roseau	218-469-2533		230
Roseau	Slater, Gary	Roseau	218-463-1064		922
Roseau	Wensloff, Tony	Roseau	218-463-2668		381

Oats

County	Producer	City	Phone	R	C
ANTIGO					
Mower	Grass & Sons Seed, Inc	LeRoy	507-324-5820		40
Rice	Werner Seed Co.	Dundas	507-645-7995		27
Stearns	Nietfeld Farm, Inc	Melrose	320-987-3442		71
Wabasha	Zabel Seeds	Plainview	507-534-2498		46
DEON					
Carlton	Northland Farm Supply Inc.	Cromwell	218-821-1627		12
Mahnomen	Sweep, Nathan A	Fosston	218-435-1360		63
Polk	Fosston Tri-Coop	Fosston	218-435-6222	40	377
Rice	Werner Seed Co.	Dundas	507-645-7995		32
Stearns	Nietfeld Farm, Inc	Melrose	320-987-3442		138
Todd	Faust, Kevin	Long Prairie	320-732-3361	13	87
Wabasha	Gerken's Feed & Grain LLC	Wabasha	651-565-2611		20
ESKER2020					
Wabasha	Zabel Seeds	Plainview	507-534-2498		41
MN-PEARL					
Beltrami	Neft, Frank	Kelliher	218-647-8408	55	
Brown	Cunningham Seed Farms	Sleepy Eye	507-794-7323	12	35
Carlton	Northland Farm Supply Inc.	Cromwell	218-821-1627		28
Clay	Tobolt Seed	Moorhead	218-287-2904	32	
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		130
Grant	Red River Marketing Co	Elbow Lake	218-685-6100	15	120
Kittson	Lake Bronson Elevator, Inc	Lake Bronson	218-754-4200	20	109
Le Sueur	Haas Seed Farm	Le Sueur	612-327-5385	13	100
Le Sueur	Stangler, Richard	Kilkenny	507-595-3331		65
Mahnomen	Pazdernik Farms, Inc	Waubun	218-766-9531	25	
Meeker	Anderson Seeds	Dassel	320-286-2700		58
Polk	Fosston Tri-Coop	Fosston	218-435-6222	33	580
Polk	LaPlante, Craig	Fisher	218-289-4506	129	
Redwood	Sawvell's Seed, Inc	Clements	507-692-2240		26
Renville	Enestvedt Seed Company	Sacred Heart	320-765-2728	32	
Rice	Werner Seed Co.	Dundas	507-645-7995		27
Roseau	Magnusson Farms	Roseau	218-463-2374		611
Swift	Falk's Seed Farm	Murdock	320-875-4341	25	
Swift	Lee's Seed Farm	Benson	320-843-2857		28
Todd	Faust, Kevin	Long Prairie	320-732-3361		104
Wabasha	Zabel Seeds	Plainview	507-534-2498	67	
Wadena	Petersen, Mike	Sebeka	218-639-5448		32

County	Producer	City	Phone	R	C
REINS					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		358
Todd	Faust, Kevin	Long Prairie	320-732-3361		69
Wabasha	Zabel Seeds	Plainview	507-534-2498		110
RUSHMORE					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		480
SADDLE					
Brown	Cunningham Seed Farms	Sleepy Eye	507-794-7323		18
Mahnomen	Spring Creek Seed & Consulting	Ulen	218-261-1647		15
Meeker	Anderson Seeds	Dassel	320-286-2700		45
Rice	Werner Seed Co.	Dundas	507-645-7995		44
Stearns	Spring Water Acres LLC	Melrose	320-249-2254		286
Swift	Falk's Seed Farm	Murdock	320-875-4341		174
Wabasha	Zabel Seeds	Plainview	507-534-2498		47
SD BUFFALO					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		120
Swift	Falk's Seed Farm	Murdock	320-875-4341		35
SHELBY 427					
Wabasha	Gerken's Feed & Grain LLC	Wabasha	651-565-2611		23
STREAKER					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		55
SUMO					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		128
WARRIOR					
Swift	Falk's Seed Farm	Murdock	320-875-4341		48

Rye

AROOSTOOK					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	15	198
Winona	Speltz, Keith (Speltz Farms, Inc)	Altura	507-689-2644	6	
KWS AVIATOR					
IL-Champaign	KWS Cereals USA, LLC	Champaign	217-888-0130		
KWS RECEPTOR					
IL-Champaign	KWS Cereals USA, LLC	Champaign	217-888-0130		
KWS TAYO					
IL-Champaign	KWS Cereals USA, LLC	Champaign	217-888-0130		
ND DYLAN					
Grant	Kapphahn, John M	Elbow Lake	218-685-4604	24	
Meeker	Smith, Steven	Darwin	320-221-8255		20
Wilkin	Scheffler, Richard	Barnesville	218-493-4456		72
ND GARDNER					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	45	

Soybeans

FINCH					
Todd	Sevita International	Ontario, Canada	701-850-0340		
IA1022					
Faribault	Prescher-Willette Seeds	Delavan	507-854-3595		
IA1029					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		
IA3051RA12					
Steele	Global Processing	Hope	507-456-6248		
IAS19C3					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		
Steele	Global Processing	Hope	507-456-6248		
MN0702CN					
Wilkin	Brushvale Seed, Inc	Breckenridge	218-643-2311		
MN1312CN					
Rice	Werner Seed Co.	Dundas	507-645-7995	15	
MN1807CN					
Rice	Werner Seed Co.	Dundas	507-645-7995	15	
ND21008GT20					
Pennington	Barth, Brad (Brad Barth Farms)	Goodridge	218-681-4236		200
Roseau	Mitch Magnusson Farms Inc	Roseau	218-463-2339		128
ODESSA					
Todd	Sevita International	Ontario, Canada	701-850-0340		
TRAILL					
Pennington	Barth, Brad (Brad Barth Farms)	Goodridge	218-681-4236	140	

Timothy

CLAIR					
Lake of the Woods	Northern Excellence Seed LLC	Williams	218-783-2228		

Triticale

934271498					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		
FORAGE FX 1001					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		

County	Producer	City	Phone	R	C

Wheat

6977824					
Marshall	CHS Ag Services	Warren	218-745-4166		
AP GUNSMOKE CL2					
Polk	AgriMAX	Fisher	218-891-2211		
AP MURDOCK					
Clay	Petermann Seeds, Inc	Hawley	218-483-3302		
Clay	Tobolt Seed	Moorhead	218-287-2904		
Grant	Thiel Seed Service	Wendell	218-458-2415		
Kittson	Petersen, Ronald L	Lake Bronson	218-754-4631		
Marshall	Bakke, Deland	Newfolden	218-874-7911		
Polk	Capistran Seed Company	Crookston	218-891-7840		
Polk	Fosston Tri-Coop	Fosston	218-435-6222		
Renville	Finish Line Seed, Inc	Bird Island	320-365-3674		
Wilkin	Beyer Seed Farm	Kent	701-640-2222		
AP SMITH					
Clay	Petermann Seeds, Inc	Hawley	218-483-3302		
Grant	Thiel Seed Service	Wendell	218-458-2415		
Kittson	Petersen, Ronald L	Lake Bronson	218-754-4631		
Polk	Capistran Seed Company	Crookston	218-891-7840		
Wilkin	Beyer Seed Farm	Kent	701-640-2222		
Wilkin	Haugrud Seed Plant	Rothsay	218-493-4275		
BOLLES					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	108	
Norman	Star of the North	Gary	218-356-8300		70
Swift	Falk's Seed Farm	Murdock	320-875-4341		107
CAG RECKLESS					
ND-Foster	Champions Alliance Group Inc	Carrington	701-840-7418		
Pennington	Farmers Co-op Grain & Seed	Thief River Falls	218-681-6281		
CANNON					
Clay	Krabbenhoft Seed & Supply LLC	Sabin	218-789-7219		115
Marshall	Jensen Farms	Stephen	218-478-3397		150
Polk	Balstad, Scott	Fosston	218-435-6311		120
Wilkin	Friederichs Seed Farm	Foxhome	218-205-8759		60
DRIVER					
Wilkin	Wolverton Farm Supply (Ross E Aigner)	Wolverton	701-367-4133		74
FALLER					
Polk	Balstad, Scott	Fosston	218-435-6311		110
GLENN					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	45	35
LANG-MN					
Redwood	Sawvell's Seed, Inc	Clements	507-692-2240		29
Renville	Enestvedt Seed Company	Sacred Heart	320-765-2728		45
LCS BUSTER					
Marshall	Jensen Farms	Stephen	218-478-3397		
Marshall	Thompson, Jake	Middle River	218-469-9384		
Polk	Capistran Seed Company	Crookston	218-891-7840		
Wilkin	Friederichs Seed Farm	Foxhome	218-205-8759		
LCS DUAL					
Marshall	Jensen Farms	Stephen	218-478-3397		
LCS TRIGGER					
Polk	Balstad, Scott	Fosston	218-435-6311		200
Wilkin	Friederichs Seed Farm	Foxhome	218-205-8759		190
LINKERT					
Kittson	Aakre, Adam	Karlstad	218-688-2346		56
Kittson	Johnson Farms, Inc, Lloyd	Karlstad	218-686-8432		64
Kittson	Oak Grove Seed & Supply LLC	Hallock	218-526-0239		145
Lac qui Parle	Kemen, Robert & Sons	Madison	320-769-2868		39
Norman	Star of the North	Gary	218-356-8300		65
Pennington	Barth, Brad (Brad Barth Farms)	Goodridge	218-681-4236	80	537
Red Lake	Myhre Farms	Red Lake Falls	218-698-4615		106
Red Lake	Swenson Seed Farm	Brooks	218-796-5285	96	839
Red Lake	Vatthauer Farm	Red Lake Falls	218-253-2490		147
Roseau	CHS Northern Grain	Greenbush	218-782-2111		194
MN-ROTHSAY					
Clay	Krabbenhoft Seed & Supply LLC	Sabin	218-789-7219	25	
Clay	Ness, Larry & Matt	Fargo	218-585-4179	38	
Clay	Olsgaard, Inc, Harold	Moorhead	218-585-4535	36	
Clay	Tande, Harmen	Moorhead	701-429-0541	35	
Clay	Tobolt Seed	Moorhead	218-287-2904	21	
Grant	Kapphahn, John M	Elbow Lake	218-685-4604	40	
Grant	Thiel Seed Service	Wendell	218-458-2415	40	
Kittson	Bloomquist Farms, Inc.	Drayton	218-455-3863	20	
Kittson	Hunt Seed Company	Hallock	218-843-2327	18	
Kittson	Johnson Farms, Inc, Lloyd	Karlstad	218-686-8432	28	
Kittson	Lake Bronson Elevator, Inc	Lake Bronson	218-754-4200	20	
Kittson	Larson Farms, Michael J	Drayton	701-520-1033	20	
Kittson	Oak Grove Seed & Supply LLC	Hallock	218-526-0239	17	
Kittson	Petersen, Ronald L	Lake Bronson	218-754-4631		
Kittson	Schwenzfeier, Ryan	Kennedy	218-843-1394	34	
Kittson	Sedenquist Farms, Inc	Hallock	218-843-5027		
Mahnomen	Haugo Farms	Waubun	218-473-2254	35	
Mahnomen	Pazdernik Farms, Inc	Waubun	218-766-9531	28	
Marshall	Anderson, Luther H	Stephen	218-455-3305		
Marshall	Green, Carl M	Strandquist	218-597-2861	40	
Marshall	Holte, Steven and Andrew	Grygla	218-294-6537	12	
Marshall	Jensen Farms	Stephen	218-478-3397	30	

County	Producer	City	Phone	R	C
Marshall	Kowalski, John & Darrin	Stephen	218-478-4119	11	
Marshall	Peterson Farms of Warren, Inc, D L	Warren	218-745-4077	20	
Marshall	Peterson, Maynard	Stephen	218-478-3859	35	
Marshall	Riopelle, Brent	Argyle	218-201-2133	32	
Marshall	Riopelle, Larry	Argyle	701-739-3848	30	
Marshall	Riopelle Seed/Joshua David Kostrzcwski	Argyle	218-478-4069	20	
Marshall	Stusynski, David	Strandquist	218-436-2717	20	
Marshall	Thompson, Jake	Middle River	218-469-9384	17	
Norman	Borge, Brian & Jon	Ada	218-784-2168	12	
Norman	Chisholm, Keith, Bill & Nick	Gary	218-356-8300	30	
Otter Tail	Walkup, John S & Chad	Campbell	218-739-2580	16	
Pennington	Barth, Brad (Brad Barth Farms)	Goodridge	218-681-4236	40	
Pennington	Miller, Aaron	Goodridge	218-378-4145	25	
Polk	AgriMAX	Fisher	218-891-2211	16	
Polk	Broadwell, Jeff	Fosston	218-435-2194	29	
Polk	Capistran, Kevin	Crookston	218-891-7840	35	
Polk	Christian Farms, Stuart & Dwight	Fertile	218-945-6021	28	
Polk	Larson, Ray H, Inc	Warren	218-779-5864	16	
Polk	Peterson, Douglas	East Grand Forks	218-779-1993	15	
Polk	Peterson, Inc, D.W.	Warren	218-745-4507	20	
Polk	Roed Farms	Fosston	218-435-1705	17	
Polk	Tiedemann, Gene R	Euclid	218-281-6723	26	
Polk	Vig Farms, Inc	Fosston	218-435-1330	22	
Red Lake	Myhre Farms	Red Lake Falls	218-698-4615	60	
Red Lake	Swenson Seed Farm	Brooks	218-796-5285	63	
Red Lake	Vatthauer Farm	Red Lake Falls	218-253-2490	57	
Roseau	C&S Habstritt Inc	Roseau	218-463-1193	79	
Roseau	Kukowski, Jim	Strathcona	218-781-2478	100	
Swift	Lee's Seed Farm	Benson	320-843-2857	24	
Wilkin	Etzler Farms, Inc	Foxhome	218-643-1361	33	
Wilkin	Friederichs Seed Farm	Foxhome	218-205-8759	45	
Wilkin	Haugrud Seed Plant	Rothsay	218-493-4275	40	
Wilkin	Larson Farms/Eldon	Rothsay	218-867-2674	28	
Wilkin	Torkelson, Brent	Foxhome	218-736-7086	30	
Wilkin	Wolverton Farm Supply (Ross E Aigner)	Wolverton	701-367-4133	20	
MN-TORGY					
Brown	Cunningham Seed Farms	Sleepy Eye	507-794-7323	32	
Clay	Krabbenhoft Seed & Supply LLC	Sabin	218-789-7219		130
Clay	Ness, Larry & Matt	Fargo	218-585-4179		73
Clay	Tobolt Seed	Moorhead	218-287-2904	40	304
Clay	Wetterlin, Jerry & Aaron	Glyndon	218-494-3339		147
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	12	52
Grant	Adams Seed	Wendell	218-458-2151	20	53
Grant	Red River Marketing Co	Elbow Lake	218-685-6100		373
Kittson	Johnson Farms, Inc, Lloyd	Karlstad	218-686-8432		483
Kittson	Lake Bronson Elevator, Inc	Lake Bronson	218-754-4200		230
Kittson	Larson Farms, Michael J	Drayton	701-520-1033	30	50
Kittson	MN Wiese Partnership (Neil & Mark Wiese)	Humboldt	218-843-1282		151
Kittson	Oak Grove Seed & Supply LLC	Hallock	218-526-0239		263
Lincoln	Jerzak, Jerome & Tim	Ivanhoe	507-694-1582	20	
Mahnomen	Haugo Farms	Waubun	218-473-2254		165
Mahnomen	Pazdernik Farms, Inc	Waubun	218-766-9531		170
Mahnomen	Spring Creek Seed & Consulting	Ulen	218-261-1647	20	55
Marshall	Anderson, Luther H	Stephen	218-455-3305		
Marshall	Bakke, Deland	Newfolden	218-874-7911		300
Marshall	Bengston, CJ	Middle River	218-686-9023		
Marshall	Holte, Steven and Andrew	Grygla	218-294-6537		193
Marshall	Jensen Farms	Stephen	218-478-3397	20	380
Marshall	Peterson Farms of Warren, Inc, D L	Warren	218-745-4077		110
Marshall	Riopelle Seed/Joshua David Kostrzcwski	Argyle	218-478-4069		66
Marshall	Thompson, Jake	Middle River	218-469-9384		351
McLeod	Thalmann Seeds, Inc	Plato	320-238-2185		37
Meeker	Anderson Seeds	Dassel	320-286-2700		56
Norman	Borge, Brian & Jon	Ada	218-784-2168	32	
Norman	Chisholm, Keith, Bill & Nick	Gary	218-356-8300	40	
Norman	West Central Ag Services	Ulen	218-596-8830		107
Pennington	Barth, Brad (Brad Barth Farms)	Goodridge	218-681-4236	80	473
Polk	Balstad, Scott	Fosston	218-435-6311		230
Polk	Broadwell, Jeff	Fosston	218-435-2194		156
Polk	Brule, David A	Crookston	218-289-0067	145	155
Polk	Fosston Tri-Coop	Fosston	218-435-6222	51	321
Polk	Novak Farms	Angus	701-740-2008	78	
Red Lake	Myhre Farms	Red Lake Falls	218-698-4615		157
Red Lake	Swenson Seed Farm	Brooks	218-796-5285	159	662
Red Lake	Vatthauer Farm	Red Lake Falls	218-253-2490		158
Redwood	Sawvell's Seed, Inc	Clements	507-692-2240		66
Rice	Werner Seed Co.	Dundas	507-645-7995		22
Roseau	CHS Northern Grain	Greenbush	218-782-2111		558
Roseau	Kukowski, Jim	Strathcona	218-781-2478	180	
Swift	Falk's Seed Farm	Murdock	320-875-4341		57
Swift	Lee's Seed Farm	Benson	320-843-2857		94
Traverse	Triple J Seed	Wheaton	320-563-4509		102
Wilkin	Etzler Farms, Inc	Foxhome	218-643-1361		278
Wilkin	Haugrud Seed Plant	Rothsay	218-493-4275	40	360
Wilkin	Wolverton Farm Supply (Ross E Aigner)	Wolverton	701-367-4133	54	285
MN-WASHBURN					
Roseau	C&S Habstritt Inc	Roseau	218-463-1193	35	
ND FROHBERG					
Norman	Star of the North	Gary	218-356-8300	30	

County	Producer	City	Phone	R	C
SHELLY					
Clay	Tobolt Seed	Moorhead	218-287-2904		90
Kittson	Oak Grove Seed & Supply LLC	Hallock	218-526-0239		190
Marshall	Green, Carl M	Strandquist	218-597-2861		70
Marshall	Jensen Farms	Stephen	218-478-3397		100
Marshall	Thompson, Jake	Middle River	218-469-9384	65	170
Red Lake	Vatthauer Farm	Red Lake Falls	218-253-2490		200
Wilkin	Haugrud Seed Plant	Rothsay	218-493-4275	40	230
SY VALDA					
Clay	Petermann Seeds, Inc	Hawley	218-483-3302		
Grant	Backman, Michael	Herman	320-304-2232		
Grant	Backman Seeds, Inc	Herman	320-677-2231		
Kittson	Petersen, Ronald L	Lake Bronson	218-754-4631		
Polk	Capistran Seed Company	Crookston	218-891-7840		
Polk	Fosston Tri-Coop	Fosston	218-435-6222		
TCG-HEARTLAND					
Norman	West Central Ag Services	Ulen	218-596-8830		
TCG-WILDCAT					
Marshall	Jensen Farms	Stephen	218-478-3397		
Norman	West Central Ag Services	Ulen	218-596-8830		
Polk	AgriMAX	Fisher	218-891-2211		
TW OLYMPIC					
Polk	Fosston Tri-Coop	Fosston	218-435-6222		
WB9479					
Norman	West Central Ag Services	Ulen	218-596-8830		
Polk	AgriMAX	Fisher	218-891-2211		
Polk	Capistran Seed Company	Crookston	218-891-7840		
Polk	Thorson Farming JV	East Grand Forks	218-893-2285		
WB9590					
Clay	Krabbenhoft Seed & Supply LLC	Sabin	218-789-7219		
Grant	Adams Seed	Wendell	218-458-2151		
Grant	Backman, Tim	Herman	320-677-2231		
Marshall	CHS Ag Services	Warren	218-745-4166		
Norman	West Central Ag Services	Ulen	218-596-8830		
Polk	AgriMAX	Fisher	218-891-2211		
Polk	Capistran Seed Company	Crookston	218-891-7840		
Polk	TDS Fertilizer, Inc.	Fertile	218-945-6021		
Polk	Thorson Farming JV	East Grand Forks	218-893-2285		
WB9719					
Grant	Adams Seed	Wendell	218-458-2151		
Norman	West Central Ag Services	Ulen	218-596-8830		

Wheat, Durum

ND RIVELAND					
Norman	Crompton, Shawn	Borup	218-784-8184	120	

Wheat, Winter

EXPEDITION					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		68
Le Sueur	Stangler, Richard	Kilkenny	507-595-3331		73
IDEAL					
Polk	Fosston Tri-Coop	Fosston	218-435-6222		78
KELDIN					
Polk	AgriMAX	Fisher	218-891-2211		
ND NOREEN					
Carlton	Northland Farm Supply Inc.	Cromwell	218-821-1627	41	
Norman	Chisholm, Keith, Bill & Nick	Gary	218-356-8300	75	
Norman	Star of the North	Gary	218-356-8300	30	
REDFIELD					
Meeker	Smith, Steven	Darwin	320-221-8255		18
SY WOLF					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		
THOMPSON					
Rice	Werner Seed Co.	Dundas	507-645-7995		54
WINNER					
McLeod	Thalmann Seeds, Inc,	Plato	320-238-2185		44

Quality Assured Seed Directory

Crop	Variety	County	Grower	City	Phone
Soybeans	BG9071E3 Brand	Becker	Hein Farms, Inc	Audubon	218-439-6621
Soybeans	HC-02 Brand	ND-Cass	HC International, Inc	Fargo	701-850-0340
Soybeans	HC-901 Brand	ND-Cass	HC International, Inc	Fargo	701-850-0340

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Very good straw strength
Above average protein
Good pre-harvest sprout rating

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Very good protein
Good Scab and BLS resistance
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MN-Washburn — Disease resistance
Linkert — Strong straw
Shelly — High yield
Bolles — High protein

OATS

Deon — Proven high yield
MN-Pearl — High yielding, white oat

BARLEY

Lacey — Yield and quality
Quest — Scab resistant
Rasmusson — High yield

NEW!

WINTER BARLEY

MN-Equinox — Plant in fall or spring

View Minnesota field crop variety trial results at **varietytrials.umn.edu** or check your state or local variety trials.
For a list of seed producers, visit the Minnesota Crop Improvement Association at **mncia.org** or call 1-800-510-6242.