2024
Minnesota Certified
Seed Guide

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

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FARM & RANCH GUIDE

Welcome to the 2024 Minnesota Seed Guide

The year 2023 was one of the most memorable in the history of the Minnesota Crop Improvement Association. The most remarkable achievement was the successful organization and execution of the Association of Official Seed Certifying Agencies' (AOSCA) annual meeting. For the first time in almost three decades MCIA had the honor to host this international event, which was attended by delegates from most state certification agencies, as well as Canada and New Zealand.

Fawad Shah
MCIA President/CEO

In his welcoming remarks to attendees, Thom Petersen, Minnesota Department of Agriculture Commissioner, highlighted the importance of our state's seed and agricultural industries. The keynote talk at the awards banquet was given by Tom Slunecka, CEO of the Minnesota Soybean Growers Association. He discussed the many initiatives in which his group is involved, particularly the AG Innovation Campus in Crookston. There, growers, researchers, and industry professionals work together to make soybeans Minnesota's most valuable crop, ensuring the state's economic vitality through domestic use and export of conventional and specialty soybean varieties.

MCIA's achievements were recognized at the meeting. MCIA received AOSCA's inaugural Excellence in Innovation Award. Roger Wippler, longtime MCIA Foundation Seed Manager, received AOSCA's Honorary Member Award. In addition, Jody Prudhomme, MCIA Certification and Administrative Manager, was recognized for her 25-year contribution in the certification field.

MCIA is grateful to all the meeting sponsors for their generous support in making the event successful.

This past year saw change and renewal in MCIA's staff. After two employees departed to further their education and pursue other opportunities, the talent search began. Our recruitment process included advertising the open positions through industry websites, academic institutions, and personal contacts. Applicant screenings and interviews followed. We are glad to report that Claire Biel and Kate Sinnott were hired for positions in the Seed Laboratory, while Sarah Lindblom, and Tessa Parks joined the Organic Services department.

The *Minnesota Certified Seed Guide* is a result of the joint efforts of the Minnesota Agricultural Experiment Station, *Farm and Ranch 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 2024 *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 2024! ✻

MCIA
MINNESOTA CROP IMPROVEMENT ASSOCIATION

CONTACT MCIA
612-625-7766
800-510-6242
mncia@mncia.org
www.mncia.org

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- Variety Licensing

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- Audit Services
- Seed Quality Assurance

SEED LABORATORY TESTING

- Viability Testing (Germination, TZ, Vigor)
- Seed Count/Moisture/ Test Weight
- Purity and Varietal ID Testing

CERTIFICATION PROGRAMS

- Seed Certification
- Identity Preserved Grain
- Native Seeds
- Forage & Mulch
- Sod Quality Assurance

ORGANIC CERTIFICATION

- Crops
- Handling/Processing
- Livestock
- Wild Crops

Improving your process.
Enhancing your products.
Increasing your profits.

TABLE OF CONTENTS

Kjolhaug receives Achievement in Crop Improvement Award 4

Baldus, Flegel, Johnson, Aakre receive Premier Seed Grower Award 5

Grafstrom, Thiede receive Honorary Premier Seed Grower Award ... 6

MCIA – Providing services that add value for agriculture 7

MCIA uses wintertime to inspect seed facilities 10

UMN Soybean Research Center drives collaboration 12

Why test seed? 13

2023 Barley field crop trial results 23

2023 Canola field crop trial results 26

2023 Corn Grain field crop trial results 28

2023 Oat field crop trial results 32

2023 Soybean field crop trial results 35

2023 Winter Rye field crop trial results 43

2023 Hard Red Spring Wheat field crop trial results 45

2023 Hard Red Winter Wheat field crop trial results 52

Directory of Certified Seed Growers 54

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About the Cover ....

Tobolt Seed, Moorhead, Minnesota.
Photo by Roger Wippler.

Kevin Schulz (left), editor of the Farmer magazine, presents the Achievement in Crop Improvement award to Paul Kjolhaug (right) at the 2023 MCIA Annual Meeting, Bigwood Event Center, Fergus Falls, Minn. Jan. 12, 2023.

Kjolhaug receives Achievement in Crop Improvement Award

Paul Kjolhaug 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.

Paul Kjolhaug did not grow up on a farm, but he has spent most of his life involved in agriculture. As a youth, he lived in Springfield, Minn., learning to work hard on crop and livestock farms in the area. His first experience in seed production was detasseling corn. So began a lifelong journey in the world of seed.

Paul pursued his interest in agriculture through studies at the University of Minnesota, earning a degree in agronomy. The connections he made there led to his first position in the seed industry, at Northern Farm and Garden.

Interstate Payco was the next step. There, Paul managed seed production of hybrid corn, sunflowers, and soybean seed. Much of this production was for export. Consequently, Paul became familiar with MCIA, requesting field inspections and seed testing to meet OECD standards.

Paul understood the value of seed certification and worked closely with MCIA Field Supervisor Ben Lang. As Ben noted, "Paul would come to the field and help me train my staff to do seed corn field inspections. He would explain to them how important their job was."

After a short stint doing environmental consulting, Paul returned to the seed world. For the last 21 years he has been part owner of MayerSeedLine of Willmar, a contract production and seed brokerage firm. Their customers range from small independent companies to large multinational corporations.

Over the years, Paul has been involved in many seed trade organizations as well as local and regional seed associations. He served six years on the MCIA board of directors, including one term as board chairman.

When Paul became an MCIA board member, Ben Lang, by then MCIA's president/CEO, appreciated the insight Paul brought to the board. "He had a great perspective and would look at the big picture, often looking toward the future of MCIA. This approach has served Paul well throughout his career."

Commenting on receiving the award, Paul said, "I have enjoyed my years in the seed industry and being able to work with many great people." Adding, "I am truly humbled and honored to receive this award." ✻

Baldus, Flegel, Johnson, Aakre 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 Lon Baldus, Kurt Flegel, and Dean Johnson and Kurt Aakre as Premier Seed Growers.

Lon Baldus

In 1998, instead of growing the new Roundup resistant soybeans, Lon Baldus began growing non-GMO, food-grade soybeans. He reasoned that food-grade soybeans added more value to his crop, and he has been growing them ever since. At first, he grew for other companies. Eventually, he started his own food-grade soybean export business.

Lon grew up on a livestock and crop farm. Soon after high school he was ready to venture out on his own, buying a farm in Mower County. In addition to farming, he studied farm equipment mechanics and worked at the local implement dealer.

Through the early years of his farming operation, he cooperated with his brother-in-law, sharing equipment and labor. Lon also did off-farm work at Hormel and in construction, building grain elevators and seed conditioning plants. The experience building grain cleaning facilities would come in handy many years later.

Owning the business allowed him to have more control over the production and marketing of his crop. Over the years he would export soybeans to Japan and other countries in Southeast Asia. He bought a seed conditioning plant in Mapleton. In addition to processing soybeans for export, he also conditioned small grains and buckwheat seed. Lon was one of the first in Minnesota to clean industrial hemp seed, which was a challenging crop to process. Eventually, his conditioning plant was certified organic by MCIA.

As a member of MCIA, Lon has participated in the seed certification, identity preserved, and the approved facility programs. He is also a member of the Minnesota Corn and Soybean Grower Associations and the American Soybean Association.

Upon receiving notice of being selected a Premier Seed Grower, Lon said, "I am very honored," adding, "The people I have worked with in the seed industry are very dedicated and sincere and I enjoy working with them."

Kurt Flegel

Kurt has been in the seed business for 40 years. Currently, he is the plant manager at Syngenta in Danvers. He grew up on a farm near Kulm, N.D. His father enjoyed growing durum wheat and Kurt recalls asking about the blue Certified tags attached to the bags of seed. With an interest in agriculture, he attended Bismarck Junior College and was one of the first students to study as an "ag transfer student." The transfer led to North Dakota State University, where he obtained a degree in ag economics.

Following graduation, he took a position with Stauffer Seeds in Fargo, and in 1983 he transferred to the Danvers production plant. In those early years he was very involved with the sunflower program. In 1987, Stauffer's merged with Northrup King and added soybeans to the operation. Kurt became familiar with MCIA as his work involved OECD certification of seed for export to Europe.

OECD varieties were typically very early, and Kurt needed to convince farmers in North Dakota and northern Minnesota that they could grow soybeans. Through the years, he has developed great relationships with growers, some are into their third generation working with Kurt. Eventually, OECD exports declined, and sunflower production shifted to California. In 2001, as soybean acres moved north and west, Syngenta switched the facility to a soybean-only plant, to handle the increasing demand for domestic seed production.

Kurt has been an active member of MCIA, serving on various committees and three terms as chair of the MCIA Board of Directors. During his tenure, he led MCIA's management through a continuity and succession planning process.

Kurt has served as a board member for several community organizations, including his church. A longtime paramedic for Centra Care, Kurt also teaches Emergency Medical Services classes.

Lon Baldus

Kurt Flegel

Dean Johnson

Kurt Aakre

After receiving the award Kurt commented, "When I got the call telling me I had been selected I didn't believe it at first. I have had many good experiences working in the seed industry and I am grateful for the honor."

Dean Johnson and Kurt Aakre

Dean Johnson and his brother-in-law, Kurt Aakre, have been farming together since 1989. The Lloyd Johnson farm, in northwest Minnesota, has been in the family since 1887. Their first seed crop was potatoes, which were grown by multiple generations before the transition to only seed grains.

Dean grew up on the home farm. He attended Evangel University and the University of Minnesota Crookston before returning home to farm with his father. Over the years, he has grown a wide variety of crops.

Kurt learned the value of hard work while growing up on a dairy farm near Rollag, Minnesota. After a start in college at Concordia Moorhead and a little work experience, he graduated from North Dakota State University with a degree in ag economics. He married Dean's sister and, after a five-year stint in banking, he joined the Johnson's family farm.

The duo has shared responsibilities, working together to build a successful business. They began growing seed in their own name over thirty years ago. Barley was

PREMIER SEED GROWER AWARD: Continued on page 6

Grafstrom, Thiede 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, and their local community.

Dave Grafstrom

Dave is a key member of the University of Minnesota team addressing crop production issues at the Magnusson Research Farm near Roseau. His interest in agriculture began while growing up on a dairy farm in Roseau County. Dave earned a degree in agronomy from the University of Minnesota, and a PhD in weed science from NDSU.

Dave's career began at BASF Corporation, where his work included small plot research, and greenhouse, field, and on-farm trials. He later worked as an agronomist for Cenex Harvest States.

Since 2005, Dave has been a research agronomist at the Magnusson Research Farm. His work includes small plot research trials for a wide variety of crops.

Dave is deeply involved in grass seed production research. To share information with growers, Dave created an e-newsletter. He also shares information during summer plot tours, at the annual Grass Seed Institute, and via the UMN Turf Seed website.

Dave is the secretary of the Turf Seed Council, and he has served as a member of the Minnesota Wheat Growers On-farm Research Advisory Committee.

On-farm plots are a key part of the Magnusson Research Farm's efforts. Upon learning of his recognition by MCIA, Dave remarked, "I enjoy working with the grass seed producers and farmers in the area, we get great cooperation."

Denise Thiede

Denise worked with seed and plants her entire career. She retired recently as section manager, responsible for seed, noxious weed, hemp, and biotechnology, in the Plant Protection Division of the Minnesota Department of Agriculture (MDA).

Dave Grafstrom

Denise Thiede

Although Denise grew up in the Twin Cities, experiences in her youth at her mother's family farm stimulated an interest in agriculture and plants. She went on to earn a bachelor's degree in biology from St. Olaf College, a master's degree at the University of Illinois, and a PhD in plant biology from Michigan State University.

For several years Denise conducted academic research that focused on seed genetics, characteristics, and evolution. In 2002, she joined BioDiagnostics Inc. (BDI), a commercial seed testing laboratory, regularly working with MCIA during the years when its own laboratory was closed. Denise helped guide BDI's growth, eventually becoming a partner in the business.

Denise joined the MDA in 2017, where she supervised the seed regulatory program. In that role, she worked closely with MCIA on a variety of issues.

Denise served multiple terms on MCIA's Board of Directors and was active in other seed industry organizations.

In accepting the Honorary award, Denise noted, "I very much appreciate this award," adding, "My involvement with MCIA both at BDI and the Department of Ag has been very rewarding, because of that I was better able to understand the concerns of the seed industry." ✻

PREMIER SEED GROWER AWARD:

Continued from page 5

the primary seed crop before they added wheat. Today, all their acres of wheat and soybeans are for seed production.

Growing seed is a rewarding experience for Dean and Kurt. They recognize the value and importance of high-quality seed in a successful farming operation. They are willing to put in the extra effort to ensure the seed they produce is pure and will perform well for the farmers who plant it. As Dean said, "Its enjoyable to grow seed knowing it will benefit others."

Dean and Kurt have been very active in their local community. Both have served on their church and local county crop improvement boards. Kurt has been a Sunday school teacher, youth leader, and a member of the Heritage Christian school board. An Emergency Medical Technician (EMT), Dean is also a CPR and EMT instructor. He has also served on the local Health Facilities Board and as a township supervisor.

Upon receiving the honor Kurt said, "We're thankful for the honor," adding, "Growing up, we were taught to do the very best you can in whatever you do because that's what the Bible says, and we carry that on in everyday life." ✻

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 760 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. 24, 2024

The Minnesota Crop Improvement Association will convene its 121st annual meeting on Jan. 24, 2024. The one-day meeting, which all Association members are encouraged to attend, will be held in-person, at the Holiday Inn & Suites in St. Cloud, Minn.

The program will include presentations by guest speakers and the announcement of MCIA's Premier and Honorary Premier Seed Grower 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. Guest speakers and meeting topics include:

- Panel Discussion: *Emerging Leaders in Seed Production*.
- Anthony Cortilet, Plant Protection, Minnesota Department of Agriculture: *MDA's role in cannabis seed labeling and sale in Minnesota*.
- Roger Wippler, Retired Manager, MCIA Foundation Seed Services: *Perspectives: Past, Present, and Future*.

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

MCIA Board of Directors

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MINNESOTA CROP IMPROVEMENT ASSOCIATION

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MCIA uses wintertime to inspect seed facilities

By ANDREA JOHNSON

When winter arrives, the Minnesota Crop Improvement Association (MCIA) changes its focus.

The seed is stored away. It's time to prepare for the next planting season, and that includes inspecting and approving about 200 seed facilities.

The MCIA Approved Facility Program provides a path for seed producers – of all sizes – to obtain licensure to process, handle, and sell seed and grain.

"It is a signed agreement to follow MCIA requirements. In exchange, the warehouse receives support and process verification throughout each year with MCIA staff," said Dan Krenz of Redwood Falls, Minn. Krenz is an MCIA field supervisor who conducts evaluations for companies that want MCIA Approved Facility Certification.

He is one of four MCIA full-time field supervisors that complete inspections.

The Approved Facility Program inspects approved seed conditioners, bulk handlers, and private seed companies. MCIA-approved facilities vary widely in size and scope, but the commitment to produce high quality seed remains the same.

To demonstrate that level of excellence, Krenz visited two sites in Swift County earlier this year.

The sites included Syngenta Seeds LLC, Danvers Plant, on Tuesday, Jan. 24, and Lee's Seed Farm, on Monday Feb. 27, 2023. At both sites, signs reading "MCIA Approved Facility" are prominently displayed.

Syngenta Seeds Danvers Plant

Syngenta Seeds LLC, of Danvers, Minn., (pop. 103) is tucked away in an unassuming corner of this tiny town. Rows of seed bins and a long warehouse are bordered by soybean trial plots.

Relatively unknown by those who live here, what comes out of this plant is amazing.

High quality soybeans from here eventually make their way as far north as Devils Lake, N.D., and Canada.

Because the soybeans may be exported, seed conditioning with an MCIA Approved Facility Program license is required.

"We normally send our brand-new varieties through the certification process," said Ryan Rettke, Syngenta production agronomist, Danvers. "We don't know exactly where the variety is going to end up. Are we going to grow it in the states? Are we going to grow it in Canada? Right now, those are the two most logical destinations for them."

Signing up for the Approved Facility Program requires completion of a five-page inspection. It goes through all the general requirements, equipment requirements for receiving, storage and processing, as well as selling and labeling.

Once a plant has a facility program approval, it is inspected annually by MCIA.

The annual inspection is a great way to get feedback on what an unbiased MCIA inspector observes in the facility. While some inspections – like organic certification – don't include conversation, communication is encouraged during the annual facility inspection.

"It's just nice to know how everybody is doing, and it has value," Krenz said. "Over time, you gain trust in who we are and what we do."

The inspection includes a walk-through of the plant, storage areas, and warehouses. Documentation is reviewed. All equipment, gravity tables, and sorters must be in top working order. Samples are taken to determine if germination and purity information is accurate.

After the inspection, the seed plant receives a summary and a list of any required changes. Changes to Seed Laws and new available technology are also discussed.

"This is an opportunity to continue to educate to help you stay up to date with what we are doing as well, so you don't fall behind in some of the things we do," Krenz said.

Because Seed Laws and seed certification have very high standards, Krenz and the other field supervisors re-visit facilities to help train new employees.

"Training/educating new personnel is one of the biggest things," he said. "Probably one of the biggest things is to see or talk to the person doing the sampling. To talk to the personnel, as well as the manager."

The MCIA process is a good additional step to maintain quality control, Rettke added.

"Genetic purity is always at the top of our farmer/grower's list as they purchase seed for their farm," he said.

The Syngenta Danvers plant is a major employer in the region, while Lee's Seed Farm of Benson, Minn., employs just one person plus some part-time help.

Both are respected operations that provide support to the farming region.

Lee's Seed Farm

Lee's Seed Farm was started in 1969 by the late Wallace "Wally" Lee. He raised certified seed and built a seed cleaning plant on his farm northeast of Benson.

His son, Scott, joined the family business in 1989.

Scott Lee and his family farm, raise certified seed, custom clean seed, and sell seed to local farmers. They raise and sell MN-Torgy, MN-Rothsay, MN-Washburn, Linkert and Lang-MN certified public wheat varieties, as well as MN-Pearl oat seed.

Scott Lee and his family raise Certified seed, custom clean seed, and sell seed to local farmers. Dan Krenz, MCIA field supervisor, inspects Lee's Seed Farm annually.

Tony Lenz, Syngenta plant operations lead, Danvers (MN); Dan Krenz, MCIA field supervisor; and Ryan Rettke, Syngenta production agronomist, Danvers, go through the steps required for Seed Certification as well as the MCIA Identify-Preserved Grain and Quality-Assured Seed programs. Because the soybeans handled in this plant may be exported, seed conditioning at an MCIA Approved Facility is required.

INSPECT SEED FACILITIES: Continued on page 12

APPROVED SEED CONDITIONING PLANTS

NAME	ADDRESS, CITY, STATE, ZIP CODE	COUNTY	PHONE
A			
Ada Feed & Seed, Inc	12 W Thorpe Ave, Ada,, MN 56510	Norman	218-784-7158
Adams Seed	29245 300th St, Wendell, MN 56590	Grant	218-458-2151
Agassiz Seed & Supply Inc	3660 Kennebec Dr, Eagan, MN 55122	Hennepin	651-287-3400
Agassiz Seed & Supply Inc	445 7th St NW, West Fargo, ND 58078	Cass	701-282-8118
AgReliant Genetics LLC	PO Box 190, Wadena, MN 56482	Wadena	218-631-2954
AgriMAX	23917 350th Ave SW, Fisher, MN 56723	Polk	218-891-2211
Albert Lea Seed House, Inc	PO Box 127, Albert Lea, MN 56007	Freeborn	507-373-3161
American Crystal Beet Seed Products	PO Box 1227, Moorhead, MN 56560	Clay	218-236-4773
Anderson Seeds	74151 CSAH 5, Dassel, MN 55325	Meeker	320-286-2700
Anderson Seeds of St. Peter	37825 Cty Rd 63, Saint Peter, MN 56082	Nicollet	507-246-5032
Angell Seed Farm	86381 320th St, Blooming Prairie, MN 55917	Freeborn	507-583-7581
B			
Backman Seeds, Inc	13045 310th Ave, Herman, MN 56248	Grant	320-677-2231
Bayer Northern Production	PO Box 46, Redwood Falls, MN 56283	Redwood	507-637-2204
Bayer Northern Production	PO Box 530, Redwood Falls, MN 56283	Redwood	507-644-2108
Bloomquist Farms, Inc.	1737 130th St, Drayton, MN 58225	Kittson	218-455-3863
Bonanza Bean LLC	PO Box 164, Morris, MN 56267	Stevens	320-585-2326
Brad Barth Farms	14701 250th Ave NE, Goodridge, MN 56725	Pennington	218-681-4236
Brushvale Seed, Inc	1656 280th St, Breckenridge, MN 56520	Wilkin	218-643-2311
Burkel Grain	20463 State Hwy 11, Greenbush, MN 56726	Roseau	218-782-2121
C			
C&S Habstritt Inc	PO Box 148, Roseau, MN 56751	Roseau	218-463-1193
Capistran Seed Company	19380 270th St SW, Crookston, MN 56716	Polk	218-891-7840
CentraSeed, LLC	20364 210th St, Hutchinson, MN 55350	McLeod	320-434-7333
CHS Northern Grain	PO Box 246, Greenbush, MN 56726	Roseau	218-782-2111
CHS, Inc	PO Box 39, Winger, MN 56592	Polk	218-938-4126
CHS, Inc - Marshall	2712 Cty Rd 6, Marshall, MN 56258	Lyon	507-532-3246
Clements Seed LLC	211 Pine St, Clements, MN 56224	Redwood	507-692-2240
Cummings Ag Inc	PO Box 152, Buxton, ND 58218	Traill	218-779-7789
D			
DK Farms, Inc	23316 Cty Road 23, Greenbush, MN 56726	Roseau	218-782-2767
Dahlman Seed Co	73504 200th St, Dassel, MN 55325	Meeker	320-275-2527
Deer Creek Seed, Inc	PO Box 105, Ashland WI 54806	Ashland	715-681-0899
DLF USA DBA La Crosse Seed	PO Box 995, La Crosse WI 54603	La Crosse	608-783-9560
E			
Enestvedt Seed Company	75802 Cty Rd 12, Sacred Heart, MN 56285	Renville	320-765-2728
F			
Falk's Seed Farm	1170 Hwy 9 NE, Murdock, MN 56271	Swift	320-875-4341
Farmers Co-op Grain & Seed	PO Box 525, Thief River Falls, MN 56701	Pennington	218-681-6281
Faust, Kevin	26270 202nd St, Long Prairie, MN 56347	Todd	320-732-3361
Finish Line Seed, Inc	PO Box 277, Bird Island, MN 55310	Renville	320-365-3674
Fosston Tri-Coop	PO Box 88, Fosston, MN 56542	Polk	218-435-6222
Fosston Tri-Coop - McIntosh	PO Box 88, Fosston, MN 56542	Polk	218-563-3735
Friederichs Seed Farm	2847 390th St, Foxhome, MN 56543	Wilkin	218-205-8759
Friederichs Seed Inc.	PO Box 99, Foxhome, MN 56543	Wilkin	218-643-5612
G			
Gertens Wholesale/Professional Turf Sply	1980 Seneca Rd, Eagan, MN 55122	Dakota	651-361-8502
Grain Millers/Specialty Products Div	1502 Gault St, Saint Peter, MN 56082	Nicollet	507-934-0210
Grass & Sons Seed, Inc	77249 125th St, LeRoy, MN 55951	Mower	507-324-5820
Gro Alliance, LLC	520 5th St S, Breckenridge, MN 56520	Wilkin	218-643-1892
H			
Haas Seed Farm	37459 Ottawa Rd, Le Sueur, MN 56058	Le Sueur	612-327-5385
Haugrud Seed Plant	3331 130th St, Rothsay, MN 56579	Wilkin	218-493-4275
I			
Integrated Ag Services	490 29th St NE, Northwood, ND 58267	Grand Forks	701-620-1762
J			
Jensen Seed Co	41439 330th Ave NW, Stephen, MN 56757	Marshall	218-478-3397
Joliette Ag Systems, Inc	15866 Hwy 5, Pembina, ND 58271	Pembina	701-454-6221
JSF, Inc (Johnson Seed Farm)	85380 180th St, Sacred Heart, MN 56285	Renville	320-765-2225
K			
Kennedy Seed Co.	2412 250th St, Hallock, MN 56728	Kittson	218-526-0239
Knewtson Soy Products	17303 State Hwy 22, Good Thunder, MN 56037	Blue Earth	507-278-4087
Krabbenhoft Seed & Supply LLC	PO Box 16, Sabin, MN 56580	Clay	218-789-7219
Kukowski, Jim	17485 Cty Road 6, Strathcona, MN 56759	Roseau	218-781-2478

NAME	ADDRESS, CITY, STATE, ZIP CODE	COUNTY	PHONE
L			
Lake Bronson Elevator, Inc	PO Box 40, Lake Bronson, MN 56734	Kittson	218-754-4200
Lee's Seed Farm	670 50th Ave NE, Benson, MN 56215	Swift	320-843-2857
M			
Magnusson Farms	PO Box 28, Roseau, MN 56751	Roseau	218-463-2374
Meyer's Seeds, Inc.	7813 Hwy 247 NE, Elgin, MN 55932	Olmsted	507-876-2482
Midway Sales	PO Box 285, Argyle, MN 56713	Marshall	218-820-5587
Midway Seed, LLC	10095 Highway 18, Cavalier, ND 58220	Pembina	701-265-4224
Millborn Seeds, Inc	2132 32nd Ave, Brookings, SD 57006	Brookings	605-697-6306
MNL, Inc.	8740 77th St NE, Otsego, MN 55362	Benton	763-295-0010
Moxness, Matthew	2665 170th Ave, Kent, MN 56553	Wilkin	763-486-3976
N			
Newfolden Co-op Elevator Assn	PO Box 157, Newfolden, MN 56738	Marshall	218-874-7465
Nietfeld Farm, Inc	34253 Cty Road 31, Melrose, MN 56352	Stearns	320-987-3442
Norfarm Seeds, Inc	31154 430th Ave, Roseau, MN 56751	Roseau	218-463-2119
Northern Excellence Seed LLC	PO Box 186, Williams, MN 56686	Lake of the Woods	218-783-2228
Northern Tier Seed Company	PO Box 132, Thompson,, ND 58278	Grand Forks	701-599-9065
Northland Farms Seed & Grain	5685 Cty Road 4, Cromwell, MN 55726	Carlton	218-821-1627
O			
OCF Seeds	1355 300th St, Hendricks, MN 56136	Lincoln	605-690-0918
P			
Pazdernik Farms, Inc	1657 290th St, Waubun, MN 56589	Mahnomen	218-766-9531
Petermann Seeds, Inc	3008 210th St N, Hawley, MN 56549	Clay	218-483-3302
Pioneer Hi-Bred Int'l Inc	182 Industrial Pkwy, Jackson, MN 56143	Jackson	800-582-0107
Pioneer Hi-Bred Int'l, Inc	PO Box 93, Wahpeton, ND 58074	Richland	701-642-5300
Prescher-Willette Seeds	41721 160th St, Delavan, MN 56023	Faribault	507-854-3595
R			
Radium, Inc	26188 241st St NW, Warren, MN 56762	Marshall	218-745-5556
Ramy Turf Products	731 Prior Ave N, Saint Paul, MN 55104	Blue Earth	507-387-4091
Ramy Turf Products	731 Prior Ave N, Saint Paul, MN 55104	Ramsey	651-917-0939
Red River Marketing Co	20145 240th St, Elbow Lake, MN 56531	Grant	218-685-6100
Remington Seeds, LLC	19160 Lillehei Ave, Hastings, MN 55033	Dakota	651-480-3416
Remington Seeds, LLC	2222 W Lincoln, Olivia, MN 56277	Renville	320-523-1331
Remington Seeds, LLC	302 4th Ave SE, Mapleton, ND 58059	Cass	701-282-8400
Remington Seeds, LLC	PO Box 118, 105 N 1st St, Olivia, MN 56277	Renville	320-523-5965
Remington Seeds, LLC	PO Box 605, Grafton, ND 58237	Walsh	701-379-1000
Richland IFC, Inc	100 10th St N, Breckenridge, MN 56520	Wilkin	218-643-1797
Rivard's Turf & Forage Inc	3150 27th Ave N, Grand Forks, ND 58203	Grand Forks	701-330-3699
RJ Hunt Seed Company	13471 Cty Road 101, Wadena, MN 56482	Wadena	866-361-4190
S			
Schwitters Bros Partnership	4040 160th Ave SE, Raymond, MN 56282	Chippewa	320-894-5006
Shooting Star Native Seeds	20740 Cty Rd 33, Spring Grove, MN 55974	Houston	507-498-3944
Soyko International, Inc	2493 380th St, Gary, MN 56545	Norman	218-356-8214
Spronk & Sons Seed Farm, Art	84 130th Ave, Edgerton, MN 56128	Pipestone	507-442-5334
Stangler Seed Co LLC	44357 Kilkenny Rd, Kilkenny, MN 56052	Le Sueur	507-595-2883
Star of the North	303 Main Street, Gary, MN 56545	Norman	218-356-8300
Swenson Seed Farm	29667 State Hwy 92 SE, Brooks, MN 56715	Red Lake	218-796-5285
Syngenta Seeds, LLC	4915 Reardon Ave SW, Cokato, MN 55321	Meeker	320-286-5511
Syngenta Seeds, LLC	PO Box 38, Amboy, MN 56010	Blue Earth	507-674-3320
Syngenta Seeds, LLC	PO Box 59, Danvers, MN 56231	Swift	320-567-2141
T			
Thalmann Seeds, Inc	2275 80th St, Plato, MN 55370	McLeod	320-238-2185
Thiel Seed Service	30232 320th St, Wendell, MN 56590	Grant	218-458-2415
Thunderbird Commodities Inc	PO Box 217, Mahnomen, MN 56557	Mahnomen	218-935-2772
Tobolt Seed	1334 50th St S, Moorhead, MN 56560	Clay	218-287-2904
Trilogy Ag Group	PO Box 854, Alvarado, MN 56710	Marshall	218-965-4942
Triple J Seed	15 10th St N, Wheaton, MN 56296	Traverse	320-563-4509
Twin City Seed Company	7265 Washington Ave S, Edina, MN 55439	Hennepin	952-944-7105
W			
Weinlaeder Seed Company	7162 160th Dr NE, Drayton, MN 58225	Kittson	701-454-6427
Werner Seed Company	3080 Millersburg Blvd E, Dundas, MN 55019	Rice	507-645-7995
West Central Ag Services	PO Box 8, Beltrami, MN 56517	Polk	218-926-5522
Western Integrated Seed	15403 US Highway 12, Cokato, MN 55321	Wright	320-286-5982
Wigen Seed Farm	63726 230th St, Litchfield, MN 55355	Meeker	320-221-8830
Z			
Zabel Seeds	53295 282nd Ave, Plainview, MN 55964	Wabasha	507-534-2498

UMN Soybean Research Center drives collaboration

Minnesota farmers plant over 7 million acres of soybeans annually. That means our state ranks third in the nation in soybean production.

Breaking down information silos, increasing collaboration among the research community, and working hand in glove with industry, were all motives driving the launch of the University of Minnesota's Soybean Research Center (SRC). The Center, established in 2020, provides a platform for researchers across various disciplines to collaborate on new and ongoing projects with the goal of improving soybean production practices, providing value-added research for consumers, and improving yield increases.

On Aug. 31, 2023, the Soybean Research Center hosted a field day to display its research efforts to program stakeholders. Nearly 100 people, including soybean producers, representatives from various industries that use soybeans in their product lineup, researchers, students, and MCIA staff members were in attendance.

On Aug. 31, 2023, the Soybean Research Center hosted an afternoon field tour and research symposium on the UMN's Saint Paul campus. Photo by Kurt Lawson.

According to Seth Naeve, soybean agronomist at the University of Minnesota Extension, the major goals of the field day were to spread awareness of the Soybean Research Center, showcase its research-based solutions, achieved through the collaborative efforts of UMN soybean researchers, and promote the need to work together to achieve larger goals.

The UMN's Soybean Research Center encourages collaboration by offering opportunities to work with over thirty researchers from various departments, work that can lead to innovative research projects and insights. Soybean research at the UMN is interdisciplinary, spanning multiple academic fields. The result can be a more holistic and thorough approach to soybean-related, science-based solutions for both producers and consumers. This could be especially attractive for companies or organizations looking to invest in soybean-related research and development. Such broad collaboration will lead to garnering substantial financial support to study more complex and cross-discipline issues that would benefit growers, the soybean industry, and consumers.

The Soybean Research Center provides an ideal forum for enhancing the awareness of soybean research at the University of Minnesota through efficient and effective communication of research outcomes, which is critical to the university's overall commitment to the agricultural community. Another essential goal of the SRC is to educate students, prepare them for the workforce, and assist them in becoming future agricultural leaders. ✻

INSPECT SEED FACILITIES:
Continued from page 10

They also clean and package traited soybeans for a private company, cereal rye for cover crops, and corn that is packaged and distributed in bird seed mixes.

Krenz inspects Lee's Seed Farm once a year.

"It's turned into more of an internal audit," Lee said. "It's a paperwork audit with bulk sales certificates, making sure we are labeling seed correctly, and that what goes out of here is accompanied by the correct tag."

A paper trail is used to compare the bushels of seed from planting, to harvesting, to entering the seed plant and selling as certified seed.

With facility inspections in February, any needed changes occur in March. Then, the seed needs to be cleaned and tested by late March/early April, so it's ready for farmers.

Only a few thousand paper bags of seed are sold now at Lee's Seed Farm. Most of the seed is purchased in bulk – as totes or directly from the bin to the farmer's seed tender or semi-trailer.

Despite its smaller size, Lee's Seed Farm still maintains a top-of-the-line gravity table and additional cleaning equipment. The warehouse is kept neat and accessible. Accurate sampling is required.

Maintaining MCIA's quality standards is important to Lee.

"We strive for a high quality," he said. "A lot of it is niche because fewer people are doing what we are doing. We have customers coming from further away, and we have shipped to Michigan and Colorado."

With their Approved Facility certifications in place, Minnesota's seed plants are ready to start the next growing season. They've had their equipment inspected, their facilities and structures evaluated, and their paperwork completed.

By purchasing seed from an MCIA Approved Facility, farmers know they are getting quality seed because of the quality assurance that takes place all year through. ✻

Approved Facilities

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. ✻

MCIA®
MINNESOTA CROP IMPROVEMENT ASSOCIATION

Plan to attend small grains events

Small Grains Update Meetings

The Minnesota Association of Wheat Growers will be hosting Small Grains Update Meetings throughout the state Jan. 9-12. Attendance is free; registration is not necessary.

Presenters and topics include: Dr. Jochum Wiersma, UMN Small Grains Specialist, spring wheat variety performance; Bruce Kleven, Legislative Strategist for MN Wheat, 2024 Minnesota legislative session update; Dr. Angie Peltier, UMN Extension Educator, pests, *Phytophthora*, white mold, SCN, and Frogeye leaf spot; Devin Hoffarth, Market Development & Industry Relations Director of MN Corn, new use opportunities for corn; Melissa Carlson, VP of Research, MN Wheat Research & Promotion Council, wheat and soybean on-farm research results.

- Dilworth – Tuesday, Jan. 9, 12:00 p.m.; Dilworth Community Center (lunch served)
- Ada – Wednesday, Jan. 10, 8:00 a.m.; Ada Event Center (lunch served)
- Crookston – Wednesday, Jan. 10, 12:00 p.m.; Crookston Inn
- Hallock – Thursday, Jan. 11, 8:30 a.m.; City Hall (lunch served)
- Roseau – Thursday, Jan. 11, 3:30 p.m.; Gene's Bar & Grill (dinner served)
- St. Hilaire – Friday, Jan. 12, 8:30 a.m.; Community Center (lunch served)

For details, visit the Minnesota Wheat Growers website: mnwheat.org/growers.

Small Grains Update Workshops

If you're a farmer or crop consultant already producing small grains or are looking for another crop to add to your rotation, these small grains management workshops are for you. The UMN Extension will offer workshops at several regional locations in January and February. The focus will be on production agronomics, variety selection, and economics. Time will be reserved to answer your production questions.

Locations, dates, and times (subject to change):

- Morris – Monday, Jan. 15, 12:00 noon to 3:30 p.m.; West Central Research and Outreach Center
- Le Center – Monday, Feb. 19, 1:00-3:00 p.m.; 4H Building
- Cold Spring, Tuesday, Feb. 20, 10:00 a.m.-12:00 noon; Great Blue Heron Restaurant
- Slayton – Thursday, Feb. 22, 1:00-3:00 p.m.; 4H Building
- Benson – Friday, Feb. 23, 10:00 a.m.-12:00 noon; McKinney's on Southside
- Grand Rapids – Monday, Feb. 26, 10:00 a.m.-12:00 noon; North Central Research and Outreach Center

For more information, visit the UMN Extension's courses and events web page: https://extension.umn.edu/courses-and-events. ✻

Why test seed?

By FAWAD SHAH
MCIA President/CEO

Seed testing is like a treasure hunt for valuable information about seeds. These tiny powerhouses, ranging in worth from a few bucks to over a million dollars, hold secrets about their ability to grow, their physical makeup, how many fit in a pound, how wet or dry they are, and more. All these details play a crucial role in ensuring a successful and consistent crop.

Humans have been using seeds for as long as we've existed, but it's only in the last century that we really started to understand how to test them properly. The idea behind seed testing was to shield consumers from bad seeds, ones contaminated with weeds or mixed with other kinds. Back in the late 1800s, seed buyers had no guidance or laws to protect them. They had to rely on their instincts and hope that the seeds they bought would perform well in their fields.

The first seed testing laboratory was established in Saxony, Germany, in 1869, and the first such laboratory in the U.S. was established at the Connecticut Agricultural Experiment Station in 1876.

So, what's the big deal with seed testing, you might ask? Well, it's like looking into the soul of a seed lot to figure out its true worth for planting. Since we can't test every single seed in a lot, a representative sample following specific rules is drawn, which is vital to uniformity in seed testing results. This also ensures that our testing reflects the entire lot accurately.

Seed testing serves many purposes. It's not just about making sure you're selling seeds legally and the label attached to the seed bag has complete and accurate information. It's about providing valuable information to seed buyers and sellers. This data helps them decide how to market seeds, store them, mix them, and ensure they meet contract requirements. For growers, this information is gold. It helps them calculate the right planting rate, when to plant, and what fertilizers and chemicals to use. Basically, it's the recipe for a successful crop.

And here's the kicker: seed testing is like affordable insurance for farmers. When you're investing in land, irrigation, labor, and equipment, you want to know your seeds won't let you down. Seed testing gives you that peace of mind. But it doesn't stop there. Researchers and breeders rely on seed testing to develop new and improved seed varieties. It's like their toolbox for creating the crops of the future.

The MCIA Seed Testing Laboratory primarily tests seeds destined for certification. In addition, the lab tests non-certified seed samples often known as common seed, as well as cover crop, vegetable, and – soon – native seeds. The MCIA Lab has established a rigorous quality management system that meets national standards. The lab recently received USDA accreditation for testing cereals and other crops, grasses, legumes, vegetables, flowers, herbs, trees, and shrubs.

So, if you've got seeds that need testing, or have seed quality-related inquiries, don't hesitate to reach out to the MCIA Seed Testing Laboratory. ✻

How unauthorized seed sales hurt crop research

Rather than purchasing seed, farmers will occasionally save their protected-variety seed to plant the crop the next year. This practice is commonly called "brown-bagging." It is important to keep in mind that federal law forbids the unapproved sale or use of protected kinds for reproductive purposes. Illegal use of cultivars that are protected impedes research and ultimately causes lower yields.

The Variety Development Fund (VDF) was founded by the University of Minnesota to promote research and variety development. The VDF is supported through a fee derived from the sale of certified and registered seed of crop varieties created by university researchers. Every year, a significant amount of the VDF is reinvested into plant breeding research to develop improved varieties that are well adapted for the entire region. According to data from the U.S. Department of Agriculture, brown-bagging costs the U.S. wheat seed sector up to $677 million annually. Cutting back on funds like those from the VDF, especially for already financially strapped public institutions, makes it more difficult for crop researchers to continue their cutting-edge research, limiting their access to tools and advanced technologies used to breed new, high-yielding varieties and address threats from emerging pest and diseases.

Minnesota Crop Improvement Association (MCIA) 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 and contaminated seeds may lead to low yields by introducing weeds that are otherwise unknown to a particular farm. Furthermore, crops grown from such seed could need more chemicals for weed control, and grain may be subjected to more dockage due to excessive foreign matter.

The Minnesota Department of Agriculture's (MDA) warns farmers of the unintended risks of introducing weeds through untested seed that may be of poor quality and that will lead to low yields. Furthermore, most seed varieties have some form of intellectual property protection such as PVP, plant patents or license agreements that restrict the use and sale of that variety. Violators of these protections can be penalized with stiff fines.

When purchasing seed, farmers are advised by MDA to ensure that the seed is labeled and tested for noxious weed seeds, such as Palmer amaranth. The seed purchasers should ensure that the seed seller has an MDA-issued permit to sell seeds. Buyers should also inquire about the seed's variety; a PVPA-protected variety might only be offered under its variety name and may be required to be sold as certified seed class.

The Plant Variety Protection Act certificate holder offers 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. Two exceptions are offered, however, for seeds protected by the PVPA. Initially, seed replanting is permitted by the PVPA Act to conduct research and develop new varieties. Second, farmers who legally purchase certified seed are eligible for a seed-saving exception that allows them to harvest enough seed to replant on their own land in an area that is no bigger than what was originally sown.

To prevent the illegal selling of UMN crop varieties protected by the PVP Act, the University of Minnesota has teamed up with Farmers Yield Initiative (FYI). The staff at FYI investigates complaints of illegal seed sales, collects evidence, tests seed to determine the variety, and files court cases. Significant verdicts were recently rendered against two farming enterprises in Minnesota by federal courts.

Apart from the financial damages caused by brown-bagging, there is another unrecognized yet detrimental aspect of the practice: the loss of certified acres. For seed certifying organizations like MCIA, a non-profit organization that generated revenues through seed certification, the loss of certified acres translates into a financial loss.

A producer may save a few bucks by using and selling brown-bagged seed, but there are substantial legal risks involved. They also take a chance on the quality of the seeds, running the danger of poor germination and weed-seed contamination, which have an impact on crop stands and yields. Additionally, it means less money is available for ongoing 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. ✻

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. ✻

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 18, 2023. 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
- ABI Cardinal
- ND Genesis
- Pinnacle
- Quest
- Rasmusson
- Thoroughbred
- Tradition

BARLEY, WINTER
- MN-Equinox*

FIELD BEANS
- Eclipse Black
- ND Falcon
- ND Palomino
- ND Twilight Black
- ND Whitetail
- Red Cedar
- Red Hawk
- Rosie
- Talon
- Zorro

FIELD PEAS
- Agassiz
- Matrix
- Viper

OATS
- BetaGene™
- Colt
- Crema*
- Deon
- Goliath
- Hayden
- Horsepower
- MN-Pearl
- Natty
- Reins
- Rushmore
- Saber
- Saddle
- SD Buffalo
- Shelby 427
- Stallion
- Streaker
- Sumo
- Warrior

RYE
- KWS Aviator
- KWS Serafino
- KWS Tayo
- ND Dylan
- ND Gardner

SOYBEANS
- Ashtabula
- ND1100S
- ND1406HP
- ND17009GT
- ND21008GT20*
- ND Benson
- ND Bison
- Traill

TRITICALE
- 141
- Forage FX 1001

WHEAT, DURUM
- Carpio
- Divide
- Joppa
- ND Riveland
- ND Stanley

WHEAT, SPRING
- 122010W
- 7995104*
- Advance
- AP Gunsmoke CL2
- AP Murdock
- AP Smith
- Barlow
- Bolles
- Driver

Wheat, Spring Continued
- Elgin-ND
- Faller
- Forefront
- Glenn
- Lang-MN
- LCS Breakaway
- LCS Powerplay
- Linkert
- MN-Rothsay*
- MN-Torgy
- MN-Washburn
- ND Frohberg
- ND Vitpro
- Prevail
- Prosper
- RB07
- Rollag
- Shelly
- SY 611 CL2
- SY Ingmar
- SY McCloud
- SY Rowyn
- SY Soren
- SY Valda
- TCG-Climax
- TCG-Cornerstone

Wheat, Spring Continued
- TCG-Glennville
- TCG-Heartland
- TCG-Spitfire
- TCG-Teddy*
- TCG-Wildcat
- TCG-Wildfire
- TW Starlite
- Velva
- WB9479
- WB9483
- WB9590
- WB9606*
- WB9719

WHEAT, WINTER
- Emerson
- Expedition
- Ideal
- Kaskaskia
- Keldin
- ND Noreen
- NE01643
- Oahe
- Redfield
- SD Midland*
- SY Wolf
- Thompson

PLANT VARIETY PROTECTED

Unauthorized seed multiplication prohibited

FIELD PEAS
- Jetset

OATS
- 126
- Antigo
- Badger
- Beach
- Esker
- Esker2020
- Laker
- Morton
- Newburg
- Rockford
- Souris

RYE
- KWS Receptor

TRITICALE
- 815
- 618491724
- 641512175
- 6977824*
- 934271498

WHEAT, SPRING
- 122001W
- CAG Justify
- CAG Reckless
- Cannon
- Chevelle

Wheat, Spring Continued
- Edge
- LCS Boom*
- LCS Buster
- LCS Dual
- LCS Hammer AX*
- LCS Iguacu
- LCS Nitro
- LCS Prime
- LCS Rebel
- LCS Trigger
- MS-Stingray
- SY Longmire

Wheat, Spring Continued
- TW Elite
- TW Olympic
- TW Trailfire*
- WB9507
- WB9653
- WB-Digger
- WB-Mayville

WHEAT, WINTER
- CDC Falcon
- WB-Matlock
- Winner

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

Who's who at the MDA Seed Regulatory Program

2023 was a year of significant change at the Minnesota Department of Agriculture's (MDA) Seed Regulatory Program (SRP). Denise Thiede, manager of the Seed, Weed, Hemp, and Biotechnology Section, retired at the end of July. Denise brought the Seed Regulatory Program to excellence over her six-year tenure at MDA. She led the implementation of a new inspection and reporting software system, fostered improved relations with seed labs and seed labelers, and provided valuable input on legislation that will change the program in the future.

Michael Merriman took on the role of seed regulatory supervisor in September 2022 and has oversight of the SRP, including operations, hiring, communicating regulatory and enforcement actions with seed labelers, communicating legislative changes and other outreach to labelers, and coordinating the Seed Program Advisory Committee. Mike also oversees the regulated biotechnology framework for Minnesota, including approving permits issued by USDA AMS Biotechnology Regulatory Services (BRS) for the movement and release of regulated genetically engineered organisms in Minnesota and coordinating state inspector–led inspections on behalf of USDA BRS.

Since Mike assumed his position, he has hired four new staff members, including a regulatory administrator, Gergana Radinova; an inspection coordinator, Shane Blair; and two new district inspectors. The seed inspection team includes Jeff Siira (North Central and Arrowhead), Lisa Becker (Southwest), Patrick Walrath (Twin Cities Metro), Megan Thompson (Northwest), and Maya Sarkar (Southeast).

Michael Merriman

Anthony Cortilet

Following Denise Thiede's retirement, Anthony Cortilet was hired to manage the Seed, Weed, Hemp, and Biotechnology Section. Tony has oversight of all four programs but is focused on the Noxious Weed and Industrial Hemp programs. The SWBH Section is part of the MDA's Plant Protection Division, which is directed by Mark Abrahamson. The PPD's mission is to provide consistent, efficient, and effective services to minimize the impacts of invasive species and enhance agricultural opportunities in Minnesota. ✻

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	Rice	MNL, Inc	14088 Hwy 95 NE, Foley, MN 56329	763-295-0010
Canada bluejoint	Rice	MNL, Inc	14088 Hwy 95 NE, Foley, MN 56329	763-295-0010
Grass mix	Wright	Tyson, Todd W	17426 Cty. Road 50 SE, Big Lake, MN 55309	763-263-1939
Indiangrass	Rice	MNL, Inc	14088 Hwy 95 NE, Foley, MN 56329	763-295-0010
Little bluestem	Rice	MNL, Inc	14088 Hwy 95 NE, Foley, MN 56329	763-295-0010
Oats	Carlton	Northland Farms Seed & Grain	5685 County Road 4, Cromwell, MN 55726	218-821-1627
Oats	Red Lake	Svendson, David	18716 330th Ave SE, Oklee, MN 56742	218-416-0157
Orchardgrass	Anoka	Hammer Hay	19420 Cleary Rd NW, Anoka, MN 55303	763-438-1980
Rye	Anoka	Hammer Hay	19420 Cleary Rd NW, Anoka, MN 55303	763-438-1980
Rye	Carlton	Heikes, Bruce	3803 McDowell Rd, Holyoke, MN 55749	612-919-9100
Rye	Douglas	Heikes, Bruce	3803 McDowell Rd, Holyoke, MN 55749	612-919-9100
Rye	Wright	Centre Farms LLC	14248 Appleton Ave NW, Monticello, MN 55362	763-772-6701
Tall dropseed	Rice	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	Beltrami	Neft, Frank	36299 Corral Rd NE, Kelliher, MN 56650	218-647-8408
Wheat	Clearwater	Nelson, Ben	21391 470th St, Clearbrook, MN 56634	218-556-3450
Wheat	Marshall	Blawat Farms	21370 290th St NW, Viking, MN 56760	218-684-0750
Wheat	Pennington	Pribyl Hay & Straw	21607 165th St SE, Plummer, MN 56748	218-465-4005
Wheat	Chisago	Central Turf Farms	13655 Lake Dr NE, Forest Lake, MN 55025	651-464-2130
Wheat	Hennepin	Leurer Farms/Steve Leurer	3312 Red Fox Dr, Hamel, MN 55340	763-478-9583

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 revegetation 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 Co. 3326 190th St, Lake Bronson, MN 56734	218-689-0218
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's Roger Wippler retires: Years of change

By ROGER WIPPLER
Retired MCIA Foundation Seed Services Manager

When I began my tenure at the Minnesota Crop Improvement Association (MCIA) in 1989, I never imagined my time here would span 34 years. After retiring and having a little time to reflect, I can say that my career was extremely rewarding, and I truly enjoyed being part of the organization. One reason my work continued to be interesting was the amount of change that occurred in agriculture and at MCIA over that period.

Roger Wippler

Carl Anfinson

As manager of the Foundation Seed Program, my primary focus was the production and distribution of foundation seed. Most of our seed production was done with MCIA members who were scattered around the state. Their cooperation was exceptional. One of the most rewarding parts of the job was visiting those growers and walking fields.

During my years at MCIA agriculture across Minnesota certainly has changed. In my early years, the foundation seed offerings matched the diversity of crops grown in the state. Along with small grains and soybeans there were seeds of flax, annual canarygrass, bluegrass, buckwheat, field peas and rye. In 1990, Minnesota produced over 4.5 million acres of wheat, oats, and barley. By 2022, there were barely 1.5 million acres of those three crops and 90 percent of those were wheat. Soybeans in 1990 was a relatively new crop in the Red River Valley and a corn field was rarely seen north of Moorhead. Now corn and soybeans are major crops all the way to the Canadian border.

Traveling around the state during the summer and fall gave me a great appreciation for the diverse geography of our state and the varied scope of Minnesota agriculture. From the rolling hills in southeast Minnesota to the flat prairies of the Red River Valley, I have walked shoulder-high oats, waving wheat, and fields of soybeans during stunning fall days. All the while weaving my way along a myriad of county and township roads.

Those roads led me to cross paths with a lot of great people, including seed producers, my coworkers, University of Minnesota plant breeders, and commodity group and ag leaders. My fellow foundation seed and certification folks in our neighboring states have been great neighbors indeed. All continue to seek ways to make agriculture better.

As agriculture across Minnesota has changed so has MCIA. The ability to adapt and change has been essential to MCIA's longevity. I have seen MCIA grow from an agency that provided only seed certification and foundation seed to an organization with a host of services that support seed growers, specialty crop producers, and organic operations. Leaders in the organization continue to seek out ways to serve an ever-changing agricultural industry.

With my tenure at MCIA complete, Carl Anfinson has stepped up to manage the Foundation Seed program. Carl has worked with me for the past four years as seed production coordinator. He will serve the organization well.

YEARS OF CHANGE: Continued on page 19

Six steps to Organic Certification with MCIA

The following are 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. ✻

YEARS OF CHANGE: Continued from page 18

Finally, I offer my sincere thanks to the seed growers and MCIA members for the opportunity to serve this organization. It has truly been a pleasure to work with you. I wish you all the best. ✻

Anfinson new MCIA manager of Foundation Seed Services

Carl Anfinson is the new manager of Foundation Seed Services at MCIA. Carl worked closely with Roger Wippler as the department's seed production coordinator for several years. Prior to joining MCIA, he did ag-related work in both government and the private sector. Carl holds an MS in international agribusiness/applied economics from NDSU. ✻

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 – 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: Blue River organic corn, soybeans, and alfalfa. Viking non-GMO corn, soybeans, and alfalfa. Supplier of organic and non-GMO 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 – CentraSeed LLC
20364 210th St, Hutchinson MN 55350 / 877-733-3224
glen@centraseed.com e-mail / centraseed.com
Organic seed conditioner.
Einkorn, oats, soybeans, wheat, and other small grains.

Minnesota – Clements Seed LLC
211 Pine St, Clements MN 56224 / 507-692-2240
clementsseedllc@outlook.com
Organic seed conditioner.
Can obtain organic seed for growers.

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 – Friederichs Seed Inc
3159 State Hwy 210, Foxhome MN 56520 / 218-643-5612
Bradley@friederichsseed.com / Christine@friederichsseed.com
Organic seed conditioner.

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 – Kieth Speltz
19457 County Road 28, Altura MN 55910 / 507-689-2644
Aroostock rye.

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

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).

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

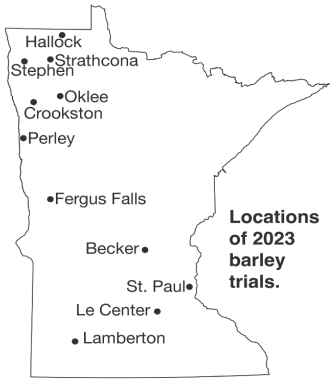
Rates are based on seed of normal size and good quality and normal seedbed. Actual rates used will vary widely, depending on seed cost, desired stand, expected mortality, emerging ability, seed weight, seed germination, seedbed condition, depth of planting and planting equipment.

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.

2023 Barley field crop trial results

Spring barley varieties were evaluated in 2023 in replicated trials at Crookston, Hallock, Oklee, Perley, Stephen, and Strathcona in the northern part of the state and Becker, Fergus Falls, Lamberton, Le Center, and St. Paul in the south. Yield is reported for 2023 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 11 testing locations was 105.5 bushels per acre in 2023. The highest yields this year were recorded in Hallock (162 bushels per acre) while the lowest grain yields were recorded in Lamberton (57 bushels per acre). 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 six rows, with the exception of Quest, are generally more susceptible to Fusarium head blight expressed as lower concentrations of vomitoxin or DON.

The other diseases listed in the disease reactions table are leaf diseases that can be a problem in Minnesota.

BARLEY: Continued on page 24

Table 1. Agronomic characteristics of malting barley varieties, 2021-2023.

Entry	Origin[1]	Year of Release	PVP Status	Heading (DAP)	Height (inches)	Stem Breakage (%)
2-row						
AAC Connect	AAFC	2017	Yes	56	26	7
AAC Synergy	AAFC	2012	Yes	57	27	4
ABI Cardinal	ABI	2021	Yes	57	25	11
Excelsior Gold	NY			53	29	6
Explorer	AS	2020		57	24	6
ND Genesis	ND	2015	Yes	56	29	10
Pinnacle	ND	2007	Yes	54	26	14
6-row						
Lacey	MN	2000	Expired	52	28	13
ND Treasure	ND			51	24	18
Quest	MN	2010	Yes	52	29	46
Rasmusson	MN	2008	Yes	51	25	12
Robust	MN	1984	Expired	52	28	16
Tradition	ABI	2003	Yes	52	26	5
No. of Environments				**9**	**8**	**6**

[1]Agriculture and Agri-Food Canada (AAFC), Anheuser-Busch InBev (ABI), North Dakota State University (ND), University of Minnesota (MN), Cornell University (NY), Agrii (Secobra)
Excelsior Gold and Explorer evaluated in 2022 and 2023.
ND Treasure only evaluated in 2023.

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

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

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

[2] Deoxynivalenol (DON) is the mycotoxin produced by the Fusarium head blight pathogen. The score is based on DON data for 2021 and 2022.

[3] Net blotch data is for 2022 and 2023.

[4] Spot Blotch data is for 2020.

Excelsior Gold and Explorer evaluated in 2022 and 2023.

ND Treasure only evaluated in 2023.

BARLEY:

Continued from page 23

Pinnacle is very susceptible to net blotch. All the varieties tested are generally susceptible (ratings from 3-8) to the QCCJ race of stem rust which has not been identified as a threat in the Midwest yet. All listed varieties carry stem rust resistance to the predominate Puccinia graminis f. sp. tritici race (MCCF). Most varieties possess pre-heading resistance to stem rust; thus, they will not likely incur much damage unless the disease epidemic is severe. Bacterial Leaf Streak fungicides and there are some modest differences (ratings from 2-6) in resistance among the tested two row varieties.

PVP Status

The varieties covered by the Protection Act, PVP (94) are indicated in the table. Growers can save seed of PVP protected varieties for their own planting only; it cannot be sold to anyone else, not even a

BARLEY:
Continued on page 25

Table 3. Relative grain yield of barley varieties in northern Minnesota locations in single-year (2023) and multiple-year comparisons (2021-2023).

	Crookston			Hallock			Oklee			Perley			Roseau[1]		Stephen			Strathcona[2]	
Entry	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	3 Yr
2-row																			
AAC Connect	103	102	102	101	103	104	94	94	95	106	103	106	98	99	98	104	103	91	96
AAC Synergy	100	103	101	102	104	103	94	99	98	106	109	106	96	100	107	112	112	102	99
ABI Cardinal	109	96	100	96	99	103	90	98	98	105	104	101	95	101	106	106	104	97	95
Excelsior Gold	87	96	.	98	103	.	105	101	.	106	107	.	109	.	91	100	.	90	.
Explorer	98	100	.	97	96	.	93	93	.	90	87	.	104	.	104	97	.	96	.
ND Genesis	88	101	102	98	103	101	99	99	102	101	102	105	107	107	104	109	105	103	104
Pinnacle	104	98	100	106	100	101	113	111	111	104	101	101	111	113	104	100	100	105	102
6-row																			
Lacey	106	103	101	97	94	92	106	100	102	108	97	97	97	100	96	88	92	103	101
ND Treasure	113	.	.	106	.	.	104	.	.	93	.	.	.	.	93	.	.	101	.
Quest	94	99	97	100	98	96	99	103	100	89	94	92	90	87	95	91	92	101	98
Rasmusson	108	110	107	104	101	104	103	103	103	107	104	103	103	107	106	101	95	108	104
Robust	92	94	93	91	94	93	97	95	92	89	93	90	95	91	102	99	100	101	98
Tradition	99	98	95	104	104	101	106	104	100	98	100	98	96	95	93	93	97	103	102
Mean (Bu/Acre)	**119.7**	**110.6**	**103.5**	**162.1**	**141.0**	**127.9**	**110.5**	**108.1**	**92.5**	**113.4**	**118.5**	**116.9**	**132.9**	**102.0**	**124.6**	**114.8**	**114.2**	**129.7**	**109.4**
LSD (0.10)	**13.2**	**19.0**	**12.8**	**5.7**	**10.2**	**8.5**	**14.9**	**9.9**	**9.0**	**9.8**	**10.1**	**8.5**	**8.7**	**8.3**	**10.3**	**14.3**	**10.3**	**6.9**	**8.5**

[1]Trial data for Roseau is from 2021 and 2022.

[2]Trial data for Strathcona is from 2021 and 2023.

relative or a neighbor without

BARLEY:

Continued from page 24

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Authors

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Researchers

Guillermo Elasquez, Curtis Reese, Joseph Wodarek, Mike Leiseth, Steve Quiring, Travis Vollmer 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 5. Relative grain yield of barley varieties in a single-year (2023) and multiple-year comparisons (2021-2023).

	State			North			South		
Entry	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr
2-row									
AAC Connect	99	100	101	99	100	101	99	100	101
AAC Synergy	103	103	101	102	104	103	103	101	98
ABI Cardinal	102	99	99	100	100	101	106	99	97
Excelsior Gold	96	98	.	96	101	.	95	95	.
Explorer	99	97	.	96	95	.	104	100	.
ND Genesis	101	103	103	99	103	104	106	102	102
Pinnacle	102	101	102	106	103	103	95	99	101
6-row									
Lacey	103	99	99	102	97	97	104	101	101
ND Treasure	100	.	.	102	.	.	98	.	.
Quest	96	98	97	96	97	95	94	100	101
Rasmusson	106	106	105	106	104	103	107	109	108
Robust	94	94	92	95	95	94	91	92	90
Tradition	100	101	100	101	100	99	98	103	101
Mean (Bu/Acre)	**105.5**	**103.1**	**95.0**	**125.9**	**119.6**	**109.6**	**81.1**	**86.7**	**80.3**
LSD (0.10)	**5.4**	**3.8**	**3.2**	**5.3**	**4.5**	**3.6**	**12.1**	**6.6**	**5.5**
No. of Environments	**11**	**24**	**38**	**6**	**12**	**19**	**5**	**12**	**19**

Table 4. Relative grain yield of barley varieties in southern Minnesota locations in single-year (2023) and multiple-year comparisons (2021-2023).

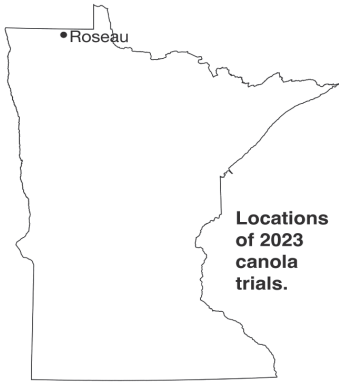
	Becker			Fergus Falls			Lamberton			Le Center			New Ulm[1]		Rochester[1]		St. Paul		
Entry	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2 Yr	3 Yr	2 Yr	3 Yr	2023	2 Yr	3 Yr
2-row																			
AAC Connect	100	100	98	103	102	101	91	92	94	90	100	101	102	103	97	102	114	104	107
AAC Synergy	100	101	106	107	102	101	98	97	97	100	95	92	110	87	109	100	113	106	108
ABI Cardinal	104	105	108	110	97	101	79	90	96	110	105	98	98	95	76	71	116	107	107
Excelsior Gold	90	95	.	99	104	.	93	96	.	96	93	.	83	.	91	.	92	86	.
Explorer	91	97	.	96	96	.	99	103	.	91	95	.	101	.	88	.	156	124	.
ND Genesis	101	93	96	106	110	106	102	104	102	113	103	103	83	98	107	105	102	101	101
Pinnacle	94	96	100	102	103	102	80	91	92	94	99	100	101	104	103	103	99	96	103
6-row																			
Lacey	125	101	99	95	95	97	108	105	105	103	101	100	103	108	109	105	95	102	97
ND Treasure	98	.	.	99	.	.	118	.	.	102	.	.	.	.	.	.	73	.	.
Quest	82	99	101	92	96	97	129	119	119	100	102	101	106	104	107	106	72	81	82
Rasmusson	120	119	113	101	106	105	110	106	106	107	106	104	107	105	113	117	97	106	108
Robust	98	88	83	90	87	90	97	96	93	97	96	95	101	98	99	92	67	82	79
Tradition	96	103	95	99	102	101	95	101	97	97	106	104	105	100	100	100	104	105	107
Mean (Bu/Acre)	**70.5**	**85.7**	**67.4**	**109.0**	**118.4**	**106.4**	**56.8**	**64.0**	**62.7**	**106.3**	**104.6**	**94.0**	**81.3**	**92.5**	**82.4**	**87.2**	**64.1**	**64.0**	**59.6**
LSD (0.10)	**13.0**	**21.3**	**21.4**	**6.5**	**12.9**	**11.2**	**26.8**	**12.1**	**10.6**	**9.2**	**15.0**	**11.7**	**16.1**	**22.3**	**12.5**	**11.5**	**14.9**	**31.6**	**14.9**

[1]Trial data for New Ulm and Rochester is from 2021 and 2022.

2023 Canola Field Crop Trial Results

The 2023 Canola Production Center (CPC) was located on Northern Resources Cooperative land on the west side of Roseau, Minn., on the south side of Highway 11. Primary tillage was done by Magnusson Farms.

Final seedbed preparation was done by University of Minnesota personnel. Previous crop was soybeans. A spring fertilizer rate of 140-20-40-20s was applied and incorporated prior to final seedbed preparation. Early spring weather conditions were warm and dry. Planting date for the canola variety trial was May 23. Soil moisture condition at planting was good and emergence was generally uniform.



Early season flea beetle pressure was moderate. Premium seed treatments on most varieties provided good early season flea beetle control prior to the post emergent treatment of 1.5 oz/acre Grizzly Too(permethrin).

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. Canola seeding rate was 10-12 pure live seeds(PLS)/ft.2 as provided by the seed company submitting the entry. 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 12 for grassy weed and flea beetle control. General weed control was done with applications of either Roundup PowerMax at 16 oz. to RR, TruFlex, and Opt.gly varieties or Liberty at 28 oz. to LL varieties. Labeled adjuvants were combined with all herbicides. A weather event with marble size hail and 40 MPH wind gusts occurred on July 13. To minimize the effects of this, 6 oz Priaxor was applied on July 18. Plots were swathed on Aug. 23 and combining was completed on Sept. 10, 2023.

Authors and Researchers

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

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Thank you for reading the 2024 Minnesota Certified Seed Guide!

2023 Canola variety trial [5]

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	**3321**	21.6	45.8	52.4	1.8	50	83	8.5	30-Jun	26-Jul	26
2	CROPLAN	CP9221TF	TF	**3056**	21.3	44.0	51.5	2.0	46	78	8.0	27-Jun	25-Jul	28
3	Pioneer	P515G	RR	**3127**	20.8	46.0	52.6	1.0	54	73	8.0	2-Jul	27-Jul	24
4	Pioneer	P511G	Opt. Gly	**2777**	21.4	44.8	52.0	1.0	54	78	8.5	2-Jul	24-Jul	21
5	Proseed	TR23127	TF	**2831**	22.7	43.8	52.9	1.5	52	60	6.0	3-Jul	1-Aug	28
6	Meridian Seeds	CS3100 TF	TF	**2382**	21.6	42.7	51.9	1.0	59	80	8.0	4-Jul	5-Aug	31
7	Nuseed	NC155 TF	TF	**2572**	23.2	42.7	53.0	1.0	50	80	8.5	29-Jun	28-Jul	30
8	Nuseed	NC471 TF	TF	**2726**	21.8	44.0	52.7	1.0	57	83	8.0	2-Jul	27-Jul	29
9	Nuseed	NC527CR TF	TF	**2644**	22.3	43.9	51.1	1.0	51	85	9.0	30-Jun	28-Jul	28
10	Star Specialty Seed	StarFlex	TF	**3320**	20.0	47.3	52.2	1.3	48	85	8.5	30-Jun	26-Jul	27
	RR/TF only		LSD @ 5% level	**253**	1.1	1.2	0.3	0.8	4	2	1	1	5	
			CV(%)	**6.1**	3.4	1.9	0.4	45.7	5.4	13.5	11.1	2.0	11.7	
11	Dekalb	DKTFLL21SC	TF+LL	**2609**	19.9	47.8	51.9	2.3	44	88	8.5	28-Jun	23-Jul	25
12	Dekalb	DKLL82SC	LL	**2896**	20.6	47.0	52.0	1.0	47	88	9.0	30-Jun	24-Jul	24
13	Dekalb	DKLL83SC	LL	**2670**	21.1	45.6	51.7	1.8	50	83	8.5	28-Jun	23-Jul	25
14	Meridian Seeds	CS4000 LL	LL	**2526**	20.4	46.0	52.7	1.5	53	80	8.5	2-Jul	25-Jul	23
15	CROPLAN	CP7250LL	LL	**2584**	21.5	44.7	52.2	1.0	55	80	8.0	2-Jul	29-Jul	27
16	BASF	InVigor L233P	LL	**3072**	20.7	44.3	51.5	1.5	54	83	8.5	2-Jul	25-Jul	23
17	BASF	InVigor L340PC	LL	**2826**	20.7	43.0	51.2	1.3	54	80	8.0	1-Jul	26-Jul	26
18	BASF	InVigor L343PC	LL	**2711**	19.8	44.5	51.3	1.5	58	83	9.0	2-Jul	25-Jul	24
19	BASF	InVigor L345PC	LL	**2751**	20.7	43.1	52.6	1.0	58	80	8.0	4-Jul	31-Jul	28
20	BASF	InVigor L350PC	LL	**2584**	20.6	45.0	52.5	1.0	62	78	8.0	7-Jul	3-Aug	24
	LL only		LSD @ 5% level	**290**	1.0	1.2	0.4	0.9	4	1	2	1	3	
			CV(%)	**7.3**	3.5	1.9	0.9	45.9	4.7	9.9	12.6	2.7	6.9	
			LSD @ 5% Level	**266**	1.0	1.1	0.3	0.9	4.0	13.0	1.0	1.0	4.0	
			LSD @ 10% Level	**222**	0.9	1.0	0.3	0.7	3.0	12.0	1.0	1.0	3.0	
			CV (%)	**6.7**	3.4	1.8	0.4	46.3	5.2	12	12.2	2.4	9.5	
			Trial mean	**2800**										
			Mean of RR/TF only varieties	2876										
			Mean of LL only varieties	2723										

Experimental Design: RCB w/ 4 reps.
Seeding rate=12PLS/Ft.[2] Planting Date: 5/24/2023

*Herbicide Tolerance: LL = Liberty Link, RR = Roundup Ready, Opt.Gly=Optimum Glyphosate Tolerant and TF = TruFlex Roundup Ready

[1] Clean Seed. Yields corrected to 8.5% moisture.
[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
[5] Pea-marble size hail 7/13 - Priaxor at 6 oz. was applied on 7/17/2023.
Fertilizer application: 140-20-40-20s applied PPI 5/22/23
Past crop=Soybean-conventional tillage

2023 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

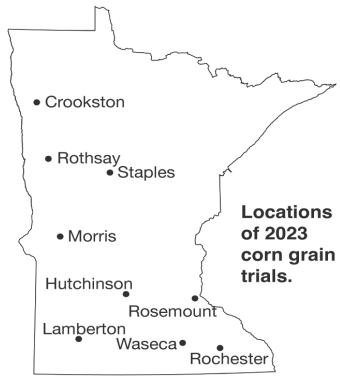
Test zones, locations and maturities are as follows:

Southern Zone:

Lamberton, Rochester and Waseca

• Early Maturity Trial - 102 Relative Maturity (RM) and earlier entries.

• Late Maturity Trial - 103 RM and later entries.



Central Zone:

Hutchinson, Morris and Rosemount

• Early Maturity Trial - 98 RM and earlier entries.

Late Maturity Trial - 99 RM and later entries.

CORN GRAIN: Continued on page 29

Table 1. Companies participating in the 2023 corn grain trials.

Company	Website
Anderson Seeds	andersonseedsmn.com
Beck's	beckshybrids.com
Blue River Organic Seed	blueriverorgseed.com
Dairyland Seed	dairylandseed.com
Dynagro	dynagroseed.com
Enestvedt Seed Company	enestvedtseeds.com
Legacy Seeds	legacyseeds.com
REA Hybrids	rea-hybrids.com
Viking Seed	alseed.com
Wyffels Hybrids	wyffels.com

Table 3. Early maturity entries, southern locations, 2023.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Lamberton	Waseca	Average Across Locations Bu/Acre	% Moisture
98 and earlier RM entries							
Anderson Seeds	786R	Gly	95	197	216	206	15.6
Anderson Seeds	6909		98	186	242	214	15.7
Enestvedt Seed	E658		95	178	232	205	15.8
Enestvedt Seed	E654		95	195	245	220	15.9
Wyffels	W1996	Bt, Gly	98	211	250	231	16.0
Becks Hybrids	4672AM	Bt, Gly, LL	96	217	254	236	16.1
Enestvedt Seed	E663	Bt, Gly	97	199	252	226	16.4
Dairyland Seed	DS-3881AM	Bt, Gly, LL	98	186	251	219	16.6
98 and earlier RM averages:				**196**	**243**	**219**	**16.0**
99 to 102 RM entries							
Legacy Seeds	LC492-22	Bt, Gly	99	194	244	219	15.7
Anderson Seeds	681VT2P	Bt, Gly	100	205	234	220	15.9
Anderson Seeds	528TRE	Bt, Gly	102	177	236	206	16.2
Viking	24-01		101	206	255	230	16.3
Legacy Seeds	LC512-22	Bt, Gly	101	194	254	224	16.3
Dekalb	DKC101-35RIB	Bt, Gly	101	199	269	234	16.5
Legacy Seeds	LC494-23	Bt, Gly, LL	99	217	247	232	16.5
Anderson Seeds	507R	Gly	102	216	241	229	16.6
Dairyland Seed	DS-4219AM	Bt, Gly, LL	100	207	268	238	16.8
Viking	24-99		99	196	223	209	16.9
Becks Hybrids	5231AM	Bt, Gly, LL	102	209	231	220	17.0
Viking	46-02		102	202	258	230	17.0
Anderson Seeds	507SRC	Bt, CRW, Gly, LL	102	204	240	222	17.3
99 to 102 RM averages:				**202**	**246**	**224**	**16.5**
Southern locations, early maturity averages:				**200**	**245**	**222**	**16.3**
LSD (0.20)				**19**	**18**	**13**	**0.4**

CORN GRAIN: Continued from page 28

Northern Zone:
Crookston, Rothsay and Staples

Testing Procedure

Seed corn companies choose their entries for each zone. Entries in each trial were based on the relative maturity (RM) 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 2023.

Reported yields are adjusted to 15.5 percent grain moisture. Entries are ranked within a maturity group by moisture content averaged across locations for 2023. The site at

CORN GRAIN: Continued on page 31

Table 2. Individual Trial Information, 2023.

Location	Cooperators	Previous Crop	Planting Date	Harvest Date
Lamberton	Travis Vollmer	Soybeans	May 22	Oct 19
Waseca	Tom Hoverstad	Soybeans	May 2	Nov 5
Hutchinson	School Dist #423	Corn	May 23	Nov 3
Rosemount	Gerry Holz	Soybeans	May 9	Oct 18
Crookston	Mike Leiseth	Wheat	May 23	Oct 17
Staples	Noah Boelter	Soybeans	May 19	Nov 9

Table 4. Late maturity entries, southern locations, 2023.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Lamberton	Waseca	Average Across Locations Bu/Acre	% Moisture
103 to 105 RM entries							
Enestvedt Seed	E539		103	198	242	220	16.1
Viking	84-05		105	207	247	227	16.2
Legacy Seeds	LC554-23	Bt, CRW, Gly, LL	105	212	229	221	16.4
Wyffels	W3576	Bt, Gly	103	189	263	226	16.4
Legacy Seeds	LC534-23	Bt, Gly, LL	103	208	221	215	16.5
Becks Hybrids	5393V2P	Bt, Gly	103	190	236	213	16.7
Dyna-Gro	D45SP33RIB	Bt, CRW, Gly, LL	105	191	236	214	16.7
Dekalb	DKC103-07RIB	Bt, Gly	103	201	249	225	16.9
Wyffels	W4246	Bt, Gly	105	179	244	211	17.0
Blue River	49M23		103	180	242	211	17.3
Viking	84-04		104	193	215	204	17.6
Dairyland Seed	DS-4365AM	Bt, Gly, LL	103	209	232	221	17.6
Dekalb	DKC105-35RIB	Bt, Gly	105	216	272	244	17.6
Legacy Seeds	LC544-22	Bt, Gly, LL	104	200	230	215	17.8
103 to 105 RM averages:				**198**	**240**	**219**	**16.9**
Later than 105 RM entries							
Enestvedt Seed	E598		107	206	241	224	16.4
Anderson Seeds	472SRC	Bt, CRW, Gly, LL	106	208	251	229	16.6
Viking	72-06		106	188	253	220	17.0
Enestvedt Seed	E541		106	193	242	217	17.0
Dairyland Seed	DS-4686AM	Bt, Gly, LL	106	183	265	224	17.4
Wyffels	W5086	Bt, Gly	107	201	235	218	17.4
Dyna-Gro	D50VC09RIB	Bt, Gly	110	182	231	207	17.5
Dekalb	DKC59-82RIB	Bt, Gly	109	200	247	223	17.8
Becks Hybrids	5864AM	Bt, Gly, LL	108	199	279	239	17.8
Dairyland Seed	DS-4833AM	Bt, Gly, LL	108	202	242	222	18.3
Enestvedt Seed	E543		106	200	265	233	18.4
Dekalb	DKC110-10RIB	Bt, CRW, Gly, LL	110	216	248	232	18.5
Viking	85-09		109	205	240	223	18.8
Dekalb	DKC108-64RIB	Bt, CRW, Gly, LL	108	220	278	249	18.8
Enestvedt Seed	E523		107	191	246	218	19.1
Later than 105 RM averages:				**199**	**251**	**225**	**17.8**
Southern locations, late maturity averages:				**199**	**246**	**222**	**17.4**
LSD (0.20)				**16**	**26**	**15**	**0.5**

Table 5. Early maturity entries, central locations, 2023.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Hutchinson	Yield, Bushels/Acre at: Rosemount	Average Across Locations Bu/Acre	Average Across Locations % Moisture
95 and earlier RM entries							
Anderson Seeds	7865		95	265	172	219	15.6
Legacy Seeds	LC403-22	Bt, Gly, LL	90	279	169	224	16.0
Enestvedt Seed	E658		95	270	190	230	16.1
Anderson Seeds	7422		92	253	163	208	16.2
Legacy Seeds	LC454-22	Bt, Gly	94	292	161	226	16.3
Dekalb	DKC44-98RIB	Bt, Gly	94	269	173	221	16.3
Enestvedt Seed	E654		95	282	171	227	16.3
Dairyland Seed	DS-3599Q	Bt, CRW, Gly, LL	94	260	178	219	16.5
Dekalb	DKC45-74RIB	Bt, CRW, Gly, LL	95	272	179	225	16.5
95 RM and earlier averages:				**271**	**173**	**222**	**16.2**
96 to 98 RM entries							
Viking	O.45-97UP		97	259	190	225	15.7
Viking	52-96		96	251	172	211	15.8
Anderson Seeds	726VT2P	Bt, Gly	98	289	175	232	15.9
Enestvedt Seed	E663	Bt, Gly	97	303	176	240	16.0
Enestvedt Seed	E692		98	273	175	224	16.0
Anderson Seeds	609R	Bt, CRW, Gly, LL	98	273	185	229	16.1
Viking	44-98		98	266	167	217	16.1
Legacy Seeds	LC465-23	Bt, Gly, LL	96	307	165	236	16.3
Dekalb	DKC47-85RIB	Bt, Gly	97	270	154	212	16.3
Anderson Seeds	746SRC	Bt, CRW, Gly, LL	98	279	167	223	16.4
Dairyland Seed	DS-3881AM	Bt, Gly, LL	98	289	192	240	16.4
Anderson Seeds	728TRE	Bt, Gly	98	328	169	248	16.5
96 to 98 RM averages:				**282**	**174**	**228**	**16.1**
Central locations, early maturity averages:				**278**	**174**	**226**	**16.1**
LSD (0.20)				**16**	**17**	**12**	**0.4**

Table 6. Late maturity entries, central locations, 2023.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Hutchinson	Yield, Bushels/Acre at: Rosemount	Average Across Locations Bu/Acre	Average Across Locations % Moisture
99 to 101 RM entries							
Viking	52-00		100	243	176	209	16.4
Dekalb	DKC099-11RIB	Bt, Gly	99	256	162	209	16.4
Viking	24-99		99	270	174	222	16.6
Legacy Seeds	LC512-22	Bt, Gly	101	256	176	216	16.7
Legacy Seeds	LC492-22	Bt, Gly	99	251	182	217	16.9
Dekalb	DKC101-35RIB	Bt, Gly	101	301	177	239	17.0
Legacy Seeds	LC494-23	Bt, Gly, LL	99	277	180	228	17.1
Dyna-Gro	D41TC74RIB	Bt, Gly	101	268	179	223	17.2
Dairyland Seed	DS-4003QQ	Bt, CRW, Gly, LL	100	246	174	210	17.4
Dairyland Seed	DS-4219AM	Bt, Gly, LL	100	276	173	224	17.5
Viking	24-01		101	246	146	196	17.7
99 to 101 RM and earlier averages:				**263**	**172**	**218**	**17.0**
Later than 101 RM entries							
Dyna-Gro	D44DC73RIB	Bt, Gly	104	295	180	238	15.9
Anderson Seeds	5072		102	256	173	214	17.1
Dekalb	DKC103-07RIB	Bt, Gly	103	276	175	226	17.3
Legacy Seeds	LC534-23	Bt, Gly, LL	103	276	164	220	17.4
Enestvedt Seed	E539		103	280	184	232	17.7
Dairyland Seed	DS-4365AM	Bt, Gly, LL	103	271	177	224	17.8
Dekalb	DKC105-35RIB	Bt, Gly	105	261	196	229	18.0
Later than 101 RM averages:				**274**	**178**	**226**	**17.3**
Central locations, late maturity averages:				**267**	**175**	**221**	**17.1**
LSD (0.20)				**33**	**14**	**18**	**0.5**

CORN GRAIN: Continued from page 29

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 YieldGuard corn borer event, or the Herculex corn borer event.

Identifiers will be:

- Bt = European 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. 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.

Authors and Researchers

Tom Hoverstad, Wade Ihlenfeld, Jeff Coulter, Matt Bickell, Travis Vollmer and Mike Leiseth. ✻

Corn Grain

Planting Rate and Date

Bushel Weight, Pounds.....56

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

Planting Date.....May 2-May 23

Table 7. Northern locations, 2023.

Source	Entry	Traits	Relative Maturity	Yield, Bushels/Acre at: Crookston	Staples	Average Across Locations Bu/Acre	% Moisture
86 and earlier RM entries							
Legacy Seeds	LC364-23	Bt, Gly	86	190	238	214	16.6
Dairyland Seed	DS-2612AM	Bt, Gly, LL	86	185	225	205	16.7
REA Hybrids	86B55	Bt, Gly	86	171	227	199	16.8
REA Hybrids	86A94	Bt, CRW, Gly, LL	86	174	216	195	16.8
Legacy Seeds	LC354-23	Bt, Gly, LL	85	170	240	205	16.9
Legacy Seeds	LC363-23	Bt, Gly, LL	86	187	233	210	17.7
86 and earlier RM entry averages:				**180**	**230**	**205**	**16.9**
87 to 91 RM entries							
Dairyland Seed	DS-2919AM	Bt, Gly, LL	89	165	240	203	17.3
REA Hybrids	92B10	Bt, Gly	92	179	252	215	17.5
Dairyland Seed	DS-3159AM	Bt, Gly, LL	91	185	270	227	17.5
REA Hybrids	88B04	Bt, Gly	88	183	219	201	17.6
Legacy Seeds	LC384-23	Bt, Gly	88	143	244	193	17.8
Dekalb	DKC42-65RIB	Bt, Gly	92	166	238	202	18.1
Viking	42-92		92	167	235	201	18.1
Enestvedt Seed	E612		92	185	238	211	18.2
87 to 91 RM entry averages:				**172**	**242**	**207**	**17.8**
92 and later RM entries							
Enestvedt Seed	E654		95	197	265	231	17.5
Dairyland Seed	DS-3599Q	Bt, CRW, Gly, LL	94	184	249	216	18.2
Dekalb	DKC47-85RIB	Bt, Gly	97	166	273	220	18.3
REA Hybrids	95B53	Bt, Gly	95	210	265	238	18.4
Dekalb	DKC44-98RIB	Bt, Gly	94	172	233	203	18.8
REA Hybrids	93F72	Bt, CRW, Gly, LL	93	206	280	243	19.0
Viking	O.62-93UP		93	182	232	207	19.7
Dekalb	DKC45-74RIB	Bt, CRW, Gly, LL	95	191	271	231	19.8
Dekalb	DKC099-11RIB	Bt, Gly	99	179	266	222	21.0
92 and Later RM entry averages:				**187**	**259**	**223**	**19.0**
Northern locations averages:				**180**	**246**	**213**	**18.0**
LSD (0.20)				**16**	**19**	**12**	**0.7**

2023 Oat field crop trial results

Oat varieties were sown in trials in 2023 at Lamberton, Le Center and Waseca in southern Minnesota (south of I-94) and Crookston, Fergus Falls and Stephen in northern Minnesota (north of I-94). 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 2021-23 except where noted.

Table 2. Disease characteristics of oat varieties.

Entry	Crown Rust[1, 2] (1-9)	Loose Smut[1, 3] (1-9)	BYDV[1, 4] (1-9)
Antigo	5	4	4
CS Camden	7	3	4
Deon	6	1	4
Esker2020	4	2	3
Hayden	6	2	3
Mink	3	2	na
MN-Pearl	4	1	4
ND Carson	5	2	na
ND Heart	5	8	4
ND Spilde	4	1	na
Reins	7	1	4
Rushmore	6	3	4
Saddle	6	1	4
SD Buffalo	5	2	na
Streaker	6	3	4
Sumo	5	1	4
Warrior	4	3	4
No of Trials	2	3	1

[1]All traits evaluated on a 1-9 scale where 1 = most resistant and 9 = susceptible
[2]Crown Rust evaluated in 2022 and 2023; 2021 trial failed due to drought
[3]Loose Smut evaluated in 2021, 2022, and 2023
[4]BYDV evaluated in 2021 only
Entries ND Carson and ND Spilde were only evaluated in 2023.

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 2021. 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 pre-

OAT: Continued on page 33

Table 1. Origin and agronomic characteristics of oat varieties in Minnesota in multiple-year comparisons (2021-2023).

Entry	Origin	Year of Release	Legal Status	Seed Color	Days to Heading (days)	Plant Height (inches)	Straw Strength[1] (1-9)	Test Weight (lbs/bu)
Antigo	WI	2017	PVP	Yellow	53.5	26.8	1.7	36.1
CS Camden	Meridian Seeds	2013	PVP(94)	White	59.4	28.2	1.3	32.4
Deon	MN	2014	PVP(94)	Yellow	59.6	31.5	2.4	35.9
Esker2020	WI	2020	PVP	Yellow	56.5	28.0	1.9	33.5
Hayden	SD	2015	PVP(94)	White	58.7	30.0	2.3	33.7
Mink	WI	2022	PVP Pending	Yellow	62.0	29.4	1.8	35.5
MN-Pearl	MN	2018	PVP(94)	White	58.1	29.6	4.9	35.9
ND Carson	ND	2023	PVP(94) Pending	White	58.8	29.2	1.0	33.6
ND Heart	ND	2020	PVP(94)	White	58.6	29.8	3.0	34.9
ND Spilde	ND	2023	PVP(94) Pending	White	56.0	31.7	1.8	33.4
Reins	IL	2016	PVP(94)	White	52.0	21.7	0.6	35.6
Rushmore	SD	2020	PVP(94)	White	56.1	28.7	1.9	37.0
Saddle	SD	2018	PVP(94)	White	52.3	26.3	1.0	36.0
SD Buffalo	SD	2021	PVP(94) Pending	White	57.6	29.6	2.2	34.8
Streaker[2]	SD	2016	PVP(94)	Hulless	56.3	28.9	3.6	43.1
Sumo	SD	2017	PVP(94)	White	51.6	27.2	2.1	33.9
Warrior	SD	2019	PVP(94)	White	56.2	27.1	1.4	35.8
No. of Trials					9	9	10	15

[1]Straw strength evaluated on a 1-9 scale where 1 = most resistant and 9 = susceptible
Entry CS Camden was developed by Lantmannen Seed in Sweden.
Entries ND Carson and ND Spilde were only evaluated in 2023.
[2]Entry Streaker is a hulless oat.

OAT: Continued from page 32

vented crown rust development in our screening nursery, so ratings are based on data from 2022 and 2023.

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 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 resistance 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

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Researchers

Curtis Reese, Mike Leiseth, Steve Quiring, Travis Vollmer, 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 3. Relative grain yield of oat varieties in Minnesota in single-year (2023) and multiple-year comparisons (2021-2023).

	Northern Minnesota			Southern Minnesota			Statewide		
Entry	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr
	% of mean								
Antigo	88	85	84	87	91	93	87	87	88
CS Camden	109	111	110	116	109	107	112	110	109
Deon	110	108	110	116	109	109	112	109	109
Esker2020	105	103	102	101	106	105	104	105	104
Hayden	104	108	108	106	108	110	105	108	109
Mink	118	111	111	101	117	114	112	114	112
MN-Pearl	107	111	112	104	100	103	106	106	108
ND Carson	106	.	.	102	.	.	104	.	.
ND Heart	98	93	95	84	91	91	93	92	93
ND Spilde	109	.	.	119	.	.	113	.	.
Reins	87	92	90	100	92	93	92	92	91
Rushmore	99	104	104	98	100	102	99	102	103
Saddle	98	100	98	97	99	96	98	99	97
SD Buffalo	106	109	109	112	111	110	108	110	110
Streaker	73	76	76	72	74	75	73	75	75
Sumo	84	87	87	84	89	91	84	88	88
Warrior	98	103	104	102	104	103	100	103	104
Mean (Bu/Acre)	**177.7**	**176.6**	**152.3**	**105.7**	**113.4**	**105.8**	**141.7**	**142.9**	**127.1**
LSD (0.1)	**10.5**	**7.3**	**6.4**	**14.9**	**9.1**	**7.1**	**9.4**	**5.9**	**4.9**
# of Environments	**3**	**7**	**11**	**3**	**8**	**13**	**6**	**15**	**24**

Entries ND Carson and ND Spilde were only evaluated in 2023.

Table 4. Relative grain yield of oat varieties in Northern Minnesota locations in single-year (2023) and multiple-year comparisons (2021-2023).

	Crookston			Fergus Falls			Roseau[1]		Stephen		
Entry	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2 Yr	3 Yr	2023	2 Yr	3 Yr
	% of mean										
Antigo	86	87	86	88	76	81	81	80	89	91	89
CS Camden	112	108	110	112	112	113	114	104	106	111	112
Deon	106	107	107	102	105	104	111	118	119	110	111
Esker2020	108	107	109	95	93	96	111	102	110	104	102
Hayden	105	108	108	101	108	109	110	109	105	106	107
Mink	110	110	113	116	107	110	108	100	125	116	116
MN-Pearl	105	110	111	104	113	112	112	113	111	109	111
ND Carson	109	.	.	103	.	.	.	.	105	.	.
ND Heart	102	99	104	105	100	99	86	89	90	86	89
ND Spilde	114	.	.	118	.	.	.	.	98	.	.
Reins	90	94	90	86	85	86	93	91	86	94	91
Rushmore	94	99	97	99	101	101	111	115	102	106	106
Saddle	110	105	101	92	93	92	99	102	94	101	97
SD Buffalo	103	108	108	103	108	105	109	113	110	111	111
Streaker	70	73	71	78	84	83	76	77	72	72	74
Sumo	79	79	80	94	96	94	83	88	82	89	87
Warrior	96	105	106	103	118	116	96	99	96	93	97
Mean (Bu/Acre)	**171.5**	**179.4**	**159.2**	**151.6**	**146.3**	**127.9**	**191.3**	**154.8**	**215.7**	**196.0**	**169.6**
LSD (0.1)	**13.9**	**8.8**	**7.5**	**7.8**	**16.6**	**12.6**	**12.9**	**17.3**	**11.0**	**17.3**	**13.5**

[1]Trial data for Roseau is from 2021 and 2022.

Entries ND Carson and ND Spilde were only evaluated in 2023.

Table 5. Relative grain yield of oat varieties in Southern Minnesota locations in single-year (2023) and multiple-year comparisons (2021-2023).

	Becker[1]		Lamberton			Le Center			Rochester[1]		Waseca		
Entry	1 Yr	2 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	1 Yr	2 Yr	2023	2 Yr	3 Yr
Antigo	108	97	68	81	81	92	96	98	87	97	95	87	90
CS Camden	122	118	125	115	112	108	106	106	85	82	118	120	125
Deon	85	90	133	125	121	113	108	108	116	113	106	101	105
Esker2020	104	108	98	105	109	97	100	96	116	108	110	111	111
Hayden	106	111	97	109	109	117	114	113	109	112	99	96	100
Mink	112	114	115	120	116	88	104	103	125	116	108	131	127
MN-Pearl	89	95	96	97	103	107	102	103	104	100	107	106	113
ND Carson	.	.	133	.	.	87	.	.	.	.	96	.	.
ND Heart	86	90	90	97	95	88	93	94	84	91	72	88	81
ND Spilde	.	.	106	.	.	121	.	.	.	.	128	.	.
Reins	102	98	101	94	93	100	97	99	70	82	100	95	92
Rushmore	85	92	82	91	93	106	104	104	108	111	102	108	106
Saddle	109	102	98	96	90	96	97	98	105	104	97	93	84
SD Buffalo	113	109	116	109	110	109	105	104	129	121	112	107	108
Streaker	64	67	62	71	75	84	82	81	70	74	63	72	75
Sumo	97	97	82	90	94	86	89	92	92	88	83	79	82
Warrior	116	111	98	100	100	102	103	103	100	103	105	105	101
Mean (Bu/Acre)	**100.9**	**91.4**	**82.6**	**103.0**	**100.7**	**142.7**	**140.4**	**134.5**	**147.1**	**136.5**	**93.1**	**86.4**	**73.3**
LSD (0.1)	**18.2**	**16.9**	**25.9**	**14.2**	**12.1**	**8.2**	**13.0**	**8.9**	**16.6**	**19.5**	**17.0**	**22.2**	**19.9**

[1]Trial data for Becker and Rochester is from 2021 and 2022.
Entries ND Carson and ND Spilde were only evaluated in 2023.

2023 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 variety-trials.umn.edu/soybean.

As ever, it is hard to generalize the weather for growing season across the whole state. For the most part, 2023 started with ample moisture in the spring followed by dry and hot weather for most of the summer. Ample precipitation arrived for most places too late in the fall during harvest. We were able to get all of our testing locations planted in between rainfall events in May. We achieved good stand establishment, and the moisture available in the soil from the spring rainfalls helped our fields get off to a good start, resulting in average to good yields at all locations. An exception was our Morris location which was lost due to poor stand establishment caused by excessively dry conditions at planting. Another item to note is that because of the lack of rainfall during much of the season, our Becker location was irrigated on a weekly basis. This amount of irrigation, particularly during seed fill, produced larger seeds, biasing the seed sized of many of our small-seeded specialty varieties.

Locations of 2023 soybean trials.

Tables 1-4 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 6 and May 26 at planting rates of 174,000 seeds per acre.

Herbicides were used as necessary for good weed control. Row spacings were 24 inches at Crookston, 6 inches at Roseau and 30 inches at all other locations. Plots were machine harvested using a small plot combine.

Tables 5-10 provide characteristics and performance data from special-purpose soybean entry tests. These tests were conducted to provide reliable data for growers who are interested in producing special-purpose soybeans, which are typically grown under contract.

Table 11 displays results from greenhouse tests conducted by the Nematology Laboratory at the University of Minnesota Southern Research and Outreach Center in Waseca, MN. All submitted entries were grown in soil inoculated with an HG type 7 (race 6) population of soybean cyst nematode in 2023. A subset of entries with non-88788 sources of resistance were tested using HG type 2 (race 1).

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

Seed Treatments/Transgenic Traits

Entrants were allowed to enter treated seed in 2023. The type of seed treatment, as provided by the originator, is designated as follows:

- AC = Acceleron
- AMS = Agrishield Max + Saltro
- CMV = Cruiser Maxx + Vibrance
- EVSV = Equity VIP, Saltro, Vayantis
- OPVRI = Obvius Plus, Poncho/Votivo, Relenya, ILEVO
- PS = Peterson Select

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

SOYBEAN: Continued on page 36

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)

Names and email addresses of seed company representatives that entered varieties into the 2023 trials.

Company	Rep Name	Contact Email
Albert Lea Seed/Viking Seed	Jake Hansen	jake@alseed.com
Anderson Seeds	Kelsey (Anderson) Henke	kelsey.anderson528@gmail.com
BASF/MS Technologies	Nick Weidenbenner	nick.weidenbenner@basf.com
Bayer Crop Science/Asgrow	Austin Carlson	Austin.carlson@bayer.com
Brushvale Seed, Inc.	Travis Meyer	travis@brushvaleseed.com
Dyna-Gro Seed	Tom Head	Tom.head@nutrien.com
GDM Seeds	Grant Schmieg	gschmieg@gdmseeds.com
LG Seeds	Tim Beninga	tim.beninga@lgseeds.com
Minnesota Ag Experiment Station (Minnesota AES)	Carl Anfinson	carl.anfinson@mncia.org
Peterson Farms Seed	Alex Amderson	alex@petersonfarmsseed.com
Proseed, Inc.	Karmen Hardy	karmen.hardy@proseed.net
Richland IFC, Inc.	Paul Meindl	paul@richlandifc.com

Location	Planting date	Seeding rate per acre	Harvest date	Latitude	Longitude	Soil type	Drainage	Previous crop
Becker	15-May	174,000	11-Oct	45.347142	-93.853407	Mosford sandy loam	Good to excellent	Corn
Crookston	19-May	221,000	13-Oct	47.818224	-96.613323	Hegne silty clay	Poor	Wheat
Glyndon	22-May	167,000	14-Oct	46.905200	-96.610010	Fargo silty clay	Good	Corn
Lamberton	24-May	174,000	18 & 21-Oct	44.239034	-95.307135	Normania loam	Good	Corn
Roseau	24-May	174,000	13-Oct	48.8475	-95.787222	Clay loam	Adequate	Soybean
Rosemount	6-May	174,000	3-Oct	44.706979	-93.101039	Waukegan silt loam	Good	Corn
Sleepy Eye	26-May	174,000	21-Oct	44.211213	-94.665582	Canisteo clay, Clarion Loam	Excellent	Corn
Shelly	21-May	174,000	14-Oct	47.426389	-96.831694	Beardon silt loam	Good	Corn
Thief River Falls	19-May	174,000	12-Oct	48.128273	-96.242684	NA	NA	Wheat
Waseca	22-May	174,000	5 & 11-Oct	44.077017	-93.536694	Nicollet clay loam	Adequate	Corn

SOYBEAN: Continued from page 35

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 2023 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 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 2023 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

SOYBEAN: Continued on page 38

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

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

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

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.

Table 1. Performance and characteristics of transgenic, conventional and special-purpose soybean entries evaluated in the far northern zone. Trials were conducted in Crookston, Thief River Falls, and Roseau.

Entry	Originator	Maturity Rating	Maturity Date	Yield % of Mean	% of Mean		Phyto. Gene	Chlorosis Score	Seed Treat.	Trans. Trait
				2023	Protein	Oil				
PXC00799	Proseed	00.7	9/11	91	111	90	S	2.3	CMV	CV
LGS0125XF	LG Seeds	0.1	9/12	101	97	105	Rps1c	2.0	AMS	XF
PXC00899	Proseed	00.8	9/12	81	104	99	Rps1c	2.3	CMV	CV
Hana	Peterson Farms Seed	00.9	9/13	78	108	94	S	2.3	PS	CV
LGS00719XF	LG Seeds	00.7	9/14	95	98	104	Rps1c	3.3	AMS	XF
XF 30-092N	Proseed	00.9	9/14	108	98	103	Rps1c	2.0	CMV	XF
LGS0139XF	LG Seeds	0.1	9/15	102	98	102	Rps1c	1.8	AMS	XF
XF 40-12N	Proseed	0.1	9/15	105	98	102	Rps1c	2.0	CMV	XF
XO 0213E	MS Technologies	0.2	9/18	96	98	102	Rps1a+Rps3a	2.0	OPVRI	E3
LGS00901E3	LG Seeds	00.9	9/19	115	98	101	Rps3a	2.3	AMS	E3
XO 0094E	MS Technologies	00.9	9/19	107	98	101	-	2.3	OPVRI	E3
XO 0234E	MS Technologies	0.2	9/20	108	99	100	Rps3a	2.0	OPVRI	E3
LGS0105E3	LG Seeds	0.1	9/22	117	98	101	Rps3a	1.8	AMS	E3
EL 40-093N	Proseed	00.9	9/22	100	101	96	Rps3a	2.0	CMV	E3
EL 40-13N	Proseed	0.1	9/26	95	96	100	Rps3a	2.0	CMV	E3
Mean			**9/17**	**44 bu/a**	**34.3%**	**18.9%**		**2.2**		
LSD 25%			**2.3d**	**7%**	**2%**	**2%**		**0.5**		

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.
–indicates "not specified".
Maturity date data collected from all locations.

Table 2. Performance and characteristics of transgenic, conventional and special-purpose soybean entries evaluated in the northern zone. Trials were conducted in Crookston, Shelly, and Glyndon.

Entry	Originator	Maturity Rating	Maturity Date	Yield % of Mean 2022	Yield % of Mean 2023	% of Mean Protein	% of Mean Oil	Phyto. Gene	Chlorosis Score	Seed Treat.	Trans. Trait
XO 0311E	MS Technologies	0.3	9/14	95	99	100	100	S	1.5	OPVRI	E3
S04K9	Syngenta	0.4	9/16		96	110	96	-	2.8	None	CV
M13-257047	Minnesota AES	0.5	9/16		94	103	103	Rps1a	2.5	None	CV
Viking I Blue River 0821N	Albert Lea Seed House	0.8	9/19		96	99	99	S	1.8	None	CV
LGS0444XF	LG Seeds	0.4	9/19		108	101	99	Rps1c	1.0	AMS	XF
LGS0323E3	LG Seeds	0.3	9/19		82	98	101	Rps3a	2.3	AMS	E3
LGS0550E3	LG Seeds	0.5	9/19	98	101	101	101	Rps3a	2.3	AMS	E3
LGS0405E3	LG Seeds	0.4	9/20		96	97	104	Rps1c	1.8	AMS	E3
M15-105140	Minnesota AES	0.5	9/20		97	100	99	Rps1c+Rps3a	1.3	None	CV
LGS0701XF	LG Seeds	0.7	9/21		113	100	98	Rps3a	2.5	AMS	XF
XO 0554E	MS Technologies	0.5	9/22		110	97	102	Rps1k+Rps3a	2.3	OPVRI	E3
M13-118036	Minnesota AES	0.8	9/22		111	99	98	S	2.0	None	CV
XO 0602E	MS Technologies	0.6	9/23	104	100	99	97	S	2.5	OPVRI	E3
XO 0993E	MS Technologies	0.9	9/24		92	95	104	Rps3a	2.8	OPVRI	E3
LGS0822E3	LG Seeds	0.8	9/25		102	101	99	Rps1c+Rps3a	1.8	AMS	E3
Mean			**9/20**	**58 bu/a**	**50 bu/a**	**33.5%**	**19.1%**		**2.1**		
LSD 25%			**1.1d**	**3%**	**6%**	**1%**	**1%**		**0.4**		

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 all locations.

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

Entry	Originator	Maturity Rating	UAS Mat. Date*	Yield % of Mean 2022	Yield % of Mean 2023	% of Mean Protein	% of Mean Oil	Phyto. Gene	Chloro-sis Score	Seed Treat.	Trans. Trait
M13-118036	Minnesota AES	0.8	9/07	96	99	100	98	S	2.0	None	CV
Viking 1223N	Albert Lea Seed House	1.2	9/08	92	108	96	102	S	3.3	None	CV
M13-250056	Minnesota AES	0.8	9/08	127	106	100	102	Rps1c	2.8	None	CV
VikingIBlue River 0821N	Albert Lea Seed House	0.8	9/09	113	97	99	100	S	1.8	None	CV
P11A50	Pioneer	1.1	9/11		94	104	101	-	2.5	None	CV
XO 0993E	MS Technologies	0.9	9/12	114	100	99	104	Rps3a	3.3	OPVRI	E3
AG11XF4	Asgrow	1.1	9/13		96	100	100	Rps1c	1.3	AC	XF
XO 1133E	MS Technologies	1.1	9/13		96	102	98	S	2.0	OPVRI	E3
M13-250046	Minnesota AES	1.6	9/13	115	99	103	99	Rps1c	1.5	None	CV
VikingIBlue River 1518N	Albert Lea Seed House	1.5	9/14	86	83	100	96	S	1.8	None	CV
AG09XF3	Asgrow	0.9	9/15	113	98	97	93	Rps1c	2.0	AC	XF
XO 1372E	MS Technologies	1.3	9/15	107	93	100	103	S	2.5	OPVRI	E3
NK14-W6E3	MS Technologies	1.4	9/15		102	100	102	-	3.0	-	-
XO 1761E	MS Technologies	1.7	9/15	115	101	101	99	Rps1k	2.5	OPVRI	E3
AG13XF4	Asgrow	1.3	9/16		94	98	104	Rps1c	2.3	AC	XF
CZ 1660 GTLL	MS Technologies	1.6	9/16	104	99	100	101	Rps1k	2.8	-	LLGT27
P17A87E	MS Technologies	1.7	9/16		110	101	98	-	2.0	-	-
XO 1632E	MS Technologies	1.6	9/16	124	107	98	102	Rps3a	3.0	OPVRI	E3
VikingIBlue River 1718N	Albert Lea Seed House	1.7	9/17	103	101	100	101	Rps1k	2.0	None	CV
XO 1404E	MS Technologies	1.4	9/17		105	104	97	Rps1c	2.0	OPVRI	E3
XO 1212E	MS Technologies	1.2	9/17	101	107	103	98	Rps1c	1.8	OPVRI	E3
Viking 2022N	Albert Lea Seed House	2.0	9/19		106	98	101	Rps1k	2.8	None	CV
Mean			**9/14**	**56 bu/a**	**70 bu/a**	**34.3%**	**19.8%**		**2.3**		
LSD 25%			**1.7d**	**6%**	**6%**	**2%**	**3%**		**0.4**		

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 all locations.

SOYBEAN: Continued from page 36

ratings in tables are from tests conducted on high lime (high pH) soils in Crookston, Minn., in 2023.

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 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.

Protein and Oil

Protein and oil values were determined from mature seed using near infrared reflectance spectroscopy. The tabled values are for the 2023 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:

100-desired moisture/87 x 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) + Pm/.44 (Y)]

Where:

• APV = Approximate value of a bushel of soybeans

• Po = soybean oil price (in $ per pound)

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

• X = oil content at 13 percent moisture (in decimals)

• Y = protein content at 13 percent moisture (in decimals)

And:

• price of meal $/ton = $/pound 2000

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 soilborne disease that occurs in heavy wet soils. Infection generally oc-

SOYBEAN: Continued on page 39

Table 4. Performance and characteristics of transgenic, conventional and special-purpose soybean entries evaluated in the southern zone. Trials were conducted in Lamberton, Waseca, and Sleepy Eye.

Entry	Originator	Mat. Rating	Mat. Date	Yield % of Mean		% of Mean		Phyto. Gene	Chlorosis Score	Seed Treat.	Trans. Trait
				2022	2023	Protein	Oil				
M13-250046	Minnesota AES	1.6	9/16	91	82	101	100	Rps1c	2.0	None	CV
NK14-W6E3	MS Technologies	1.4	9/17		101	100	102	-	2.8	-	-
S16EN42	Dyna-Gro Seed	1.6	9/20		112	101	99	Rps3a	2.5	EVSV	E3
XO 1632E	MS Technologies	1.6	9/21	104	100	100	100	Rps3a	2.8	OPVRI	E3
A151E3	Anderson Seeds	1.5	9/21	99	105	100	101	Rps3a	2.8	None	E3
MN1807CN	Minnesota AES	1.8	9/21	93	85	102	102	Rps1c	2.5	None	CV
XO 1404E	MS Technologies	1.4	9/22		104	104	98	Rps1c	2.0	OPVRI	E3
A172E3	Anderson Seeds	1.7	9/22	100	99	101	100	Rps1k	2.8	None	E3
P17A87E	MS Technologies	1.7	9/22		100	102	98	-	2.8	-	-
V1621	GDM Seeds	1.6	9/23		103	100	96	Rps1k	2.0	CMV	CV
NK18-J7E3	MS Technologies	1.8	9/23		98	99	101	-	2.3	-	-
XO 1822E	MS Technologies	1.8	9/23	107	105	101	99	Rps3a	3.0	OPVRI	E3
S21EN81	Dyna-Gro Seed	2.1	9/23		104	99	100	Rps1k	2.5	EVSV	E3
V1821	GDM Seeds	1.8	9/23		100	98	97	Rps1c	2.0	CMV	CV
XO 2181E	MS Technologies	2.1	9/23	103	100	101	99	Rps1k	3.3	OPVRI	E3
VikingIBlue River 1718N	Albert Lea Seed House	1.7	9/23	102	102	98	101	Rps1k	2.3	None	CV
XO 1971E	MS Technologies	1.9	9/23	102	100	100	99	S	3.0	OPVRI	E3
P21A53E	MS Technologies	2.1	9/23		100	97	103	-	3.5	-	-
Viking 2022N	Albert Lea Seed House	2.0	9/23	111	101	98	102	Rps1k	3.0	None	CV
V2122	GDM Seeds	2.1	9/24	108	99	103	102	S	2.0	CMV	CV
A182E3	Anderson Seeds	1.8	9/24	105	97	98	102	Rps1k	2.5	None	E3
A203E3	Anderson Seeds	2.0	9/24		103	101	103	Rps1a+Rps3a	2.8	None	E3
AG19XF3	Asgrow	1.9	9/24	104	104	99	102	Rps1c	2.3	AC	XF
A1923XF	Anderson Seeds	1.9	9/25		112	98	101	S	3.3	None	XF
M13-262053	Minnesota AES	1.9	9/25		99	98	101	Rps1a	2.0	None	CV
S20EN84	Dyna-Gro Seed	2.0	9/25		101	96	105	Rps1k	1.8	EVSV	E3
VikingIBlue River 2418N	Albert Lea Seed House	2.4	9/26	106	99	101	100	Rps1c	1.8	None	CV
AG20XF4	Asgrow	2.0	9/27		101	99	94	Rps1c	2.8	AC	XF
AG21XF2	Asgrow	2.1	9/27		100	103	96	Rps3a	2.8	AC	XF
XO 2282E	MS Technologies	2.2	9/27	102	94	99	101	S	2.8	OPVRI	E3
AG22XF3	Asgrow	2.2	9/27	103	99	102	99	Rps1c	3.3	AC	XF
Viking 2340KN	Albert Lea Seed House	2.3	9/27	105	96	98	99	Rps1k	2.3	None	CV
XO 2323E	MS Technologies	2.3	9/28	106	101	101	100	Rps1c	2.5	OPVRI	E3
XO 2444E	MS Technologies	2.4	9/28		97	101	100	Rps1a	2.5	OPVRI	E3
VikingIBlue River 2155N	Albert Lea Seed House	2.1	9/28	95	99	98	96	S	2.3	None	CV
Mean			**9/24**	**82 bu/a**	**78 bu/a**	**34.3%**	**19.8%**		**2.6**		
LSD 25%			**1.0d**	**3%**	**3%**	**2%**	**2%**		**0.5**		

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.
–indicates "not specified"
Maturity date data collected from all locations.

SOYBEAN: Continued from page 38

curs 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 11, 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

SOYBEAN: Continued on page 40

Table 6. Performance and characteristics of special-purpose soybean entries evaluated in the northern zone. Trials were conducted in Crookston, Shelly and Glyndon.

Entry	Originator	Mat Date	% of Mean			Chlorosis
			Yield	Protein	Oil	Score
PXC00999	Proseed	9/08	102	101	101	2.8
Hana	Peterson Farms Seed	9/11	104	107	97	3.0
M15-220021	Minnesota AES	9/14	104	101	106	1.5
MK0249	Richland IFC	9/15	90	95	104	1.8
MK009	Richland IFC	9/15	88	98	98	2.3
M15-236022	Minnesota AES	9/17	97	102	100	1.5
BS01739	Brushvale Seed, Inc.	9/18	100	104	97	2.0
M13-171089	Minnesota AES	9/18	92	99	101	2.0
M13-172108	Minnesota AES	9/19	103	100	100	2.0
SB0512	SINNER BROS	9/19	94	99	96	1.8
PXC05992	Proseed	9/20	109	104	98	1.8
MK0603	Richland IFC	9/21	96	98	97	2.0
MK808CN	Richland IFC	9/22	105	95	107	2.3
PXC0899	Proseed	9/23	114	99	98	2.0
Mean		**9/17**	**44 bu/a**	**34.1%**	**18.5%**	**2.1**
LSD 25%		**1.7d**	**4%**	**1%**	**2%**	**0.4**

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 all locations.

Table 5. Characteristics of special-purpose soybean entries evaluated in the northern zone. Trials were conducted in Crookston, Shelly and Glyndon.

Entry	Originator	Mat Rating	Mat Date	Special Characteristics	Hilum Color	Phyto. Gene	Seeds/lb	Trans. Trait
PXC00999	Proseed	00.9	9/08	Protein	Yellow	S	2,612	CV
Hana	Peterson Farms Seed	00.9	9/11	Protein	Yellow	S	2,722	CV
M15-220021	Minnesota AES	0.3	9/14	Soymilk	Yellow	S	3,636	CV
MK0249	Richland IFC	0.2	9/15	Natto	Yellow	S	4,413	CV
MK009	Richland IFC	00.9	9/15	Natto	Yellow	S	5,543	CV
M15-236022	Minnesota AES	0.3	9/17	Natto	Yellow	Rps1a	4,686	CV
BS01739	Brushvale Seed, Inc.	0.5	9/18	Soymilk	Yellow	S	3,157	CV
M13-171089	Minnesota AES	0.3	9/18	Natto	Yellow	Rps1a	5,754	CV
M13-172108	Minnesota AES	0.5	9/19	Natto	Yellow	S	4,888	CV
SB0512	SINNER BROS	0.5	9/19	Natto	Yellow	-	4,888	CV
PXC05992	Proseed	0.5	9/20	Protein	Yellow	Rps3a	2,250	CV
MK0603	Richland IFC	0.6	9/21	Sprouts	Yellow	S	5,051	CV
MK808CN	Richland IFC	0.8	9/22	Natto	Yellow	Rps1c	3,157	CV
PXC0899	Proseed	0.8	9/23	Protein	Yellow	Rps1c+Rps3a	2,568	CV

Table 8. Performance and characteristics of special-purpose soybean entries evaluated in the central zone. Trial wasconducted in Becker and Rosemount.

Entry	Originator	Mat Date	% of Mean			Chlorosis
			Yield	Protein	Oil	Score
MK41	Richland IFC	9/03	102	103	98	2.3
MK1016	RICHLAND	9/06	82	99	100	2.0
MK0603	Richland IFC	9/08	74	95	94	2.0
MK1023	Richland IFC	9/08	81	94	101	2.0
MK808CN	Richland IFC	9/08	116	96	106	2.3
M15-236026	Minnesota AES	9/09	92	99	103	2.0
MN-Decker	Richland IFC	9/09	89	103	94	1.0
M15-221092	Minnesota AES	9/09	115	101	99	1.3
MN-Sable	Richland IFC	9/10	79	101	98	1.3
BS91614	Brushvale Seed, Inc.	9/11	124	101	107	2.0
BS91615	Brushvale Seed, Inc.	9/11	119	99	102	2.5
M13-172108	Minnesota AES	9/11	96	96	104	1.8
MK1423	Richland IFC	9/11	103	91	103	2.8
M14-250018	Minnesota AES	9/11	110	104	101	2.0
MK9103	Richland IFC	9/12	101	105	96	2.0
M13-170064	Minnesota AES	9/12	86	101	99	2.3
MK9102	Richland IFC	9/13	101	101	100	1.3
Skyline	Sevita International	9/13	109	103	102	3.5
MK146	Richland IFC	9/13	112	102	101	2.3
VikingIBlue River 1700N	Albert Lea Seed House	9/17	115	101	99	3.0
MK373	Richland IFC	9/18	94	102	95	1.0
MK9101	Richland IFC	9/19	101	102	97	2.0
Mean		**9/17**	**44 bu/a**	**34.1%**	**18.5%**	**2.1**
LSD 25%		**1.7d**	**4%**	**1%**	**2%**	**0.4**

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 both locations.

SOYBEAN:
Continued from page 39

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 significantly among locations and years depending on the interaction of plant development, precipitation, relative humidity, and temperature. White mold severity also tends to

SOYBEAN:
Continued on page 41

Table 7. Characteristics of special-purpose soybean entries evaluated in the central zone. Trials were conducted in Becker and Rosemount.

Entry	Originator	Mat Rating	Mat Date	Special Characteristics	Hilum Color	Phyto. Gene	Seeds/lb	Trans. Trait
MK41	Richland IFC	1.2	9/03	Tofu	Yellow	S	2,470	CV
MK1016	Richland IFC	1.0	9/06	Natto	Yellow	-	4,941	CV
MK0603	Richland IFC	0.6	9/08	Sprouts	Yellow	S	4,456	CV
MK1023	Richland IFC	1.0	9/08	Natto	Yellow	S	4,413	CV
MK808CN	Richland IFC	0.8	9/08	Natto	Yellow	Rps1c	2,674	CV
M15-236026	Minnesota AES	0.8	9/09	Natto	Yellow	Rps1a	3,666	CV
MN-Decker	Richland IFC	1.0	9/09	Black	Black	S	2,755	CV
M15-221092	Minnesota AES	1.2	9/09	Soymilk	Yellow	S	2,772	CV
MN-Sable	Richland IFC	1.2	9/10	Black	Black	S	2,539	CV
BS91614	Brushvale Seed, Inc.	1.0	9/11	Tofu	Yellow	S	2,627	CV
BS91615	Brushvale Seed, Inc.	1.2	9/11	Tofu	Yellow	S	2,554	CV
M13-172108	Minnesota AES	0.5	9/11	Natto	Yellow	S	4,209	CV
MK1423	Richland IFC	1.4	9/11	Natto	Yellow	S	4,288	CV
M14-250018	Minnesota AES	1.5	9/11	Soymilk\Tofu	Yellow	S	2,066	CV
MK9103	Richland IFC	1.3	9/12	Black	Black	S	1,976	CV
M13-170064	Minnesota AES	1.0	9/12	Natto	Yellow	S	4,500	CV
MK9102	Richland IFC	1.2	9/13	Black	Black	S	1,976	CV
Skyline	Sevita International	1.1	9/13	Tofu	Yellow	Rps1a+Rps3a	2,431	CV
MK146	Richland IFC	1.2	9/13	Tofu	Yellow	S	2,405	CV
VikingIBlue River 1700N	Albert Lea Seed House	1.7	9/17	Protein	Yellow	S	2,738	CV
MK373	Richland IFC	2.0	9/18	Tofu	Yellow	S	2,296	CV
MK9101	Richland IFC	1.1	9/19	Black	Black	S	2,095	CV

SOYBEAN: Continued from page 40

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 manufacturers, 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, David Bundy, Gary Reid, Tom Hoverstad, Travis Vollmer, 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 2023 were Gabriel Carlson (Thief River Falls), David Swanson (Moorhead), David and Craig Swenson (Shelly), and Rob Goblirsch (Sleepy Eye). ✻

Table 10. Performance and characteristics of special-purpose soybean entries evaluated in the southern zone. Trials were conducted in Lamberton, Waseca, and Sleepy Eye.

			% of Mean			Chlorosis
Entry	Originator	Mat Date	Yield	Protein	Oil	Score
MK41	Richland IFC	9/10	98	103	98	2.5
M15-221092	Minnesota AES	9/14	97	101	101	1.0
Skyline	Sevita International	9/16	93	102	103	3.8
MK1423	Richland IFC	9/17	89	91	103	3.0
MK146	Richland IFC	9/18	101	103	100	2.5
M14-250018	Minnesota AES	9/19	97	103	101	1.5
Candor	Sevita International	9/20	106	102	98	3.3
M13-266011	Minnesota AES	9/20	106	101	100	1.8
M14-122035	Minnesota AES	9/22	106	97	105	1.3
M13-172117	Minnesota AES	9/22	91	96	98	2.0
Viking|Blue River IAS19C3	Albert Lea Seed House	9/25	114	97	101	1.2
MK373	Richland IFC	9/25	98	101	95	1.8
Viking e24Y002	Albert Lea Seed House	9/27	104	101	96	1.0
Mean		**9/20**	**70 bu/a**	**35.6%**	**19.2%**	**2.1**
LSD 25%		**1.1d**	**3%**	**1%**	**1%**	**0.4**

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 all locations.

Table 9. Characteristics of special-purpose soybean entries evaluated in the southern zone. Trials were conducted in Lamberton, Waseca and Sleepy Eye.

Entry	Originator	Mat Rating	Mat Date	Special Characteristics	Hilum Color	Phyto. Gene	Seeds/lb	Trans. Trait
MK41	Richland IFC	1.2	9/10	Tofu	Yellow	S	2,239	CV
M15-221092	Minnesota AES	1.2	9/14	Soymilk	Yellow	S	2,877	CV
Skyline	Sevita International	1.1	9/16	Tofu	Yellow	Rps1a+3a	2,307	CV
MK1423	Richland IFC	1.4	9/17	Natto	Yellow	S	4,836	CV
MK146	Richland IFC	1.2	9/18	Tofu	Yellow	S	2,431	CV
M14-250018	Minnesota AES	1.4	9/19	Soymilk\Tofu	Yellow	S	2,144	CV
Candor	Sevita International	1.9	9/20	Tofu	Yellow	Rps3a	1,863	CV
M13-266011	Minnesota AES	1.6	9/20	Soymilk	Yellow	S	2,250	CV
M14-122035	Minnesota AES	1.9	9/22	Soymilk	Yellow	S	2,612	CV
M13-172117	Minnesota AES	1.8	9/22	Natto	Yellow	Rps1a	4,413	CV
Viking|Blue River IAS19C3	Albert Lea Seed House	2.1	9/25	Protein	Yellow	S	2,738	CV
MK373	Richland IFC	2.0	9/25	Tofu	Yellow	S	1,976	CV
Viking e24Y002	Albert Lea Seed House	2.4	9/27	Protein	Yellow	Rps1k	2,554	CV

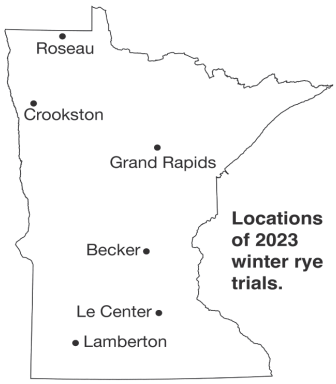
Table 11. Results of soybean cyst nematode greenhouse bioassay performed on soybean entries grown in 2023.

			Greenhouse Test HG Type 7 (Race 6)		Greenhouse Test HG Type 2 (Race 1)	
Entry	Originator	SCN Resistance Source[1]	FI	SCN Rating[2]	FI	SCN Rating[2]
Viking 1223N	Albert Lea Seed House	PI 88788	9.3	R		
Viking 2022N	Albert Lea Seed House	PI 88788	8.5	R		
Viking 2340KN	Albert Lea Seed House	Peking	3.9	R	2.0	R
VikingIBlue River 0821N	Albert Lea Seed House	PI 88788	8.7	MR		
VikingIBlue River 1518N	Albert Lea Seed House	PI 88788	91.9	S		
VikingIBlue River 1718N	Albert Lea Seed House	PI 88788	21.5	MR		
VikingIBlue River 2155N	Albert Lea Seed House	PI 88788	86.8	S		
VikingIBlue River 2418N	Albert Lea Seed House	PI 88788	13.9	MR		
A151E3	Anderson Seeds	PI 88788	11.1	MR		
A172E3	Anderson Seeds	Peking	2.2	R	1.2	R
A182E3	Anderson Seeds	PI 88788	10.1	MR		
A1923XF	Anderson Seeds	PI 88788	9.2	R		
A203E3	Anderson Seeds	PI 88788	20.0	MR		
AG09XF3	Asgrow	PI 88788	0.0	R		
AG11XF4	Asgrow	PI 88788	0.0	R		
AG13XF4	Asgrow	PI 88788	0.3	R		
AG19XF3	Asgrow	PI 88788	0.1	R		
AG20XF4	Asgrow	PI 88788	0.0	R		
AG21XF2	Asgrow	PI 88788	0.0	R		
AG22XF3	Asgrow	PI 88788	0.0	R		
S16EN42	Dyna-Gro Seed	PI 88788	11.7	MR		
S20EN84	Dyna-Gro Seed	Peking	22.8	MR		
S21EN81	Dyna-Gro Seed	PI 88788	13.0	MR		
V1621	GDM Seeds	PI 88788	13.3	MR		
V1821	GDM Seeds	PI 88788	8.4	R		
V2122	GDM Seeds	None	77.8	S		
LGS00719XF	LG Seeds	None	74.0	S		
LGS00901E3	LG Seeds	PI 88788	19.4	MR		
LGS0105E3	LG Seeds	PI 88788	11.6	MR		
LGS0125XF	LG Seeds	PI 88788	13.0	MR		
LGS0139XF	LG Seeds	PI 88788	14.4	MR		
LGS0323E3	LG Seeds	PI 88788	13.0	MR		
LGS0405E3	LG Seeds	Peking	90.7	S	21.9	MR
LGS0444XF	LG Seeds	PI 88788	21.3	MR		
LGS0550E3	LG Seeds	PI 88788	17.4	MR		
LGS0701XF	LG Seeds	PI 88788	21.2	MR		
LGS0822E3	LG Seeds	PI 88788	14.3	MR		
XO 0094E	MS Technologies	-	0.9	R		
XO 0213E	MS Technologies	None	0.5	R		
XO 0234E	MS Technologies	PI 88788	0.2	R		
XO 0311E	MS Technologies	PI 88788	0.0	R		
XO 0554E	MS Technologies	PI 88788	0.0	R		
XO 0602E	MS Technologies	PI 88788	0.0	R		
XO 0993E	MS Technologies	Peking	0.0	R	0.1	R
XO 1133E	MS Technologies	PI 88788	0.2	R		
XO 1212E	MS Technologies	PI 88788	0.2	R		
XO 1372E	MS Technologies	PI 88788	0.0	R		
XO 1404E	MS Technologies	PI 88788	0.0	R		
XO 1632E	MS Technologies	PI 88788	0.1	R		
XO 1761E	MS Technologies	PI 88788	0.1	R		
XO 1822E	MS Technologies	PI 88788	0.0	R		
XO 1971E	MS Technologies	PI 88788	0.0	R		
XO 2181E	MS Technologies	PI 88788	0.1	R		
XO 2282E	MS Technologies	PI 88788	0.0	R		
XO 2323E	MS Technologies	PI 88788	0.0	R		
XO 2444E	MS Technologies	PI 88788	0.1	R		
Hana	Peterson Farms Seed	None	83.3	S		
EL 40-093N	Proseed	PI 88788	19.2	MR		
EL 40-13N	Proseed	Peking	13.6	MR	1.4	R
PXC00799	Proseed	None	129.7	S		
PXC00899	Proseed	PI 88788	57.2	MS		
XF 30-092N	Proseed	PI 88788	14.9	MR		
XF 40-12N	Proseed	None	14.9	MR		

[1] Resistance source provided by originator. - indicates 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.

2023 Winter Rye field crop trial results

Winter rye (*Secale cereale* L.), also known as cereal rye, is the most winter hardy and drought tolerant of all small grains. Winter rye performs best in sandy loam, well-drained soils compared to fine textured soils with poor internal drainage. Soil pH for optimum growth ranges from 5.6 to 7.0 but rye can tolerated pH as low as 4.5 and as high as 8. Expect winter rye to be more productive than other small grains on infertile, sandy soils. Winter rye will continue to grow until late fall, overwinter, and resume growth quickly in the early spring. The aforementioned attributes explains the popularity of winter rye as a cover crop/green manure in both organic and conventional production systems. Other primary uses of winter rye are pasture/forage and grain crop.



Results of the University of Minnesota's variety performance evaluations are summarized in Tables 1 and 2. The rye performance trials were grown near Lamberton, LeCenter, Becker, Grand Rapids, Crookston and Roseau in 2023. The primary use, agronomic characteristics, and grain quality are summarized in Table 1. Winter hardiness,

WINTER RYE: Continued on page 44

Table 1. Origin and agronomic characteristics of winter rye varieties in Minnesota in single-year (2023) and mutiple-year comparisons (2021-2023).

Entry	Agent or Breeder[1]	Year of Release	Type[2]	Legal Status[3]	Primary Use	Seed Color	Winter Hardiness	Days to Heading	Plant Height	Straw Strength	Ergot	Test Weight	Grain Protein
							----------(1-9)[4]----------						
Danko	Danko Hodowla Roślin	1976	OPV	None	Grain	Blue/Grey	7	6	4	1	3	2	7
Elbon	OK	1956	OPV	None	Forage	Green	6	1	7	3	9	9	1
Hazlet	SeCan	2006	OPV	None	Grain	Blue/Grey	5	8	7	4	1	4	6
KWS Receptor	KWS	2019	Hybrid	N/A	Grain	Green	1	9	2	1	-	3	9
KWS Serafino	KWS	2017	Hybrid	N/A	Grain	Green	6	8	3	1	1	1	9
KWS Tayo	KWS	2018	Hybrid	N/A	Grain	Green	1	8	2	1	1	9	9
ND Dylan	NDSU	2016	OPV	PVP(94)	Dual Purpose	Blue/Green	5	7	9	9	2	9	6
ND Gardner	NDSU	2019	OPV	PVP(94)	Dual Purpose	Blue/Green	6	1	8	5	3	9	3
Remington	SeCan	2000	OPV	None	Grain	Blue/Grey	4	4	7	5	2	9	4
Rymin	MN	1973	OPV	None	Grain	Blue/Grey	1	5	5	6	4	9	5
SU Bebop[5]	FP Genetics	2021	OPV	PVP(94)	Grain	Green	-	8	4	1	-	5	8
SU Cossani[5]	FP Genetics	2020	Hybrid	N/A	Grain	Blue/Grey	-	6	2	1	-	5	9
SU Performer[5]	FP Genetics	2013	Hybrid	N/A	Grain	Green/Grey	-	6	2	1	-	2	9
LSD (0.1)							**3**	**1**	**2**	**2**	**1**	**1**	**1**

[1]OK = Oklohoma State University; NDSU = North Dakota State University; UM = University of Minnesota
[2]OPV= Open Pollinated Variety.
[3]Status under the Plant Variety Protection Act.
[4]1 = best and 9 = worst.
[5]Agronomic ratings are a statistical prediction based on single year data.

WINTER RYE: Continued from page 43

days to heading, plant height, straw strength, test weight, and grain protein have been converted to a 1-9 scale to allow for more straightforward interpretation of the data. Differences in days to heading, plant height and straw strength are generally much less in the northern half of the state. In the southern half of Minnesota, the differences between varieties for these characteristics are greater as the period of vegetative growth is generally longer in the south, especially with early and mild springs. Therefore, the averages of the actual data can be misleading. The differences in winter hardiness are very small and all winter rye varieties tested are more winter hardy then the most winter hardy winter wheat varieties. Likewise, the difference between the lowest and highest reported test weight is less than 2 pounds per bushel. Varieties with lodging scores greater than 6 should be chosen with caution as lodging can reduce harvestability, yield, and quality. This is especially important if soils are highly fertile.

For comparison, the 3-year average of relative grain yield of tested varieties is presented in Table 2. The average yield across the six testing locations included in the average was 91.9 bushels per acre in 2023. This compares to a three-year average of 92.5 bushels per acre. Danko and Hazlet are the most productive and best adapted of the open pollinated varieties. Hybrid winter rye varieties that are commercially available yield 30-40 percent more compared to the best performing open pollinated varieties.

Varieties differ in their susceptibility to several economically important fungal pathogens, including powdery mildew, leaf rust, leaf spotting diseases, Fusarium head blight, and ergot. Not enough observations have been made to-date to reliably differentiate winter rye varieties based on their susceptibility to these diseases. A preliminary rating to susceptibility to ergot is included due to the economic importance of this disease. Note that no variety tested is immune to ergot. Application of a fungicide should be considered if powdery mildew is present before jointing. Likewise, control of leaf rust may be warranted if the disease is found near the top of the canopy just as the flag leaf is emerging.

Project Leader
Jochum Wiersma

Test Plot Managers
Dave Grafstrom, Fernando de Paula Alberto, Alaina Mousel, Donn Vellekson, and Travis Vollmer ✻

Table 2. Relative grain yield of winter rye varieties in five Minnesota locations in single-year (2023) and multiple-year comparisons (2021-2023).

	Lamberton		Le Center		Becker *(irrigated)*		Grand Rapids	Crookston		Roseau		State	
Entry	2023	3 Yr	2023	3 Yr	2023	3 Yr	2023	2023	3 Yr	2023	3 Yr	2023	3 Yr
Danko	94	91	82	84	100	93	93	91	83	100	87	93	88
Elbon	76	68	68	63	70	59	87	69	62	75	58	72	62
Hazlet	73	84	54	74	77	80	68	78	86	86	86	75	81
KWS Receptor	132	126	117	113	107	107	75	120	118	93	112	116	115
KWS Serafino	123	118	124	113	127	119	132	124	122	105	115	123	118
KWS Tayo	122	117	127	119	115	119	132	115	107	109	117	119	117
ND Dylan	87	77	90	80	89	77	89	102	100	85	87	92	83
ND Gardner	82	76	80	74	73	70	97	75	73	89	77	80	74
Remington	84	78	88	77	84	72	96	83	84	96	88	86	78
Rymin	91	79	88	77	83	74	85	91	81	94	83	89	78
SU Bebop	102	-	101	-	116	-	111	103	-	132	-	106	-
SU Cossani	102	-	115	-	129	-	121	115	-	116	-	115	-
SU Performer	107	-	145	-	114	-	99	115	-	116	-	116	-
Mean (bu/acre)	**99.6**	**94.4**	**99.2**	**106.7**	**84.5**	**89.2**	**74.3**	**83.8**	**81.0**	**100.0**	**107.0**	**91.9**	**92.5**
LSD (0.1)	**9**	**7**	**11**	**6**	**15**	**8**	**27**	**10**	**9**	**24**	**10**	**6**	**4**

2023 Hard Red Spring Wheat field crop trial results

Spring wheat varieties were sown in trial plots at Becker, Crookston, Lamberton, Roseau, St. Paul, and Waseca and on-farm sites near Benson, Fergus Falls, Hallock, Le Center, Oklee, Perley, Stephen, and Strathcona. The Roseau site was abandoned due to hail. 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 per acre, assum-

HARD RED SPRING WHEAT: Continued on page 47

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 (2023) 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	50.9	26.6	5
AP Murdock	2020 AgriPro/Syngenta	PVP (94)	1.3	52.2	25.2	5
AP Smith	2021 AgriPro/Syngenta	PVP (94)	1.3	54.3	25.2	2
Ascend-SD	2021 SDSU	PVP (94) pending	1.3	52.8	28.2	5
Brawn-SD	2022 SDSU	PVP (94) (pending)	1.3	51.2	27.1	5
CAG Justify	2021 Champions Alliance Group	PVP (94)	1.2	53.2	27.0	5
CAG Reckless	2021 Champions Alliance Group	PVP (94)	1.3	52.1	28.8	5
CAG Recoil	2022 Champions Alliance Group	PVP (94) pending	1.5	55.9	26.8	3
CP3099A	2020 CROPLAN	PVP (94) pending	1.3	56.4	29.5	4
CP3188	2022 CROPLAN	PVP (94) pending	1.3	52.4	27.4	6
CP3322	2023 CROPLAN	PVP (94) pending	1.3	55.6	26.3	3–4
CP3530	2015 CROPLAN	Patented	1.3	53.1	28.7	6
CP3915	2019 CROPLAN	PVP (94) pending	1.3	52.4	27.4	4
Driver	2020 SDSU	PVP (94)	1.3	51.7	28.6	4
Dyna-Gro Ambush	2016 Dyna-Gro	PVP (94)	1.5	49.8	27.2	5
Dyna-Gro Ballistic	2018 Dyna-Gro	PVP (94)	1.5	52.6	28.4	5
Dyna-Gro Commander	2019 Dyna-Gro	PVP (94)	1.5	50.1	27.4	4
LCS Ascent	2022 Limagrain Cereal Seeds	PVP (94)	1.3	49.6	27.3	5
LCS Boom	2023 Limagrain Cereal Seeds	PVP (94) pending	1.3	48.9	25.5	4
LCS Buster	2020 Limagrain Cereal Seeds	PVP (94)	1.3	55.3	28.3	5
LCS Cannon	2018 Limagrain Cereal Seeds	PVP (94)	1.3	48.4	25.6	4
LCS Dual	2021 Limagrain Cereal Seeds	PVP (94)	1.3	50.3	28.2	3
LCS Trigger	2016 Limagrain Cereal Seeds	PVP (94)	1.3	56.0	28.2	5
Linkert	2013 MN	PVP (94)	1.3	50.6	25.5	2
MN-Rothsay	2022 MN	PVP (94) pending	1.3	53.7	24.9	3
MN-Torgy	2020 MN	PVP (94)	1.3	53.0	26.7	4
MN-Washburn	2019 MN	PVP (94)	1.3	53.6	26.1	3
MS Charger	2023 Meridian Seeds	PVP (94) pending	1.2	50.4	26.1	5
MS Cobra	2022 Meridian Seeds	PVP (94)	1.4	50.4	26.6	4
MS Ranchero	2020 Meridian Seeds	PVP (94)	1.3	55.4	28.7	6
ND Frohberg	2020 NDSU	PVP (94)	1.3	51.9	28.9	5
ND Heron	2021 NDSU	PVP (94)	1.3	49.2	27.0	5
PFS Buns	2021 Peterson Farm Seeds	PVP (94) pending	1.3	57.6	25.4	4
Shelly	2016 MN	PVP (94)	1.3	54.4	25.5	5
SY 611 CL2[5]	2019 AgriPro/Syngenta	PVP (94)	1.3	51.0	26.1	4
SY Longmire[6]	2019 AgriPro/Syngenta	PVP (94)	1.3	52.8	26.4	4
SY Valda	2015 AgriPro/Syngenta	PVP (94)	1.3	52.1	26.7	5
TCG-Heartland	2019 21st Century Genetics	PVP (94), Patent pending	1.6	49.3	24.6	3
TCG-Spitfire	2016 21st Century Genetics	PVP (94)	1.5	54.0	26.6	3
TCG-Teddy	2022 21st Century Genetics	Patented	1.6	52.3	24.0	3–4
TCG-Wildcat	2020 21st Century Genetics	PVP (94), Patent pending	1.5	51.6	27.2	3
WB9479	2017 WestBred	Patented, PVP (94)	1.3	50.2	24.3	3
WB9590	2017 WestBred	Patented, PVP (94)	1.3	50.6	23.7	3
Mean				**52.3**	**26.6**	

[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 10% stand loss and adjusting for the germination percentage and seed weight of each variety.

[3]2023 data from Crookston, St. Paul, and Waseca.

[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.

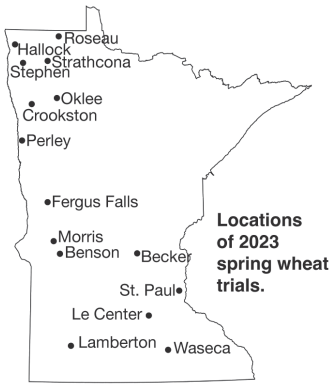
[5]AP Gunsmoke CL2 and SY 611 CL2 have tolerance to Beyond® herbicide.

[6]SY Longmire has solid stems.

HARD RED SPRING WHEAT:

Continued from page 45

ing 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 three 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 six seasons. The majority of varieties are resistant or mod-

HARD RED SPRING WHEAT: Continued on page 48

Table 2. Grain quality of hard red spring wheat varieties in Minnesota in single-year (2023) and multiple-year comparisons.

	Test Weight (lb/Bu)		Protein (%)[1]		Baking	Pre-Harvest
Entry	2023	2 Yr	2023	2 Yr	Quality[2]	Sprouting[3]
AP Gunsmoke CL2	61.0	59.9	14.7	15.2	5	2
AP Murdock	60.0	59.7	14.1	14.2	5	1
AP Smith	61.2	60.0	14.5	15.0	3	3
Ascend-SD	61.5	60.3	14.0	14.6	5	4
Brawn-SD	62.4	61.4	12.9	13.5	–	1
CAG Justify	58.8	58.5	13.0	13.4	7	3
CAG Reckless	61.7	60.8	14.1	14.6	3	4
CAG Recoil	59.8	59.5	13.9	14.2	–	1
CP3099A	59.2	58.1	11.7	12.4	6	1
CP3188	59.6	58.4	12.6	13.2	6	1
CP3322	59.7	–	12.9	–	–	2
CP3530	60.9	60.2	14.2	14.7	3	1
CP3915	61.4	60.2	14.2	14.7	4	1
Driver	61.7	61.1	14.0	14.4	6	2
Dyna-Gro Ambush	62.0	60.3	14.4	14.4	2	3
Dyna-Gro Ballistic	60.4	60.3	13.2	14.1	5	3
Dyna-Gro Commander	61.4	60.2	14.2	14.7	6	1
LCS Ascent	61.6	60.7	13.7	14.2	–	3
LCS Boom	62.7	–	14.2	–	–	3
LCS Buster	59.3	58.0	11.9	12.2	7	5
LCS Cannon	62.7	61.7	14.2	14.5	4	3
LCS Dual	61.4	60.3	13.6	14.1	–	2
LCS Trigger	60.9	60.2	12.2	12.6	7	1
Linkert	61.8	60.9	15.2	15.4	1	1
MN-Rothsay	61.5	60.5	14.0	14.4	5	2
MN-Torgy	61.7	60.6	14.4	14.7	4	1
MN-Washburn	61.3	60.1	13.9	14.3	3	1
MS Charger	61.0	60.0	12.8	13.2	–	1
MS Cobra	61.7	60.3	14.2	14.6	3	4
MS Ranchero	59.3	58.1	13.5	14.2	6	4
ND Frohberg	61.3	60.6	14.1	14.6	3	4
ND Heron	62.3	61.4	14.8	15.1	–	2
PFS Buns	58.7	–	13.0	–	–	4
Shelly	61.3	60.1	13.4	14.0	5	1
SY 611 CL2	61.8	60.4	14.3	14.7	6	2
SY Longmire	61.1	59.6	14.2	15.0	3	3
SY Valda	61.2	60.1	13.8	14.2	6	2
TCG-Heartland	61.6	60.4	15.2	15.4	2	1
TCG-Spitfire	60.4	59.3	13.9	14.1	3	4
TCG-Teddy	60.8	–	14.1	–	–	1
TCG-Wildcat	61.6	60.8	14.4	14.8	4	1
WB9479	61.5	60.1	15.3	15.7	1	1
WB9590	61.2	60.0	14.9	15.3	4	1
Mean	**61.1**	**60.1**	**14.0**	**14.4**		
No. of Environments	**10**	**16**	**11**	**17**		

[1]12% moisture basis.

[2]2014-2022 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	5	7
AP Smith	6	–	2	4	4	6
Ascend-SD	3	–	1	2–3	6	3
Brawn-SD	1	–	2	3	6	5–6
CAG Justify	3	–	2	4–5	4	4
CAG Reckless	1	–	1	3	5	4
CAG Recoil	2	–	1	2–3	5	7
CP3099A	7	–	8	6–7	4	7
CP3188	3	–	6	6–7	6	5
CP3322	7	–	2	–	3	6–7
CP3530	7	3	1	3	6	4
CP3915	1	–	1	2	4	4
Driver	2	–	1	3	4	4
Dyna-Gro Ambush	4	–	1	4	4	4
Dyna-Gro Ballistic	4	–	3	3	4	5
Dyna-Gro Commander	4	–	1	4	7	5
LCS Ascent	5	–	1	6–7	5	5–6
LCS Boom	3	–	1	–	6	3
LCS Buster	4	–	2	4	3	3
LCS Cannon	4	–	1	5	7	4
LCS Dual	3	–	2	5	5	5
LCS Trigger	1	–	1	2	3	3
Linkert	3	1	1	4	5	5
MN-Rothsay	4	–	1	4	3	4
MN-Torgy	3	–	1	3	4	3
MN-Washburn	1	2	1	3	4	4
MS Charger	4	–	2	5–6	6	5–6
MS Cobra	1	–	1	4–5	4	5
MS Ranchero	4	–	1	6	3	4
ND Frohberg	2	–	1	3	5	5
ND Heron	5	–	1	6	4	3–4
PFS Buns	5	–	1	2–3	3	6
Shelly	5	1	1	6	4	4
SY 611 CL2	5	–	5	4	4	3
SY Longmire	5	–	1	3	5	7
SY Valda	4	2	1	4	5	4
TCG-Heartland	3	–	2	5	6	7
TCG-Spitfire	4	–	1	3	4	6
TCG-Teddy	2	–	1	–	7	5–6
TCG-Wildcat	4	–	3	6	7	7
WB9479	5	–	1	6	5	7
WB9590	5	–	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.

HARD RED SPRING WHEAT:

Continued from page 47

erately 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 only one naturally infected location in 2023, so new varieties don't have a rating assigned yet for this disease. This data, in combination with data from past years was used to assign a rating to varieties that have been tested for two or more years. 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.

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

HARD RED SPRING WHEAT: Continued on page 49

HARD RED SPRING WHEAT: Continued from page 48

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.

WB9590 was the number one variety grown in Minnesota in 2023, seeded on 23.7 percent of the 1.14 million acres. The next most seeded varieties were MN-Torgy (18.6 percent), SY Valda (9.1 percent), WB9479 (7.1 percent), MN-Rothsay (6.3 percent), and Linkert (6 percent).

Varieties tested for the first time in 2023 were CP3322, LCS Boom, and TCG-Teddy. PFS Buns was first tested in 2021 but not 2022. Brawn-SD (released in 2022) was tested in 2022 under its experimental designation and 2-year averages are reported. WestBred did not submit any HRSW varieties for testing, but WB9479 and WB9590 were both tested in 2023 because each occupied more than 5 percent of the state's acreage in 2022.

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

HARD RED SPRING WHEAT: Continued on page 50

Table 4. Relative grain yield of hard red spring wheat varieties in northern Minnesota locations in single-year (2023) and multiple-year comparisons (2021-2023).

	Crookston			Fergus Falls			Hallock			Oklee			Perley			Roseau[1]	Stephen			Strathcona		
Entry	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr
AP Gunsmoke CL2	87	90	95	98	101	100	103	101	101	93	97	100	97	89	95	100	109	101	102	106	103	104
AP Murdock	91	99	98	94	92	91	93	92	91	94	98	94	102	109	105	98	86	97	95	90	101	99
AP Smith	106	103	102	102	97	100	93	93	94	94	104	104	95	99	99	92	95	96	98	93	92	95
Ascend-SD	94	97	96	100	107	106	101	101	101	104	99	102	105	103	101	107	99	107	106	101	110	105
Brawn-SD	96	101	–	108	109	–	96	100	–	97	103	–	110	110	–	–	99	103	–	101	97	–
CAG Justify	98	97	95	103	102	105	112	113	112	119	110	109	107	104	105	109	114	109	108	120	117	111
CAG Reckless	96	93	98	104	100	102	107	105	104	104	100	101	93	95	97	105	92	97	100	107	105	104
CAG Recoil	99	102	–	100	101	–	93	95	–	95	94	–	96	104	–	–	95	96	–	81	88	–
CP3099A	117	117	110	116	116	118	98	105	107	118	120	126	124	114	110	114	123	114	116	118	116	110
CP3188	104	104	106	106	98	101	105	99	100	105	102	103	108	101	103	106	105	101	104	117	110	108
CP3322	103	–	–	119	–	–	113	–	–	105	–	–	114	–	–	–	105	–	–	99	–	–
CP3530	84	90	87	98	96	97	103	106	102	111	105	101	102	102	100	110	106	106	106	100	105	103
CP3915	107	101	98	98	98	97	100	99	101	91	95	94	88	96	97	95	96	99	96	94	105	103
Driver	96	100	100	102	105	106	108	106	104	96	101	106	91	98	101	107	94	96	98	105	103	102
Dyna-Gro Ambush	100	96	101	101	103	104	96	102	100	96	103	99	98	96	98	102	105	108	103	103	104	104
Dyna-Gro Ballistic	120	108	106	115	110	109	112	107	105	101	99	103	103	95	96	98	115	110	109	108	105	103
Dyna-Gro Commander	116	108	107	96	92	94	96	97	96	99	99	98	94	100	100	101	96	97	97	115	107	108
LCS Ascent	105	101	–	107	101	–	97	101	–	96	99	–	103	97	–	–	101	102	–	98	101	–
LCS Boom	80	–	–	96	–	–	98	–	–	103	–	–	97	–	–	–	89	–	–	107	–	–
LCS Buster	118	115	109	109	110	109	115	114	111	112	110	110	116	111	110	100	113	110	109	109	104	102
LCS Cannon	98	97	95	97	97	95	99	94	96	102	101	101	95	99	101	109	96	99	102	104	103	104
LCS Dual	98	100	–	100	102	–	88	95	–	101	94	–	106	104	–	–	99	99	–	109	103	–
LCS Trigger	109	110	107	109	109	105	111	113	110	121	120	115	111	117	113	104	103	106	107	108	111	107
Linkert	85	92	97	86	86	88	91	90	93	94	92	88	90	90	89	89	91	91	94	93	91	92
MN-Rothsay	113	109	112	103	101	101	105	109	106	89	96	99	100	103	105	103	110	109	107	98	99	99
MN-Torgy	99	102	103	105	103	101	99	102	101	100	93	93	100	101	102	97	96	105	104	100	96	97
MN-Washburn	102	101	99	98	107	101	100	100	100	95	89	91	102	102	101	98	100	102	99	98	99	97
MS Charger	113	114	-	104	107	-	105	106	-	103	106	-	101	101	-	-	109	103	-	108	108	-
MS Cobra	97	99	99	93	92	98	96	97	98	102	101	97	96	95	97	100	103	99	98	107	99	100
MS Ranchero	102	93	101	117	114	108	101	105	104	99	97	98	106	98	99	100	95	91	91	75	91	93
ND Frohberg	92	90	97	97	96	96	91	94	92	98	93	96	103	96	96	101	86	84	87	104	96	97
ND Heron	85	89	–	90	94	–	92	93	–	100	100	–	95	91	–	–	98	96	–	111	101	–
PFS Buns	118	–	–	111	–	–	111	–	–	101	–	–	113	–	–	–	97	–	–	93	–	–
Shelly	101	101	100	108	108	108	110	109	107	97	97	99	100	101	98	106	107	105	105	97	101	101
SY 611 CL2	103	100	98	93	101	105	103	99	100	102	104	104	102	107	104	103	97	99	98	94	95	97
SY Longmire	98	96	95	96	95	97	97	97	97	97	95	96	96	97	97	89	96	95	98	103	102	101
SY Valda	100	95	95	99	103	101	107	108	107	111	109	109	105	109	105	104	104	105	106	97	96	97
TCG-Heartland	94	94	96	92	93	92	89	89	90	95	94	94	95	95	90	89	93	92	91	94	86	89
TCG-Spitfire	106	106	104	106	104	108	102	99	101	111	107	103	104	107	110	94	104	104	105	94	92	95
TCG-Teddy	106	–	–	98	–	–	99	–	–	98	–	–	105	–	–	–	95	–	–	97	–	–
TCG-Wildcat	104	106	102	94	92	96	96	97	98	105	102	102	101	101	103	104	92	98	96	104	104	105
WB9479	105	102	101	86	88	89	94	95	94	104	100	99	92	94	96	91	89	92	91	89	97	98
WB9590	108	103	103	89	98	99	103	103	100	102	104	100	98	96	97	101	103	100	97	101	102	101
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**	**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**	**7.2**	**11.4**	**7.0**	**5.6**	**19.3**	**9.1**	**7.1**

[1]2023 Roseau was abaondoned due to hail. 2 yr data is 2021 & 2022.

HARD RED SPRING WHEAT: Continued from page 49

plemented 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. Due to operational changes, trials were not seeded at Morris this year and the intensive trial treatments were not applied

HARD RED SPRING WHEAT: Continued on page 51

Table 5. Relative grain yield of hard red spring wheat varieties in southern Minnesota locations in single-year (2023) and multiple-year comparisons (2021-2023).

	Becker			Benson[1]		Le Center			Lamberton			Morris[2]	St Paul			Waseca[3]	
Entry	2023	2 Yr	3 Yr	2023	2 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2 Yr	2023	2 Yr	3 Yr	2023	2 Yr
AP Gunsmoke CL2	109	106	106	93	94	101	100	103	82	96	99	110	106	105	100	99	99
AP Murdock	82	87	92	92	91	98	101	98	102	101	100	102	84	81	90	85	93
AP Smith	102	101	99	97	100	98	99	100	100	99	100	98	94	93	97	102	102
Ascend-SD	106	112	111	98	102	118	113	109	110	110	109	123	103	99	100	105	111
Brawn-SD	110	111	–	103	–	113	113	–	105	107	–	–	128	121	–	115	115
CAG Justify	103	102	99	108	110	108	107	101	88	100	99	129	99	103	104	108	110
CAG Reckless	99	104	110	102	101	104	101	99	118	114	109	109	120	115	113	98	98
CAG Recoil	98	86	–	98	–	101	105	–	104	99	–	–	87	86	–	102	102
CP3099A	107	100	101	109	111	115	114	106	122	119	119	114	111	101	98	134	127
CP3188	109	103	105	109	110	118	111	111	81	85	96	118	84	89	94	101	100
CP3322	108	–	–	102	–	106	–	–	108	–	–	–	98	–	–	105	–
CP3530	104	99	99	101	101	96	102	104	98	99	99	100	96	100	101	89	95
CP3915	94	96	100	96	97	93	94	94	106	106	104	92	118	115	104	94	91
Driver	94	99	101	101	104	103	104	102	77	90	99	107	105	112	109	104	101
Dyna-Gro Ambush	105	105	103	96	99	96	102	104	104	107	103	87	105	103	107	92	98
Dyna-Gro Ballistic	114	102	106	109	104	103	102	102	101	103	101	105	120	115	106	115	111
Dyna-Gro Commander	104	99	103	98	103	98	98	100	99	95	95	103	100	103	108	105	107
LCS Ascent	105	108	–	100	–	96	100	–	92	95	–	–	119	116	–	102	100
LCS Boom	100	–	–	94	–	96	–	–	98	–	–	–	112	–	–	83	–
LCS Buster	108	106	112	105	105	101	105	103	109	107	105	96	112	105	106	122	118
LCS Cannon	99	109	108	95	102	93	96	100	77	90	93	92	91	112	112	94	99
LCS Dual	95	105	–	99	–	105	102	–	100	103	–	–	104	100	–	97	104
LCS Trigger	90	93	99	104	105	101	106	109	121	116	116	117	114	106	110	121	119
Linkert	94	97	98	94	94	88	90	93	91	93	93	92	90	98	99	87	88
MN-Rothsay	95	97	101	103	104	103	99	99	93	90	90	97	99	93	97	101	104
MN-Torgy	103	104	105	101	102	106	105	105	95	100	98	97	106	85	93	102	102
MN-Washburn	104	99	98	94	95	99	100	100	114	109	105	104	109	103	103	96	92
MS Charger	107	114	-	108	-	105	107	-	99	105	-	-	94	106	-	103	107
MS Cobra	98	103	102	105	101	98	99	100	95	98	99	93	109	111	112	98	99
MS Ranchero	96	89	90	105	108	105	99	100	99	91	92	78	79	77	85	94	89
ND Frohberg	96	98	100	98	103	91	91	94	105	101	100	102	110	109	107	91	95
ND Heron	103	104	–	91	–	92	92	–	81	86	–	–	103	110	–	89	92
PFS Buns	83	–	–	112	–	113	–	–	112	–	–	–	77	–	–	127	–
Shelly	101	95	96	101	102	101	100	101	96	102	102	102	106	105	109	111	106
SY 611 CL2	94	103	104	102	104	93	95	95	109	103	103	95	90	95	93	98	100
SY Longmire	101	88	94	98	99	102	100	98	112	101	103	100	98	97	86	103	95
SY Valda	96	97	97	104	101	98	105	105	104	102	103	99	89	100	100	99	101
TCG-Heartland	105	102	100	92	91	96	98	98	96	92	93	86	99	101	98	89	94
TCG-Spitfire	102	106	107	105	107	109	112	110	112	111	113	105	108	107	103	111	110
TCG-Teddy	105	–	–	106	–	101	–	–	102	–	–	–	94	–	–	96	–
TCG-Wildcat	106	109	109	99	98	97	101	101	121	114	113	113	106	98	101	97	99
WB9479	87	92	92	88	91	90	93	96	98	98	94	89	94	98	96	82	89
WB9590	99	101	98	94	95	89	94	96	98	93	97	91	104	106	103	90	93
Mean (Bu/Acre)	**62.0**	**61.2**	**54.5**	**96.8**	**78.7**	**89.7**	**85.4**	**80.7**	**74.3**	**67.4**	**65.1**	**56.4**	**56.7**	**55.3**	**53.0**	**80.6**	**59.5**
LSD (0.10)	**13.4**	**13.1**	**11.4**	**6.3**	**7.6**	**10.7**	**8.9**	**8.7**	**10.9**	**15.3**	**12.4**	**20.4**	**17.5**	**16.8**	**15.7**	**9.8**	**17.0**

[1]2022 Benson was abandoned due to early season flooding. 2 year data is 2021 and 2023.
[2]2023 Morris was not seeded. 2 year data is 2021 and 2022
[3]2021 Waseca was discarded due to excessive within trial variation. 2 year data is 2022 and 2023.

HARD RED SPRING WHEAT:

Continued from page 50

at the other southern location, Lamberton. The Roseau trial was hailed out, leaving Crookston as the only 2023 location with conventional and intensive treatments. The Crookston site had a higher than normal field variability and LSD (Least Significant Difference); therefore no conventional vs intensive data table is presented this year.

Project Leaders

James Anderson, Jochum Wiersma, Ruth Dill-Macky, James Kolmer, Matt Rouse, Yue Jin, and Linda Dykes

Test Plot Managers

Test plot establishment and management were supervised by Matt Bickell, Dave Grafstrom, Fernando de Paula Alberto, Danielle Fiebelkorn-Wrucke, Tom Hoverstad, Mike Leiseth, Susan Reynolds, Nathan Stuart, Donn Vellekson, and Travis Vollmer. ✻

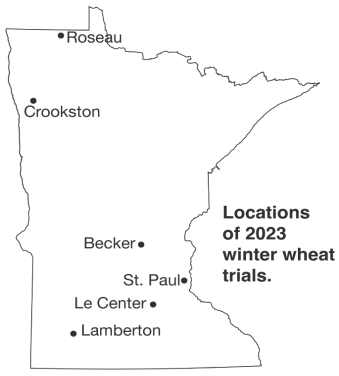
Table 6. Relative grain yield of hard red spring wheat varieties in Minnesota in single-year (2023) and multiple-year comparisons (2021-2023).

	State			North			South		
Entry	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr	2023	2 Yr	3 Yr
AP Gunsmoke CL2	98	99	100	99	98	99	93	101	101
AP Murdock	92	97	96	93	99	96	93	95	95
AP Smith	98	98	99	97	97	98	99	98	99
Ascend-SD	103	106	105	101	104	103	104	110	109
Brawn-SD	105	107	–	101	103	–	105	112	–
CAG Justify	108	108	106	111	108	107	100	107	106
CAG Reckless	103	102	103	100	99	101	106	106	105
CAG Recoil	96	97	–	94	97	–	100	97	–
CP3099A	116	113	112	116	115	114	112	111	110
CP3188	105	102	104	107	103	104	100	101	105
CP3322	107	–	–	108	–	–	106	–	–
CP3530	99	101	100	101	102	100	101	100	100
CP3915	97	99	98	96	99	98	99	99	98
Driver	98	102	103	99	102	103	91	102	103
Dyna-Gro Ambush	99	102	101	100	101	101	101	102	101
Dyna-Gro Ballistic	110	105	104	110	104	104	108	106	104
Dyna-Gro Commander	101	100	101	101	100	100	100	100	102
LCS Ascent	101	102	–	101	101	–	99	103	–
LCS Boom	96	–	–	96	–	–	97	–	–
LCS Buster	112	109	107	113	110	108	107	107	106
LCS Cannon	96	100	100	99	99	100	91	101	101
LCS Dual	100	100	–	100	99	–	98	103	–
LCS Trigger	110	111	109	111	112	109	106	108	110
Linkert	90	91	92	90	90	91	93	93	94
MN-Rothsay	101	101	102	103	104	104	98	97	99
MN-Torgy	101	100	100	100	100	100	100	99	101
MN-Washburn	100	100	99	99	99	98	103	100	100
MS Charger	105	107	-	106	106	-	105	108	-
MS Cobra	100	99	99	99	97	98	100	101	101
MS Ranchero	99	95	97	99	98	99	101	90	93
ND Frohberg	96	95	97	96	93	95	100	99	100
ND Heron	94	95	–	96	95	–	91	95	–
PFS Buns	107	–	–	106	–	–	104	–	–
Shelly	103	103	103	103	104	103	99	101	102
SY 611 CL2	99	101	100	100	101	101	102	100	99
SY Longmire	99	96	97	97	96	97	103	96	97
SY Valda	102	103	102	104	103	103	102	102	101
TCG-Heartland	94	93	93	93	91	91	97	96	95
TCG-Spitfire	105	105	105	104	102	103	106	109	108
TCG-Teddy	100	–	–	100	–	–	105	–	–
TCG-Wildcat	101	102	102	100	100	101	108	105	105
WB9479	93	94	94	95	95	95	91	93	93
WB9590	98	99	98	101	101	99	98	97	97
Mean (Bu/Acre)	**86.5**	**80.2**	**75.2**	**94.9**	**90.2**	**84.1**	**77.7**	**67.7**	**63.8**
LSD (0.10)	**3.4**	**3.3**	**2.8**	**4.3**	**4.1**	**3.4**	**5.4**	**5.5**	**4.7**
No. of Environments	**13**	**26**	**41**	**7**	**14**	**23**	**6**	**12**	**18**

2023 Hard Red Winter Wheat field crop trial results

The yield potential of winter wheat is higher than spring wheat, especially in the southern half of Minnesota, but fall establishment and winter survival are key to it reaching that potential. Ideally, a well-established winter wheat crop will have started to tiller in the fall prior to freezing temperatures that force dormancy. Winter survival also greatly improves if the crop does not break dormancy during a mid-winter thaw. No-till production practices help maintain soil moisture for rapid and even fall emergence and help maintain snow cover, thereby improving winter survival. A stubble height of 4-6 inches is ideal for catching snow, but even shorter soybean stubble provides some protection.

The results of the variety performance evaluations are summarized in Tables 1-3. The winter wheat performance trials were conducted near Lamberton, Le Center, St. Paul, Becker, Crookston, and Roseau in 2023. Testing of AAC Goldrush, Bobcat, Flathead, KWS317, KWS361, Redfield, and SY100 was discontinued. MS Sundown, MT Warcat, SD Pheasant, and WB4422 were tested for the first time.



Winter hardiness, days to heading, plant height, and resistance to lodging have been converted to a 1-9 scale to allow for easier interpretation of the data (Table 1). Differences for all four characteristics are generally much less in the southern half of the state, while in the northern half of the state, the gap in characteristics widens. Presenting averages of the actual data therefore can be misleading. Likewise, differences in test weight and grain protein are converted to a 1-9 scale. Varieties with lodging scores greater than 4 should be chosen with caution as lodging can reduce harvestability, yield, and quality. This is especially important if your soils are highly fertile.

For comparison, the single year and three-year average of grain yield of tested varieties as a percentage of the trial mean is presented in Table 2. The average yield across the six testing locations was 73.6 bushels per acre in 2023. This compares to a three-year average of 86.7 bushels per acre. The extremely dry conditions this summer across much of Minnesota affected the trials near Lamberton, St. Paul in particular.

While all winter wheat varieties should be considered susceptible to very susceptible to Fusarium head blight (scab) when compared to spring wheat varieties, they head earlier than spring wheat varieties and thereby have a better chance of escaping losses in grain yield, test weight, and

HARD RED WINTER WHEAT: Continued on page 53

Table 1. Agronomic characteristics of winter wheat varieties.

Entry	Agent or Breeder[1]	Year of Release	Class[2]	Legal Status	Winter Hardiness[3]	Days to Heading[4]	Plant Height[5]	Straw Strength[6]	Test Weight[3]	Grain Protein[3]
					(1-9)					
AAC Vortex	Alliance Seed	2021	CWRW	PVP Pending	1	6	4	1	4	5
AC Emerson	Meridian Seeds	2010	CWRW	PVP(94)	3	7	4	3	4	4
AP Bigfoot	AgriPro/Syngenta	2020	HRWW	PVP Pending	3	4	1	3	4	1
FourOSix	MT	2018	HRWW	PVP(94)	4	6	2	4	5	3
Jupiter	MSU	2012	SWWW	PVP(94)	3	6	1	3	9	9
Keldin	WestBred	2011	HRWW	PVP(94)	5	6	3	5	4	9
MS Sundown[5]	Meridian Seeds	2023	HRWW	PVP	3	1	3	3	4	5
MT Warcat[5]	MSU	2022	HRWW	PVP Pending	1	9	2	1	3	3
ND Noreen	NDSU	2019	HRWW	PVP(94)	3	6	5	3	1	4
Ruth	NE	2015	HRWW	PVP(94)	3	3	3	3	3	6
SD Andes	SDSU	2020	HRWW	PVP(94)	4	6	3	4	2	9
SD Pheasant	SDSU	2023	HRWW	PVP Pending	5	2	4	5	2	3
SD Midland	SDSU	2021	HRWW	PVP(94)	4	5	5	4	4	9
SY Wolverine	AgriPro/Syngenta	2019	HRWW	PVP(94)	4	1	1	4	4	9
Viking 211	Viking Seed	2020	HRWW	PVP Pending	4	1	4	4	3	9
WB4309	WestBred	2019	HRWW	PVP(94)	1	2	2	4	4	5
WB4422[5]	WestBred	2022	HRWW		3	5	3	1	3	6
Winner	SDSU	2019	HRWW	PVP(94)	4	5	3	4	4	9
LSD (0.1)					**2**	**1**	**2**	**2**	**2**	**1**

[1]MSU = Michigan State University, MT = Montana State University, NE = University of Nebraska/Husker Genetics, NDSU = North Dakota State University, SDSU = South Dakota State University
[2]CWRW = Canadian Western Red Winter Wheat, HRWW = Hard Red Winter Wheat, and SWWW = Soft White Winter Wheat
[3]1 = highest and 9 = lowest
[4]1 = earliest and 9 = latest
[5]1 = shortest and 9 = tallest
[6]1 = least prone and 9 = most prone to lodging
[5]The reported rated is a statitical prediction based on 2023 data

presence of deoxynivalenol or vomitoxin, a major food safety concern that can result in steep discounts. Most winter wheat varieties are also considered susceptible to very susceptible to the leaf diseases - including powdery mildew. Although AAC Vortex, AC Emerson, ND Noreen, and Winner provide some of the better genetic resistance among winter wheat varieties (Table 3), research results in the region indicate that fungicides applications to control leaf diseases early in the season and suppress scab at anthesis are nearly always warranted and should be considered an integral part of your production practices. Disease ratings for leaf diseases, stripe, leaf, and stem rust, and scab are provided by South Dakota State University and USDA-ARS.

Project Leaders

Jochum Wiersma and Jim Anderson

Test Plot Managers

Dave Grafstrom, Fernando de Paula Alberto, Susan Reynolds, Nate Stuart, Donn Vellekson and Travis Vollmer ✻

Winter Wheat Planting Rate and Date

Bushel Weight, Pounds.....60

Seeds/Pound.....14,500

Planting Rate, Pounds Acre.....75+

Planting Rate, Seeds/Sq. Ft.....25

Planting Date.....Sept. 1 - Oct. 1

Table 3. Disease reactions to economically important diseases of winter wheat.

Entry	Leaf Spotting Diseases[1,2]	Stripe Rust[2]	Leaf Rust[2]	Stem Rust[2]	Bacterial Leaf Streak[2]	FHB[2]
	(1-9)[3]					
AAC Vortex	8	-	-	-	-	4
AC Emerson	5	1	6	1	-	3
AP Bigfoot	4	3	7	-	7	7
FourOSix	6	3	6	5	-	-
Jupiter	-	8	8	8	-	6
Keldin	5	2	3	5	6	6
MS Sundown	4	-	-	-	6	5
MT Warcat	-	-	-	-	-	-
ND Noreen	7	3	3	4	2	4
Ruth	-	4	8	3	4	-
SD Andes	3	1	8	8	4	5
SD Pheasannt	5	6	2	5	5	6
SD Midland	4	1	8	7	4	6
SY Wolverine	4	6	7	2	8	8
Viking 211	-	-	-	-	-	-
WB4309	5	8	8	5	8	7
WB4422	5	-	6	6	6	8
Winner	6	5	-	4	6	4

[1]Includes tan spot and Septoria complex.
[2]Data provided by SDSU and USDA-ARS.
[3]1 = most resistant and 9 = least resistant.

Table 2. Relative grain yield of winter wheat cultivars in Minnesota in single-year (2023) and mutiple-year comparisons (2021-2023).

	Lamberton		Le Center		St. Paul		Becker *(irrigated)*		Crookston		Roseau		State	
Entry	2023	3 Yr	2023	3 Yr	2023	3 Yr	2023	3 Yr	2023	3 Yr	2023	3 Yr	2023	3 Yr
AAC Vortex[1]	131	106	90	93	85	88	101	93	111	112	93	90	97	97
AC Emerson	104	93	80	77	82	81	100	91	99	95	75	85	89	86
AP Bigfoot[1]	67	95	95	101	101	101	75	85	79	80	99	111	88	94
FourOSix	79	96	94	96	94	99	104	102	96	96	107	102	96	98
Jupiter	130	105	108	112	95	107	130	124	88	81	111	107	104	107
Keldin	108	106	105	107	97	114	103	108	110	101	115	110	107	106
MS Sundown	90	-	99	-	116	-	69	-	95	-	104	-	98	-
MT Warcat	132	-	95	-	94	-	107	-	120	-	87	-	100	-
ND Noreen	137	106	93	94	90	91	106	100	105	112	93	100	99	99
Ruth	86	99	103	101	96	97	101	103	104	100	99	90	100	99
SD Andes	133	107	109	103	93	107	117	106	110	115	112	111	110	107
SD Pheasant	94	-	110	-	118	-	111	-	113	-	104	-	109	-
SD Midland[1]	141	119	106	105	102	97	108	107	104	105	110	108	105	106
SY Wolverine	53	89	96	106	104	99	72	100	102	87	90	93	95	98
Viking 211[2]	52	90	94	95	109	102	118	114	94	100	102	101	100	101
WB4309	75	100	111	105	118	109	88	103	90	96	116	98	104	102
WB4422	68	-	106	-	107	-	92	-	101	-	89	-	99	-
Winner	114	116	115	111	114	112	110	105	94	99	98	99	105	107
Mean (Bu/Acre)	**50.2**	**67.5**	**95.5**	**88.1**	**45.1**	**89.2**	**64.6**	**70.4**	**84.9**	**79.2**	**84.9**	**79.2**	**73.6**	**86.7**
LSD (0.1)	**18**	**15**	**9**	**9**	**19**	**8**	**15**	**13**	**12**	**9**	**12**	**9**	**8**	**5**

[1]The 3 year average is a statistical prediction based on 2 years of data.
[2]

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, 2023. 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
LACEY					
Roseau	Erickson, Douglas	Roseau	218-469-2660	25	
Todd	Faust, Kevin	Long Prairie	320-732-3361		46
ND GENESIS					
Clay	Olek, Bradley	Felton	218-494-3440		75
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	40	20
Wilkin	Scheffler, Richard	Barnesville	218-493-4456		84
QUEST					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	28	90
RASMUSSON					
Polk	Capistran Seed Company	Crookston	218-891-7840		145
ROBUST					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	42	12
Meeker	Peterson, Russell M	Grove City	320-877-7793		
Roseau	Erickson, Douglas	Roseau	218-469-2660	37	
ROYAL					
Wabasha	Zabel Seeds	Plainview	507-534-2498		64
TRADITION					
Clay	Bjornson, Brock (Bjornson Enterprises Inc)	Hawley	218-790-5093		
Mahnomen	Spring Creek Seed LLC	Ulen	218-261-1647		45

Barley, Winter

County	Producer	City	Phone	R	C
MN-EQUINOX					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	29	
Lincoln	OCF Seeds	Hendricks	605-690-0918	8	

Beans

County	Producer	City	Phone	R	C
ECLIPSE BLACK					
Grant	Kapphahn, John M	Elbow Lake	218-685-4604	65	

Birdsfoot Trefoil

County	Producer	City	Phone	R	C
NORCEN					
Roseau	Pieper Farm, Daniel	Roosevelt	218-556-0755		

Buckwheat

County	Producer	City	Phone	R	C
KOTO					
Roseau	Estling Farms	Roosevelt	218-242-1556		30

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	Slater, Bridget	Roseau	218-469-2533		230
Roseau	Slater, Gary	Roseau	218-463-1064		577
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 Company	Dundas	507-645-7995		25
Wabasha	Gerken's Feed & Grain LLC	Wabasha	651-565-2611		10
CREMA					
NY-Westchester	Row 7 Seed Company, LLC	Dobbs Ferry	914-510-2824		
DEON					
Carlton	Northland Farms Seed & Grain	Cromwell	218-821-1627		70
Polk	Fosston Tri-Coop	Fosston	218-435-6222	18	388
Rice	Werner Seed Company	Dundas	507-645-7995		32
Stearns	Nietfeld Farm, Inc	Melrose	320-987-3442	88	
Todd	Faust, Kevin	Long Prairie	320-732-3361		118
ESKER2020					
Mower	Grass & Sons Seed, Inc	LeRoy	507-324-5820		25
Wabasha	Zabel Seeds	Plainview	507-534-2498		44
LAKER					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		44
MN-PEARL					
Brown	Cunningham Seed Farms	Sleepy Eye	507-794-7323	22	26
Carlton	Northland Farms Seed & Grain	Cromwell	218-821-1627		33
Clay	Tobolt Seed	Moorhead	218-287-2904	42	
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		165
Kittson	Lake Bronson Elevator, Inc	Lake Bronson	218-754-4200		160
Lake of the Woods	Northern Excellence Seed LLC	Williams	218-783-2228		
Meeker	Anderson Seeds	Dassel	320-286-2700		61
Meeker	Smith, Steven	Darwin	320-221-8255		20
Polk	Fosston Tri-Coop	Fosston	218-435-6222	30	485
Renville	Enestvedt Seed Company	Sacred Heart	320-765-2728		35
Roseau	Magnusson Farms	Roseau	218-463-2374		511
SD-Minnehaha	Lee, Chris	Dell Rapids	701-552-1300		
Swift	Falk's Seed Farm	Murdock	320-875-4341	77	
Swift	Lee's Seed Farm	Benson	320-843-2857		35
Todd	Faust, Kevin	Long Prairie	320-732-3361		71
Wabasha	Zabel Seeds	Plainview	507-534-2498		68
Wilkin	Wolverton Farm Supply	Wolverton	701-367-4133	30	
REINS					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		448
Wabasha	Zabel Seeds	Plainview	507-534-2498		21
RUSHMORE					
Carlton	Northland Farms Seed & Grain	Cromwell	218-821-1627		33
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		566
McLeod	CentraSeed, LLC	Hutchinson	320-434-7333		57
Rice	Werner Seed Company	Dundas	507-645-7995		21
Stearns	Nietfeld Farm, Inc	Melrose	320-987-3442		57
Swift	Falk's Seed Farm	Murdock	320-875-4341	32	
SADDLE					
Brown	Cunningham Seed Farms	Sleepy Eye	507-794-7323		30
Mahnomen	Spring Creek Seed LLC	Ulen	218-261-1647		88
Meeker	Anderson Seeds	Dassel	320-286-2700		48

County	Producer	City	Phone	R	C
Stearns	Spring Water Acres LLC	Melrose	320-249-2254		263
Swift	Falk's Seed Farm	Murdock	320-875-4341		156
Wabasha	Gerken's Feed & Grain LLC	Wabasha	651-565-2611		10
Wabasha	Zabel Seeds	Plainview	507-534-2498		62
SD BUFFALO					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		188
Rice	Werner Seed Company	Dundas	507-645-7995		28
Swift	Falk's Seed Farm	Murdock	320-875-4341		146
STREAKER					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	17	34
Mahnomen	Pazdernik Farms, Inc	Waubun	218-766-9531	16	
Swift	Falk's Seed Farm	Murdock	320-875-4341	38	
SUMO					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		132
WARRIOR					
Meeker	Anderson Seeds	Dassel	320-286-2700		115
Swift	Falk's Seed Farm	Murdock	320-875-4341	15	133

Rye

AROOSTOOK					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		30
Winona	Speltz, Keith (Speltz Farms, Inc)	Altura	507-689-2644		26
KWS TAYO					
IL-Champaign	KWS Cereals USA, LLC	Champaign	217-888-0130		
ND DYLAN					
Grant	Kapphahn, John M	Elbow Lake	218-685-4604	52	
Grant	Thiel Seed Service	Wendell	218-458-2415		40
Mahnomen	Spring Creek Seed LLC	Ulen	218-261-1647	50	
Otter Tail	Walkup, John S & Chad	Campbell	218-739-2580		33
ND GARDNER					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		75

Soybeans

IA1022					
Faribault	Prescher-Willette Seeds	Delavan	507-854-3595		
IA2112RA12					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		
IA3054RA12					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		
IAS19C3					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		
Wilkin	Brushvale Seed, Inc	Breckenridge	218-643-2311		
MN1312CN					
Rice	Werner Seed Company	Dundas	507-645-7995	20	
MN1807CN					
Rice	Werner Seed Company	Dundas	507-645-7995	20	
VITAL					
Swift	Falk's Seed Farm	Murdock	320-875-4341		

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		

Wheat

AP MURDOCK					
Kittson	Kennedy Seed Co.	Hallock	218-526-0239		
Marshall	Bakke, Deland	Newfolden	218-874-7911		
Polk	AgriMAX	Fisher	218-891-2211		
Renville	Finish Line Seed, Inc	Bird Island	320-365-3674		
Roseau	Kukowski, Jim	Strathcona	218-781-2478		
AP SMITH					
Clay	Petermann Seeds, Inc	Hawley	218-483-3302		
Kittson	Kennedy Seed Co.	Hallock	218-526-0239		
Polk	Capistran Seed Company	Crookston	218-891-7840		
Wilkin	Haugrud Seed Plant	Rothsay	218-493-4275		
BOLLES					
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161	10	211
Norman	Chisholm, Keith, Bill & Nick	Gary	218-356-8300	80	
CAG JUSTIFY					
Pennington	Farmers Co-op Grain & Seed	Thief River Falls	218-681-6281		
CANNON					
Polk	Balstad, Scott	Fosston	218-556-9315		70
Polk	Capistran Seed Company	Crookston	218-891-7840		270
DRIVER					
Wilkin	Wolverton Farm Supply	Wolverton	701-367-4133		124
LCS BOOM					
Polk	Balstad, Scott	Fosston	218-556-9315	65	
Wilkin	Friederichs Seed Farm	Foxhome	218-205-8759	126	
LCS BUSTER					
Wilkin	Friederichs Seed Farm	Foxhome	218-205-8759		100
LCS DUAL					
Marshall	Jensen Farms	Stephen	218-478-3397		
LCS HAMMER AX					
Polk	Capistran Seed Company	Crookston	218-891-7840	72	
Roseau	Estling Farms	Roosevelt	218-242-1556		68
LCS TRIGGER					
Polk	Balstad, Scott	Fosston	218-556-9315		150
Wilkin	Friederichs Seed Farm	Foxhome	218-205-8759		130
LINKERT					
Clay	Tobolt Seed	Moorhead	218-287-2904	40	
Kittson	Johnson Farms, Inc, Lloyd	Karlstad	218-686-8432		112
Pennington	Barth, Brad (Brad Barth Farms)	Goodridge	218-681-4236	120	
Red Lake	Swenson Seed Farm	Brooks	218-796-5285		394
Roseau	CHS Northern Grain	Greenbush	218-782-2111		245
MN-ROTHSAY					
Beltrami	Neft, Frank	Kelliher	218-647-8408		40
Clay	Krabbenhoft Seed & Supply LLC	Sabin	218-789-7219		175
Clay	Ness, Larry & Matt	Fargo	218-585-4179		153
Clay	Olsgaard, Inc, Harold	Moorhead	218-585-4535		155
Clay	Tobolt Seed	Moorhead	218-287-2904	42	237
Clay	Wetterlin, Jerry & Aaron	Glyndon	218-494-3339		150
Grant	Adams Seed	Wendell	218-458-2151	16	125
Grant	Kapphahn, John M	Elbow Lake	218-685-4604	43	
Grant	Red River Marketing Co	Elbow Lake	218-685-6100		185
Grant	Thiel Seed Service	Wendell	218-458-2415		160
Kittson	Aakre, Adam	Karlstad	218-688-2346		383
Kittson	Johnson Farms, Inc, Lloyd	Karlstad	218-686-8432		97
Kittson	Kennedy Seed Co.	Hallock	218-526-0239	25	285
Kittson	Lake Bronson Elevator, Inc	Lake Bronson	218-754-4200		252
Kittson	Peterson, Noel	Hallock	218-843-2865		167
Kittson	Schwenzfeier, Ryan	Kennedy	218-843-1394		539
Kittson	Sedenquist Farms, Inc	Hallock	218-843-5027	200	
Koochiching	Benike Farms, Inc	Baudette	218-244-9751		105
Lac qui Parle	Kemen, Robert & Sons	Madison	320-769-2868		52
Mahnomen	Haugo Farms	Waubun	218-473-2254		420
Mahnomen	Pazdernik Farms, Inc	Waubun	218-766-9531	22	83
Mahnomen	Spring Creek Seed LLC	Ulen	218-261-1647		60
Mahnomen	Sweep, Nathan A	Fosston	218-435-1360		35
Marshall	Anderson, Luther H	Stephen	218-455-3305		
Marshall	Green, Carl M	Strandquist	218-597-2861		234
Marshall	Hagen Farm of Gatzke Inc	Gatzke	218-459-3344	80	160
Marshall	Holte, Steven and Andrew	Grygla	218-294-6537		315
Marshall	Jensen Farms	Stephen	218-478-3397	35	560
Marshall	Kowalski, John & Darrin	Stephen	218-478-4119		100
Marshall	Peterson Farms of Warren, Inc, D L	Warren	218-745-4077		177
Marshall	Peterson, Maynard	Stephen	218-478-3859		78
Marshall	Riopelle, Larry	Argyle	701-739-3848	35	
Marshall	Riopelle Seed/Joshua David Kostrzewski	Argyle	701-520-2050	136	167
Marshall	Thompson, Jake	Middle River	218-469-9384	41	246
Marshall	Trilogy Ag Group - Argyle	Argyle	218-437-6426		156
Marshall	Yutrzenka, Don & Mark	Argyle	218-437-8428	39	
Norman	Borge, Brian & Jon	Ada	218-784-2168		247
Norman	Chisholm, Keith, Bill & Nick	Gary	218-356-8300	25	
Otter Tail	Walkup, John S & Chad	Campbell	218-739-2580		260
Pennington	Barth, Brad (Brad Barth Farms)	Goodridge	218-681-4236	37	513
Pennington	Miller, Aaron	Goodridge	218-378-4145		120
Pennington	Scholin Farms	Thief River Falls	218-964-5268	110	
Polk	AgriMAX	Fisher	218-891-2211	38	238
Polk	Balstad, Scott	Fosston	218-556-9315		100
Polk	Bergerson, Kent	Brooks	218-686-9640		150
Polk	Broadwell, Jeff	Fosston	218-435-2194	51	190
Polk	Brule, David A	Crookston	218-289-0067	155	350
Polk	Capistran, Kevin	Crookston	218-891-7840		280
Polk	Capistran Seed Company	Crookston	218-891-7840	35	
Polk	Christian Farms, Stuart & Dwight	Fertile	218-945-6021	100	
Polk	Fosston Tri-Coop	Fosston	218-435-6222		65
Polk	Novak Farms	Angus	701-740-2008	14	190
Polk	Peterson, Inc, D.W.	Warren	218-745-4507	50	150
Polk	Roed Farms	Fosston	218-435-1705		50
Polk	Tiedemann, Gene R	Euclid	218-281-6723		580
Red Lake	Myhre Farms	Red Lake Falls	218-698-4615		213
Red Lake	Swenson Seed Farm	Brooks	218-796-5285	155	993
Red Lake	Vatthauer Farm	Red Lake Falls	218-253-2490		300
Roseau	CHS Northern Grain	Greenbush	218-782-2111		320
Roseau	C&S Habstritt Inc	Roseau	218-463-1193		500
Roseau	Kukowski, Jim	Strathcona	218-781-2478	180	
Roseau	Magnusson Farms	Roseau	218-463-2374		150
Roseau	Pieper Farm	Daniel, Roosevelt	218-556-0755		
Swift	Lee's Seed Farm	Benson	320-843-2857		67
Wilkin	Etzler Farms, Inc	Foxhome	218-643-1361		363
Wilkin	Friederichs Seed Farm	Foxhome	218-205-8759	40	130
Wilkin	Haugrud Seed Plant	Rothsay	218-493-4275	60	325
Wilkin	Larson Farms/Eldon	Rothsay	218-867-2674		122
Wilkin	Torkelson, Brent	Foxhome	218-205-0136		299
MN-TORGY					
Brown	Cunningham Seed Farms	Sleepy Eye	507-794-7323	28	
Clay	Tande, Harmen	Moorhead	701-429-0541	41	
Clay	Tobolt Seed	Moorhead	218-287-2904	42	155
Freeborn	Albert Lea Seed House, Inc	Albert Lea	507-373-3161		137
Grant	Backman, Michael	Herman	320-304-2232		85
Grant	Red River Marketing Co	Elbow Lake	218-685-6100		109
Kittson	Johnson Farms, Inc, Lloyd	Karlstad	218-686-8432		179
Kittson	Kennedy Seed Co.	Hallock	218-526-0239		153
Lincoln	Jerzak, Jerome & Tim	Ivanhoe	507-694-1582		23
Mahnomen	Pazdernik Farms, Inc	Waubun	218-766-9531		65
Mahnomen	Spring Creek Seed LLC	Ulen	218-261-1647	20	107
Marshall	Anderson, Luther H	Stephen	218-455-3305		

County	Producer	City	Phone	R	C
Marshall	Bakke, Deland	Newfolden	218-874-7911		313
Marshall	Hagen Farm of Gatzke, Inc	Gatzke	218-459-3344		140
Marshall	Jensen Farms	Stephen	218-478-3397		150
Marshall	Peterson, Maynard	Stephen	218-478-3859	155	
Marshall	Riopelle Seed/Joshua David Kostrzewski	Argyle	701-520-2050	18	
Marshall	Thompson, Jake	Middle River	218-469-9384	79	
Meeker	Anderson Seeds	Dassel	320-286-2700		83
Norman	Chisholm, Keith, Bill & Nick	Gary	218-356-8300	25	
Pennington	Barth, Brad (Brad Barth Farms)	Goodridge	218-681-4236		103
Pennington	Scholin Farms	Thief River Falls	218-964-5268	60	320
Polk	Balstad, Scott	Fosston	218-556-9315		60
Polk	Broadwell, Jeff	Fosston	218-435-2194		212
Polk	Fosston Tri-Coop	Fosston	218-435-6222	54	151
Red Lake	Swenson Seed Farm	Brooks	218-796-5285	120	400
Red Lake	Vatthauer Farm	Red Lake Falls	218-253-2490		300
Rice	Werner Seed Company	Dundas	507-645-7995		22
Swift	Falk's Seed Farm	Murdock	320-875-4341		108
Swift	Lee's Seed Farm	Benson	320-843-2857		67
Wilkin	Etzler Farms, Inc	Foxhome	218-643-1361		158
Wilkin	Haugrud Seed Plant	Rothsay	218-493-4275	55	390
Wilkin	Moxness, Matthew	Kent	763-486-3976		195
Wilkin	Wolverton Farm Supply	Wolverton	701-367-4133	38	76
MN-WASHBURN					
Roseau	C&S Habstritt Inc	Roseau	218-463-1193		73
SHELLY					
Red Lake	Myhre Farms	Red Lake Falls	218-698-4615		120
Red Lake	Vatthauer Farm	Red Lake Falls	218-253-2490		156
SY 611CL2					
Kittson	Kennedy Seed Co.	Hallock	218-526-0239		
Polk	AgriMAX	Fisher	218-891-2211		
SY VALDA					
Clay	Petermann Seeds, Inc	Hawley	218-483-3302		
Grant	Backman Seeds, Inc	Herman	320-677-2231		
Grant	Thiel Seed Service	Wendell	218-458-2415		
Kittson	Kennedy Seed Co.	Hallock	218-526-0239		
Polk	Fosston Tri-Coop	Fosston	218-435-6222		
TCG-TEDDY					
Marshall	Jensen Farms	Stephen	218-478-3397		20
TCG-WILDCAT					
Marshall	Jensen Farms	Stephen	218-478-3397		
Norman	West Central Ag Services	Ulen	218-596-8821		
Polk	AgriMAX	Fisher	218-891-2211		
TW OLYMPIC					
Grant	Adams Seed	Wendell	218-458-2151		
TW TRAILFIRE					
Clay	Tobolt Seed	Moorhead	218-287-2904		
WB9479					
Norman	West Central Ag Services	Ulen	218-596-8821		
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		
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	218-596-8821		
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		

Wheat, Durum

County	Producer	City	Phone	R	C
ND STANLEY					
Pennington	Scholin Farms	Thief River Falls	218-964-5268	24	

Wheat, Winter

County	Producer	City	Phone	R	C
IDEAL					
Polk	Fosston Tri-Coop	Fosston	218-435-6222	11	104
ND NOREEN					
Carlton	Northland Farms Seed & Grain	Cromwell	218-821-1627		39
Norman	Star of the North	Gary	218-356-8300		75
Pennington	Scholin Farms	Thief River Falls	218-964-5268	60	
REDFIELD					
Meeker	Smith, Steven	Darwin	320-221-8255	18	
SD MIDLAND					
McLeod	CentraSeed, LLC	Hutchinson	320-434-7333		40

QUALITY ASSURED SEED DIRECTORY

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

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Quest — Scab resistant
Rasmusson — High yield

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