

Prairie Grains

Building Opportunities by Association

Delving into the Data

2021 Variety Trials

		4	6
	5	4	4
4	4	4	3
6	NA	3	2
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Prairie Grains

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Back by popular demand: We take a look at the results from the 2021 Variety Trials. Photo by University of Minnesota researcher Jim Anderson in Fergus Falls, Minnesota.



Against the Grain

Step into the Arena

Another cropping season has ended with harvest on my farm, as I grow no crops that tend to be harvested later. The harvest results are at times somewhat unpredictable, and that was certainly the case this year.

In my area, the spring wheat yields, on average, tended to be about one-half to two-thirds of normal for most growers. This appeared to be mainly a function of soil types present in a given field. Quality of the grain was excellent, and with prices at elevated levels, I believe that most growers were relieved with the results.

The soybean crop outcome was very much in question until the middle of August, when very beneficial rains arrived. The precipitation came too late to benefit early maturing soybeans to any great degree. The later maturing

soybeans that many growers had planted tended to yield at somewhat above average, according to conversations I had with area farmers.

I have served as President of the MAWG organization for nearly two years, and am approaching the end of my term to serve in that capacity, as allowed in our bylaws. This will be my final magazine column.

My time on the MAWG board will be six years at the end of 2021. I am eligible to run for another three-year term, but have

decided not to do so. I reside in Area 1, so any wheat grower living in that geography is eligible to seek election to the MAWG board.

President Theodore Roosevelt was a historical figure in the United States whom I have always been fascinated by. I believe that one of the greatest speeches he delivered was "The Man In The

Arena," given at the Sorbonne in Paris in 1910. He believed that the credit for accomplishments should go to the man who is actually in the arena. He went on to further say that the critics who stand on the sidelines should not share in the credit given for a favorable outcome.

I would like to see some talented growers to enter a new arena, and seek election to the MAWG board in Area 1. Wouldn't you like to be someone who makes things happen? I have found that what I have given to the organization ended up to be much less than the satisfaction which I have received in return.

It has been my great honor and privilege to have served you. Thank you for your support.

Respectfully,



Gary Anderson
President, MAWG Board 🌾



TAMING THE BULLS



& BEARS

BY BETSY JENSEN



Big Picture Outlook

Spring wheat is doing its spring wheat thing and off in its own world. This happens from time to time. It is a small market and can have some unbelievable price swings. In the Northern Plains, we can look to durum, oats and flax for other examples of crazy markets. I did not anticipate \$10 wheat futures any more than I expected \$16 durum, \$28 flax or the drought that caused those high prices.

I think back to the early 2000s when wheat had a 40-cent trading range in a year, for many years in a row. Fuel and fertilizer costs hardly moved from year to year. We could get all the chemical we needed. If wheat closed five cents higher, it was time to celebrate. It was boring and predictable and there were not many opportunities to make money.

That is why I am celebrating and embracing this price volatility. There are opportunities. Stop being afraid of making sales and embrace the opportunities offered.

I have written before about my Disneyworld Sale in 2008. I sold my final wheat bushels for over \$18 futures because I did not want to worry about it while on vacation. I am the only person

who has made money on a Disney World trip. I mentioned the \$18 futures price but have I ever talked about basis? My basis was \$3.05 under. When is the last time you sold wheat for a minus \$3 basis? I can brag all I want about my great futures sale. I also sold the worst basis ever posted in spring wheat country.

If I want, I can brag this year about my 2021 sales. I got over \$9 cash wheat off the combine, never even hit the bin. I can try to forget those early sales at prices that I would like to take back. Let me brag about \$9 wheat and quietly forget about the first \$5.75 sale.

I want you to focus on the big picture instead of individual decisions. How did your crop marketing work overall? What was your average price? Did you do better than planned? We cannot focus on the best or worst sale. Change your focus to the big picture.

Looking to 2022, prices look good, until you check input costs. I have started working with farmers on cost of production, and the income line on my spreadsheet says we should be celebrating. When I scroll down to the expense line, I am slapped back to reality. The biggest concern is doing one without

the other. If you buy fertilizer, you better sell some wheat. We cannot pay these input prices and make money with \$6 wheat. It won't work.

I need to use the term "hedge" more often because it does remind us why we sell our crops in advance. It is not called "top sale" or "big money maker" or "home run." It is simply called a hedge. We are hedging ourselves against negative price action. We want some protection if prices collapse. We are content to lock in small profits to avoid big losses. In a perfect wheat marketing world, we start with small profits, and work our way up to large profits.

Enjoy and embrace the price volatility because it means opportunity. Plus, it makes for an exciting winter meeting season. I love talking to farmers when prices are high. We don't always have reasons to be optimistic, but high prices offer hope. Even with drought conditions and high input costs, I hope you can find reasons to be optimistic for 2022.

Betsy Jensen farms in Stephen, MN and teaches Farm Business Management at Northland Community and Technical College. She can be reached at betsy.jensen@northlandcollege.edu.



GREAT RETURN

Longtime MN Wheat director visits Farmfest for first time in more than 40 years to receive farming award

By Drew Lyon,
Ag Management Solutions

Mark Jossund doesn't farm to earn awards, but he was flattered when he received notice his family had been selected as the 2021 University of Minnesota's Clay County Farm Family of the Year.

"It was a nice surprise, a nice honor to get," said Jossund, a veteran director on the Minnesota Wheat Research & Promotion Council.

Jossund received his award in August at Farmfest. It was his first return to the multi-day farm show since his dad took him in 1976, when Mark was 14 years old. For the first time, Minnesota Wheat also held a booth at this year's Farmfest.

"That's thanks to (Minnesota Wheat CEO) Charlie Vogel," Jossund said. "There's not a lot of wheat grown down in southern Minnesota, and he's trying to have more of a presence. I think it was a success."

Jossund lives in Moorhead but farms about 30 miles north across both northern Clay and southern Norman counties. Mark and his wife, Brendy, rotate wheat, corn and soybeans on their fourth-generation farm that dates back to the 1880s. After enduring this year's drought, he's been mostly pleased with how his crops have yielded.

"Wheat harvest was average to above average, and soybeans have been anywhere from disappointing to good," Jossund said in early October. "It certainly could've been worse. If you happened to get under a rain cloud, you're probably pretty happy."

Jossund has served on the Council for about a dozen years.

Mexico is the top buyer of Minnesota wheat, followed by Japan, the Philippines, Nigeria and Canada. In 2020, the value of U.S. wheat exports to the world totaled \$6.3 billion, a 1% increase from 2019 following increased demand from China.

Only his colleague, Rhonda K. Larson, has more seniority on the board.

"I certainly get more out of it than what I put in," he said.

Vogel says Jossund, who's also served on the AFREC and Northern Crop Institutes boards, provides the Council with steady leadership and experience.

"Mark is an outstanding director who really takes seriously the role of directing wheat checkoff funds," said Vogel, CEO since 2019. "He's a huge asset for our board."

Though the Council isn't involved in legislative advocacy, Jossund said he's concerned about rising health care costs. He's thankful he's able to receive health care through Brendy's off-farm job as a surgical nurse at the VA Hospital in Fargo.

"For a farmer, most need an off-the-farm job to provide health insurance," Jossund said. "That's the biggest problem with farm families – health insurance is a huge obstacle."

The farmer-led Council consists of nine Minnesota growers who volunteer to help direct the state's wheat checkoff.



Mark and Brendy Jossund are members of the University of Minnesota Crookston's Agronomy Club.

“You want to spend their money wisely,” Jossund said. “We’re always looking at promotion and how to leverage our dollars to make them go farther.”

Many of those checkoff resources go toward research projects like the On-Farm Research Network, currently overseen by Minnesota Wheat Vice President of Research Missy Carlson.

“That’s been going really well, and Missy is doing a great job,” Jossund said. “That’s been a big undertaking and has turned out really well. We have an amazing staff at Minnesota Wheat.”

With Council elections coming in 2022, Jossund encourages fellow growers to consider running. He said he’s made lifelong friends from serving on the Council, and has seen firsthand, through trade missions, how checkoff investments help improve farmer profitability by opening up international

markets. According to the latest data from the Minnesota Department of Agriculture, the state’s wheat producers export more than \$200 million annually.

“It was eye-opening to go on a U.S. Wheat trip to see how our dollars through U.S. Wheat are used, and the value of exports. I just learned a lot,” he said. “We get in our combine and you don’t think how far those bushels go to be turned into bread. It’s definitely a world market, yet it’s hard to think of that when you’re in your combine.”

Heading into 2022, Jossund said he’s concerned about rising fertilizer costs, but remains optimistic.

“We just keep looking for opportunities for value-added and just hope for acres to stay stable and grow,” he said. “Wheat certainly has a niche in the market.” 🌾

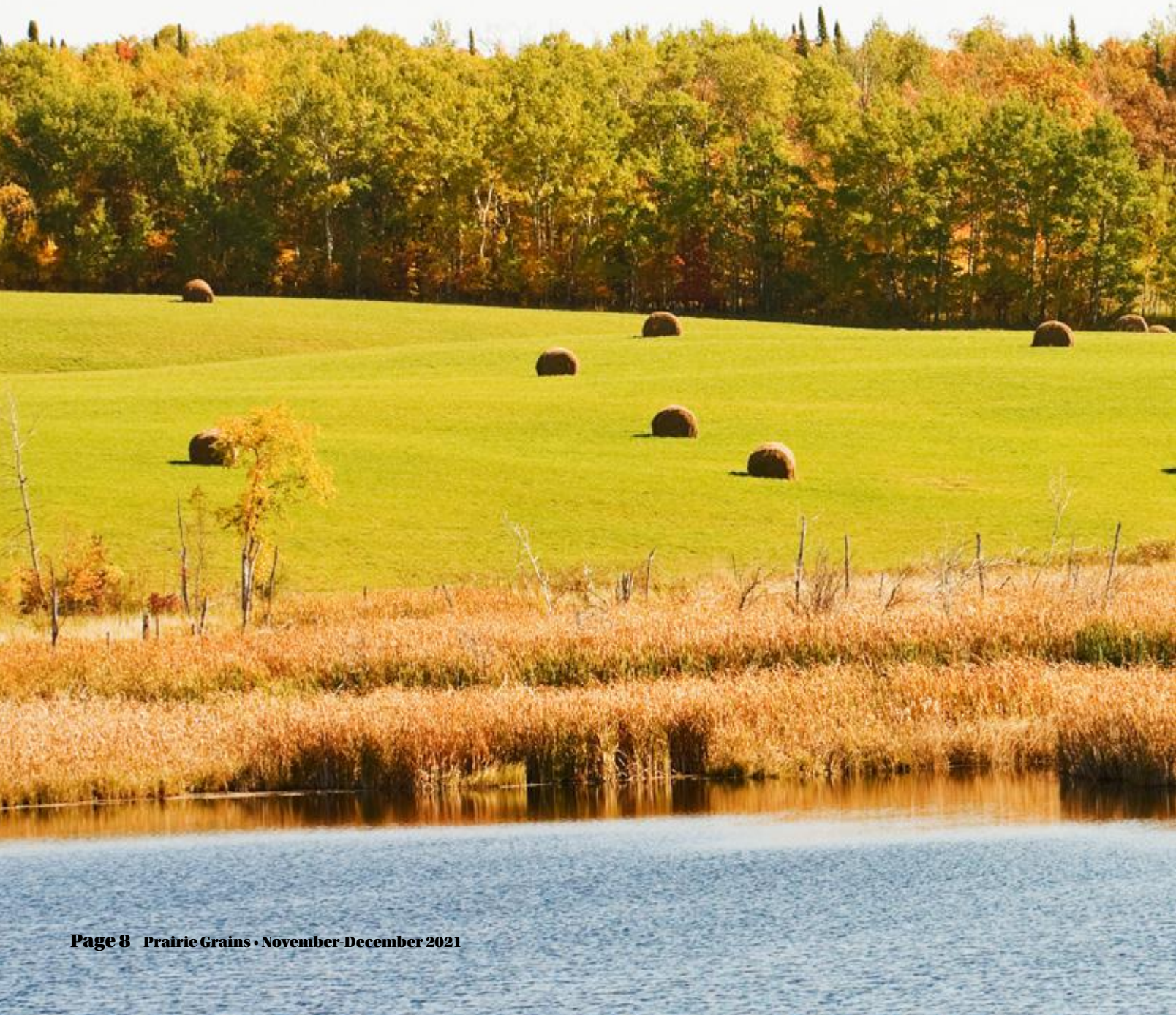
How Changes to NRCS Wetland Determination Rules Could Benefit Your Operation

Submitted by the North Dakota Grains Growers Association

Improvements to USDA regulations finalized in 2020 could provide farmers an opportunity to improve NRCS-certified wetland determinations and provide exemptions from Clean Water Act oversight by the EPA and Army Corps.

Farmers who produce an agricultural commodity on a converted wetland, or convert a wetland to make the production of an agricultural commodity possible, risk losing USDA farm program benefits and their federal crop insurance premium subsidies. Acres determined by NRCS to be prior converted cropland or non-wetland on certified wetland determinations are exempt from USDA wetland conservation

compliance provisions (commonly called “Swampbuster”) and can be drained or tiled without risk of losing benefits. Acres certified by NRCS as prior converted cropland are also more likely to be exempt from Clean Water Act oversight. The Biden Administration recently announced its intention to revisit the ever-litigated “waters of the United States” rule (“WOTUS”). Recent improvements to Swampbuster regulations and the upcoming changes to the WOTUS rule make now a prime time for farmers to investigate whether areas labeled wetland and farmed wetland on their fields should be recertified as prior converted cropland or non-wetland.



On August 28, the USDA finalized three new regulations that have improved the wetland determination process:

1. First, USDA clarified whether prior wetland determinations are “certified.” A “certified” NRCS wetland determination remains binding unless a person affected by the recertification requests review or the tract is no longer used for agricultural production.

Determinations made after November 28, 1990 and before July 3, 1996 are considered “certified” if the determination was issued on the June 1991 version of form NRCS-CPA-026 or SCS-CPA-026, the person was notified that the determination had been certified, and the map document was of sufficient quality to determine ineligibility for program benefits.

If a determination during that time period was issued on a different version of the form, a determination may still be considered certified if there is other documentation that the person was notified of the certification, provided appeal rights, and the map document was of sufficient quality to make the determination.

All wetland determinations made after July 3, 1996 are considered certified wetland determinations.

2. Second, USDA regulation now allows a farmer to request review of a specific wetland site without granting NRCS authority to conduct a new determination on the entire tract or field. This means a person can request recertification of an error on specific wetland sites without opening the entire certified wetland determination for review and without risk of new wetland acres being added or expanded.

3. Finally, the agency also codified the “best-drained condition” rule. When a wetland is affected by a drainage manipulation that occurred prior to December 23, 1985, the wetland hydrology will be identified on the basis of the best-drained condition resulting from the drainage manipulation.

Sites previously labeled by NRCS as “farmed wetland” or “farmed wetland pasture” may qualify for the prior converted cropland exemption if the site was cropped under normal climate conditions following a pre-1985 drainage manipulation. Application of the “best-drained condition” rule

is likely to increase the number of acres exempt as prior converted cropland on a farmer’s field.

On June 9, 2021, the EPA announced its intent to revise the definition of WOTUS. The exact language of the pending WOTUS Rule is not yet known; however, the EPA’s goal behind revisiting the rule is to “better protect our nation’s vital water resources that support public health, environmental protection, agricultural activity, and economic growth.”

Both Swampbuster and the Clean Water Act include exemptions for prior converted cropland and while both agencies define prior converted cropland similarly, how each agency makes a determination of prior converted cropland has diverged and converged over time.

In June 2020, the EPA codified a new definition of prior converted cropland with its Navigability Rule for WOTUS, which matches USDA’s definition. The final rule states, the “EPA and Corps will recognize designations of prior converted cropland made by the Secretary of Agriculture.”

Therefore, if an area was certified as prior converted cropland by NRCS, the area is also more likely to be exempt from Clean Water Act regulation by the EPA and U.S. Army Corps of Engineers. Relabeling an area prior converted cropland on an NRCS wetland determination now could help prevent the area from falling under Clean Water Act regulation.
















These recent regulatory changes and the pending WOTUS rule make now an opportune time for farmers to request review of NRCS certified wetland determinations issued prior to 2021 and to request certifications of tracts that have not been reviewed.

If you would like help determining whether your property has a certified wetland determination, reviewing certified wetland determinations for accuracy, or requesting changes to an NRCS certified wetland determination, please contact one of our agricultural and environmental attorneys for more information.

Katie J. Vculek (320) 257 – 3869 kvculek@rinkenoonan.com; Kale R. Van Bruggen (320) 656 – 3522 kvanbruggen@rinkenoonan.com; and Zachary Burmeister each contributed to this article. 🌾

The Farmer's Share

Did you know that farmers and ranchers receive only 14.3* cents of every food dollar that consumers spend? According to the USDA, off farm costs including marketing, processing, wholesaling, distribution and retailing account for more than 80 cents of every food dollar spent in the United States.

Bacon 1 lb.  Retail: \$17.99 Farmer: \$1.06	Top Sirloin Steak 1 lb.  Retail: \$10.49 Farmer: \$1.98	Bread 2 lbs.  Retail: \$3.99 Farmer: \$0.17	Fresh Carrots 5 lbs.  Retail: \$3.99 Farmer: \$2.11	Beer 6-pack cans  Retail: \$9.99 Farmer: \$0.05
Cereal 18 oz. box  Retail: \$4.99 Farmer: \$0.12	Tomatoes 1 lb.  Retail: \$2.99 Farmer: \$0.43	Eggs 1 dozen  Retail: \$2.19 Farmer: \$1.07	Flour King Arthur, 5 lbs.  Retail: \$3.49 Farmer: \$0.59	Boneless Ham 1 lb.  Retail: \$12.28 Farmer: \$1.06
Lettuce 1 lb.  Retail: \$2.99 Farmer: \$0.19	Milk 1 gallon, fat free  Retail: \$3.79 Farmer: \$1.52	Fresh Apples 1 lb.  Retail: \$2.99 Farmer: \$0.76	Fresh Potatos Russet, 5 lbs.  Retail: \$6.99 Farmer: \$1.32	Soda 2 liters  Retail: \$0.99 Farmer: \$0.08

Farmer's share derived from USDA, NASS "Agricultural Prices," 2021. | Prices based on August 2021 data. Retail prices based on Safeway (SE) brand except where noted. | *Figure according to U.S. Department of Agriculture Economic Research Service

September 30, 2021



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Don't be left in the dark. Come find us at the Prairie Grains Conference.

Join us to learn more about the latest checkoff-funded research for a soybean-wheat rotation and its impact on production and yield.

7:10 a.m. Evaluating Management Strategies for Iron Deficiency Chlorosis in Soybeans – Maykon da Silva, U of MN

7:30 a.m. Soybean Disease Update: White Mold, SDS, and Frogeye Leaf Spot Research and Management.

7:50 a.m. Phosphorus and Potassium Research in Soybeans – Dr. Dave Grafstrom, Research Agronomist, U of MN - Magnusson Research Farm, Roseau, MN.

8:10 a.m. Soybean Insect Research Update – Arthur Vieira Ribeiro, Post-doctoral Associate, U of MN

8:30 a.m. Waterhemp Research Update – Dr. Debalin Sarangi, Extension Weed Scientist and Assistant Professor, U of MN

The soybean checkoff: Boosting your bottom line

The Minnesota Soybean Research & Promotion Council and its board of elected farmer leaders work year-round with farmers across the state to home in on what the most prominent agronomic issues are. From there, MSR&PC uses checkoff dollars to sponsor unbiased research projects that work to improve the overall profitability of Minnesota soybean farmers. Learn more about MSR&PC and the latest checkoff-funded research at mnsoybean.org.



2021

Prairie Grains

conference

December 9, 2021

Alerus Center, Grand Forks, ND

Keynote Speakers



DARYL RITCHISON

Meteorologist / Director of NDAWN
North Dakota State University

9:05 a.m.

Marketing Panel

Industry Leader Discussion

10:05 a.m.

DR. WILLIAM W. WILSON

Agribusiness and Applied
Economics Professor
North Dakota State University

2:30 p.m.

Grower & Industry Meetings

Everyone is encouraged to attend these meetings.

Morning Sessions

9th Annual On-Farm Research Summit

Listen to updates on this year's on-farm research results and participate in group discussions about what the data could mean for wheat and soybean production in our region.

8:00 a.m. **Registration, Breakfast and Social**

8:30 a.m. **Welcome**

Wheat Seeding Rates
Flag-leaf Fungicide
N-stabilizers
Elevated P and K Fertility
Green-seeding Soybeans into Rye
On-combine Wheat Protein Mapping
Corn Herbicide Rx Mapping
Cover Crop Panel with producers

11:30 a.m. **Wrap-up**



9:00 a.m. - 12:00 p.m.

Red River Basin Flood Damage Reduction Working Group Meeting

The members of the Flood Damage Reduction Working Group are meeting to build and maintain good communications with producers as they develop projects and plans that can help reduce flooding in the Red River Basin. Leaders from NW Minnesota farm organizations will also be attending. *Growers are encouraged to attend.*

9:30 a.m. - 12:00 p.m. **North Dakota Barley Council County Representatives Meeting**

Lunch & Afternoon Sessions

12:00 p.m. **Lunch** (*Free for all attendees*)

12:30 - 4:00 p.m.

Minnesota Wheat Research Committee

The committee will be hearing presentations from researchers who have submitted research pre-proposals for funding by the Minnesota Wheat check-off. *Growers are welcome & encouraged to attend.*

1:00 - 3:30 p.m.

Growing and Processing Wheat That's Easier to Eat: Genetics, Sourdough Process and the FOD-MAP and ATI Digestibility Connection

This session will focus on the findings of recent research into the levels of anti-nutrient elements such as FOD-MAPs (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols) and ATI (Amylase Trypsin Inhibitors) naturally present in ancient, heritage, and modern wheat varieties and the subsequent effects of sourdough fermentation as a process to improve the digestibility of plant foods, such as wheat and wheat products (breads and pastas) for sensitive individuals. *Presenters: George Amponsah Anor, PhD, University of Minnesota; James Anderson, PhD, University of Minnesota and Michael Gänzle, PhD, University of Alberta, Edmonton, Canada*

Financial support for this project was provided by an Agricultural Growth, Research, & Innovation Crop Research Grant from the Minnesota Department of Agriculture.



2:00 - 3:00 p.m.

MAWG Resolutions Committee Meeting

The MAWG Resolutions Committee is made up of members who attended the November 23rd committee meeting in Red Lake Falls. At this meeting the committee will address unresolved resolutions and new resolutions presented in writing by MAWG members. The final resolutions will be presented at the Annual Business Meeting at 4:00 p.m.

1:30 - 4:00 p.m.

Minnesota & North Dakota Malting Barley Program

All growers and industry representatives interested in barley markets and production are welcome.

1:30 p.m. **Welcome**

Ryan Hough, MN Barley & Greg Kessel, ND Barley

1:35 p.m. **2-Row Barley Variety Selections**

Austin Case, Barley Breeder, Busch Ag

2:00 p.m. **Production Management of 2-Rowed Barley**

Brian Schaetz, Agronomist, Rahr Malting and Paul Schrodin, Agronomist, Busch Ag

2:30 p.m. **Beer Market and Demographics**

Lester Jones, National Beer Wholesalers, Washington, DC

3:00 p.m. **Barley Marketing Report**

Mark Black, Malteurop, Great Falls, MT

3:30 p.m. **Pet Food Market**

Kevin Pray, MGI Grain Processing, Omaha, NE



Pre-Conference Social, Banquet, and Live Auction

People with a passion for our region's agriculture - Coming together to celebrate and build relationships

5:15 p.m. Social – Hors d'oeuvres & Refreshments

6:00 p.m. Welcome and Dinner

6:40 p.m. Keynote Presentation
Natasha Mortenson

7:30 p.m. Awards & Special Recognition

7:45 p.m. Concluding Remarks, Hospitality and Live Auction



Translating Agriculture to the Inexperienced Food Eater: Why the Experienced Are the Only Ones Who Can Do It

Connecting with those outside the agriculture community requires those who live it to tell their own stories the best way they can. Learn unique ways to connect with "Food Eaters" and build trust. Find inspiration to let your voice be heard and be as effective as possible.

Natasha has a passion and deep respect for both small scale and large scale agricultural production, which provides an interesting perspective on food and agriculture. The disconnect between food growers and food eaters seems to get wider each day and Natasha is passionate about inspiring the farm and ranch community to share their story in their own way. She believes this is the only way to create a bridge where productive conversations can happen.

Her passion is to promote agriculture everywhere she is able, helping others find ways to connect their passion for agriculture with others and work with youth to build enthusiasm for agriculture.

Hospitality hosted by:



Bayer CropScience



3:00 – 4:00 p.m. Minnesota Soybean Growers County Association Meeting



County leaders from the region will get together to discuss county and regional projects and promotional programs. This is an open meeting and everyone is encouraged to attend to learn more about your soybean organization.



4:00 - 5:00 p.m. North Dakota Grain Growers Annual Meeting



4:00 - 5:30 p.m. MN Assn of Wheat Growers & MN Barley Growers Assn Annual Business Meeting

The associations will report on their activities, discuss and vote on resolutions and conduct the annual business of the association. This will include the election of board positions. *All members are encouraged to attend.*

- 6:30 a.m. Registration and Continental Breakfast
- 7:00 a.m. Wheat & Soybean Research Reporting Sessions (*see next page*)
- 8:00 a.m. Exhibits open
- 8:50 a.m. BREAK in Exhibit Hall

9:00 a.m. **Welcome** from THOM PETERSEN , *Commissioner, Minnesota Department of Agriculture*

9:05 a.m. **2022 and Beyond: Why Dry May Dominate**



DARYL RITCHISON

Meteorologist & Director of the ND Agricultural Weather Network (NDAWN)

The 2021 growing season was a dry one for most areas with there already being some concerns it may continue into 2022. In his presentation, Daryl Ritchison will discuss why the 2020s may indeed record more dry years than wet ones, but he will explain why that doesn't necessarily mean what you think it does.

10:05 a.m. **Panel: Markets, Trade, Risk Management, and Logistics: What it All Means for 2022**



SHAYNE ISANE
Moderator
MN Farm Bureau



Representative from
CHS, Inc.



JEFF BEAUDRY
Marketing Specialist
AgCountry Farm Credit
Services



TOM SLUNECKA
CEO
MN Soybean Research &
Promotion Council



JIM PETERSON
Policy and Marketing Director
ND Wheat Commission

11:00 a.m. BREAK in Exhibit Hall

11:15 a.m. **Breakout Sessions** - (*see next page*)

12:00 p.m. **LUNCH & Visit Exhibit Hall** (*Sponsored by MN Wheat Research & Promotion Council*)

1:15 p.m. **Repeat of Breakout Sessions**

2:00 p.m. BREAK in Exhibit Hall

2:30 p.m. **Challenges and Opportunities in Agriculture Trading: Implications for Trading Firms and Organizations**



DR. WILLIAM W. WILSON

Agribusiness & Applied Economics Professor, North Dakota State University

Wilson's focus is risk and strategy as applied to agriculture and agribusiness with a particular focus on agtechnology development and commercialization, procurement, transportation and logistics, international marketing and competition.

3:15 p.m. **Visit Exhibits/ Closing Reception** in Exhibit Hall

3:45 p.m. **Conference Closes**

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AG SERVICES



MINNESOTA WHEAT
RESEARCH & PROMOTION COUNCIL



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Research & Reporting Sessions

WHEAT

- 6:30 a.m. Continental Breakfast
Sponsored by MN Wheat Check-off
- 7:00 a.m. Introductions and Welcome
- 7:10 a.m. **The Role of Water in Fertilizer Loss in Northwest Minnesota Wheat Production** – *Dr. Lindsay Pease, Assistant Professor and Extension Specialist, U of MN*
- 7:30 a.m. **A Novel High-Throughput Phenotyping Pipeline to Deliver More Productive and Stress Resilient Minnesota Wheat Varieties** – *Dr. Walid Sadok, Associate Professor, U of MN*
- 7:50 a.m. **Bacterial Seed Inoculation to Improve N Uptake and Use Efficiency in Wheat** – *Dr. Paulo Pagliari, Nutrient Management Specialist, U of MN Extension*
- 8:10 a.m. **Wheat Stem Sawfly Resistance Screening** – *Dr. Jochum Wiersma, Small Grains Specialist, U of MN*
- 8:30 a.m. **Crop Research Addresses Consumer Need for Digestible Wheat** – *Harold Stanislawski, Business Development Director, Agricultural Utilization Research Institute and Dr. Jim Anderson, Spring Wheat Breeder, U of MN*
- 8:50 a.m. **Concluding Remarks**



SOYBEANS

- 6:30 a.m. Continental Breakfast
Sponsored by MN Soybean Check-off
- 7:00 a.m. Introductions and Welcome
- 7:10 a.m. **Evaluating Management Strategies for Iron Deficiency Chlorosis in Soybeans** – *Maykon da Silva, U of MN*
- 7:30 a.m. **Soybean Disease Update: White Mold, SDS, and Frogeye Leaf Spot Research and Management** – *Dr. Angie Peltier, Extension Educator - Crops, U of MN*
- 7:50 a.m. **Phosphorus and Potassium Research in Soybeans** – *Dr. Dave Grafstrom, Research Agronomist, U of MN - Magnusson Research Farm, Roseau, MN*
- 8:10 a.m. **Soybean Insect Research Update** – *Arthur Vieira Ribeiro, Post-doctoral Associate, U of MN*
- 8:30 a.m. **Waterhemp Research Update** – *Dr. Debalin Sarangi, Extension Weed Scientist and Assistant Professor, U of MN*
- 8:50 a.m. **Concluding Remarks**



Breakout Sessions

11:15 a.m. & 1:15 p.m.

45 minutes sessions that will repeat morning & afternoon

Grand Farm: Sharing the Latest Agriculture and Technology Insights from the Test Site – *Dana Peterson, Chief Strategy Officer of Emerging Prairie*

Federal Policy Issues, Challenges, and Opportunities Facing Wheat Growers – *James Callan, Washington, DC Representative, North Dakota Grain Growers, and Jacob Westlin, Vice President of Policy and Communications, National Association of Wheat Growers*

2021 Spring Wheat Variety Selection and New Variety Update – *Dr. Jim Anderson, Spring Wheat Breeder, U of MN*

Big Numbers Big Problems: Develop a Marketing Plan That Helps You Navigate the Rising Input Costs Going Into 2022 – *Ron Dvergsten and Betsy Jensen, Farm Business Management Instructors, Northland Community & Technical College*

MN Soybean Update: Ag Innovation Campus & Checkoff-Funded Soy Market Development Efforts – *Tom Slunicka, CEO, Ag Management Solutions and Kim Nill, Director of Market Development, MN Soybean Research & Promotion Council*

Managing Wheat in Dry Conditions: What To Do When the Rain Stops – *Clair Keene, Extension Agronomist, NDSU*

New ND Ag Wetland Mitigation Banking – *Drew Courtney, farmer, Oakes, ND, Secretary/Treasurer of North Dakota Corn Growers Association and Vice Chairman of North Dakota Agriculture Mitigation, and Matt Retka, Senior Soil Scientist, Stantec of Fargo, ND*

Bridging the Bench and the Field in Soilborne Fungal Pathogen Research: Developing Disease Management Tools in Minnesota Cropping Systems – *Morning Session only: Megan McCaghey, Assistant Professor of Plant Pathology, U of MN*

Marketing Opportunities for Dry Bean, Sunflower, and Canola – *Afternoon Session only: John Sandbakken, Executive Director, National Sunflower Association; Mitch Coulter, Executive Director, Northharvest Bean Growers Association; Ron Beneda, CHS Inc, Adams, ND, and Randy Martinson, Martinson Ag, Fargo, ND*

What Have We Learned? Utilizing Science to Manage Crop Stress in the Northern Plains – *Dr. Ryan Miller, Director of Applied Research, Stoller USA*

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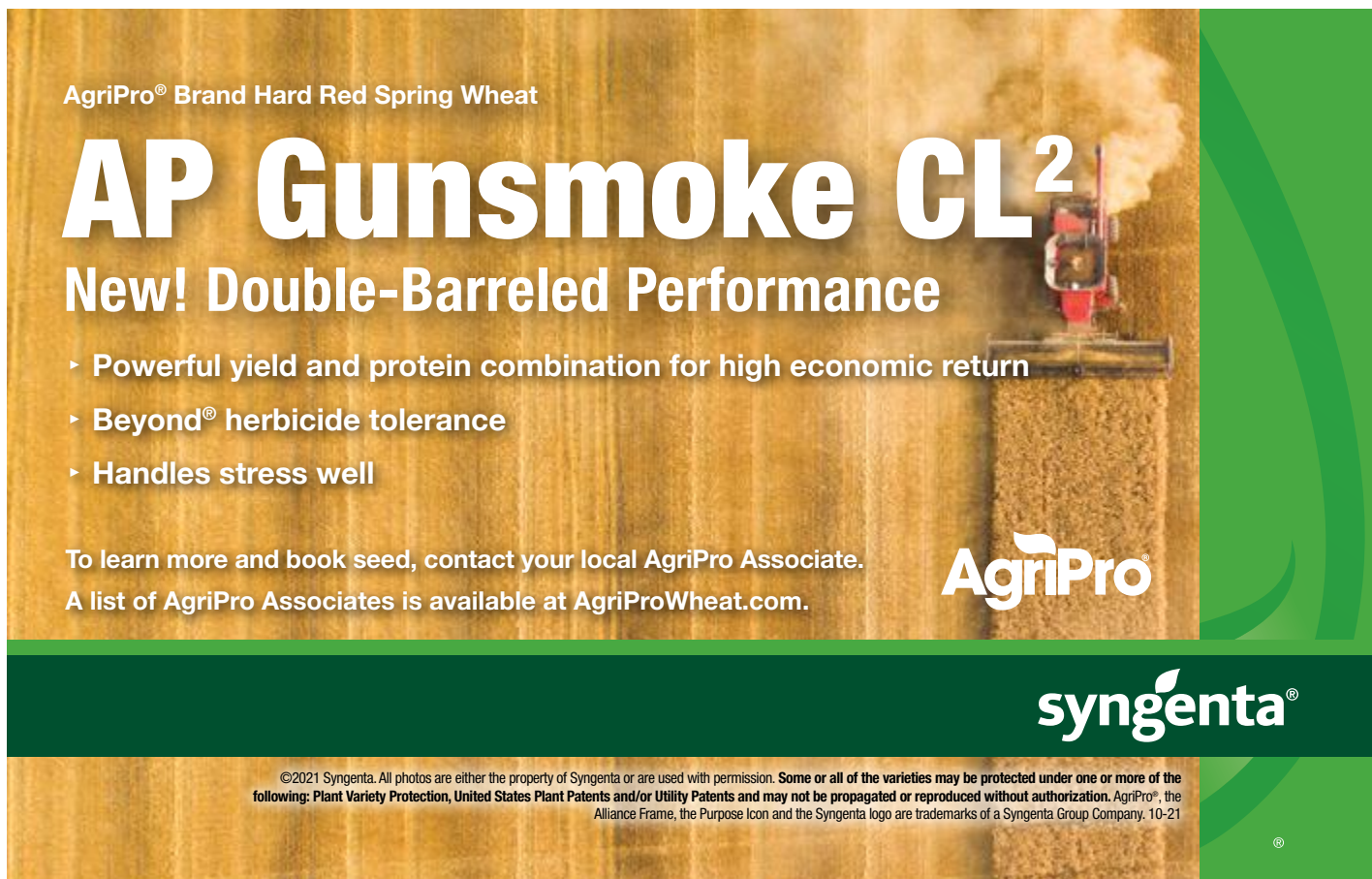
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ST. PAUL, MINNESOTA 55108

Preliminary Report 24

2021 Wheat, Barley, and Oats Variety Performance in Minnesota Preliminary Report

Preface

Jochum Wiersma

Arid, parched, sere, desertic, xerothermic are a few of the words Merriam-Webster lists to describe Minnesota's 2021 growing season. The moderate drought of the 2020 summer that cut a swath across the state from Lake Traverse to Duluth has spread across much of the state by early winter. By the New Year's Eve the whole state was either already abnormally dry or in a moderate drought. Early spring rains partially relieved the drought in the central and northeast part of the state only to immediately worsen again. By the end of June over three quarters of the state was in a moderate drought and already a tenth of the state was in a severe drought. A month later, the situation had further deteriorated with a quarter of the state being classified as in an extreme drought and another half of the state in a severe drought. The Northwest Research & Outreach Center weather records illustrate how parched especially the Red River Valley was with the second driest first half of the year and the driest first nine months of the year ever recorded since record keeping started in 1890. The NWROC weather station also recorded 21 days with daytime high temperatures above 90°F, sharing it's fifteenth overall rank with 2012, 1932, 1929, and 1894.

Stored soil moisture was the saving grace for most of this past season and allowed for a small grains harvest. Both the water holding capacity of the soil and the previous crop's water usage had a tremendous effect on this year's grain yield and probably explains much of the extreme variability in grain yield experienced by individual producers across their farms and between neighbors.

The dry conditions across much of the state allowed for an early start of the field season. By April tenth already a fifth of Minnesota's oat acreage had been seeded. Three weeks later three quarters of the state's spring wheat acreage, oats, and barley had been seeded and just about a quarter of the spring wheat and oats had emerged. All the while temperatures in that same period were well below normal. By mid-May seeding of wheat, barley and oats had all but been completed, and the earliest seeded fields had reached the jointing stage. Both metrics were about a week to two weeks ahead of both 2020 and the 5-year average for each of the three commodities.

The dry conditions allowed for some temperature records to be broken in the last days of May and the first days of June with frost and record lows being reported on May 29th followed by triple digit heat and record highs on June 5th. The widespread frost was of little consequence to the spring cereals but



caused some sterility in winter rye that had just started to head. The persistence of the drought and the accompanying low dew points resulted in very little ergot in spite of the increased risk for infections.

The lack of moisture meant that not just ergot but most fungal diseases were all but absent. The relative cool start of the season and the dry conditions did, however, allow cereal aphids to reach economic threshold prior to heading in southern and west central Minnesota. Further north the populations exploded in many cases not until after anthesis when economic losses are unlikely. We probably had not seen such high numbers of aphids after anthesis in more than two decades. Tank mixing an insecticide with the fungicide application at anthesis has become routine. The decision not to spray the fungicide meant that those same acres did not receive an insecticide either. This in turn allowed already established populations to explode exponentially during the grain fill period.

Data from US Wheat Associates' US Hard Red Spring Wheat Regional Quality Report indicate an average test weight of nearly 63 lbs./bu, an average grain protein content of 14.0%, and an average vitreous kernel count over 80%, resulting in an average grade of #1 DNS. Values more often seen in western North Dakota than in Minnesota and again a testament to the very unusual growing season. Moreover, due to the dry conditions during flowering time, deoxinivananol (DON) was undetectable in the samples collected.

I felt very much on thin ice the whole season when asked about the potential of the crop simply because of the severity of the drought. I felt that the crop could do reasonably well as long as the crop kept its toes in enough water to avoid reaching its wilting point. The low dew points meant that nighttime temperatures and thus respiration losses were low enough that they offset some of decline in photosynthetic output due to photorespiration brought on by temporary heat and drought stress during the heat of the day.

USDA-NASS' initial spring wheat yield forecast for Minnesota on July 1st was 40 bu/acre or 17 bu/acre less than their 2020 forecast. USDA-NASS corrected their forecast upwards with 2 bu/acre one month later. In the September Small Grains Summary USDA-NASS reported Minnesota's average spring wheat yield as 48 bu/acre, 4 bushels lower than last year's state average. The state's average barley yield increased 15% year-over-year to 55.0 bu/acre, while the state average for oat dropped 15% year-over-year to 57 bu/acre. The increase in the average barley yield is probably a testament to the fact that barley uses less water overall than either oats or wheat over the course of the growing season. Acreage of all three commodities dropped to near historic lows with only 55,000, 180,000, and 1.2 million acres of barley, oats, and spring wheat, respectively.

Introduction

Successful small grain production begins with selection of the best varieties for a particular farm or field. For that reason, varieties are compared in trial plots on the Minnesota Agricultural Experiment Station (MAES) sites at St. Paul, Waseca, Lamberton, Morris, and Crookston. In addition to these five MAES locations, trials are also planted at the Magnusson Research Farm near Roseau and with a number of farmer cooperators. The cooperator plots are handled so factors affecting yield and performance are as close to uniform for all entries at each location as possible.



The MAES 2021 Wheat, Barley, and Oat Variety Performance in Minnesota Preliminary Report 24 is presented under authority granted by the Hatch Act of 1887 to the Minnesota Agricultural Experiment Station to conduct performance trials on farm crops and interpret data for the public.

The MAES and the College of Food, Agricultural and Natural Resource Sciences (CFANS) grants permission to reproduce, print, and distribute the data in this publication - via the tables - only in their entirety, without rearrangement, manipulation, or reinterpretation. Permission is also granted to reproduce a maturity group sub-table provided the complete table headings and table notes are included. Use and reproduction of any material from this publication must credit the MAES and the CFANS as its source.

Variety Classifications

Varieties are listed in the tables alphabetically. Seed of tested varieties can be eligible for certification, and use of certified seed is encouraged. However, certification does not imply a recommendation. The intellectual property rights of the breeders or owners of the variety are listed as either PVP, PVP(pending), PVP(94), patent, or none. PVP protection means that the a variety is protected under the Plant Variety Protection Act for a period of 20 years, while PVP(94) means that the variety is protected for 20 years with the additional stipulation that seed of the variety can only be sold as registered and certified classes of seed. PVP(pending) indicates that the PVP application has been made and that you should consider the variety to have the same intellectual property rights as those provided by PVP(94). The designation of 'Patent' means that the variety is protected by a utility patent and that farm-saved seed may be prohibited by the patent holder. The designation 'None' means that the breeder or owner never requested any intellectual property protection or that legal protection has expired. Registered and certified seed is available from seed dealers or from growers listed in the 'Minnesota Crop Improvement Association 2021 Directory', available through the Minnesota Crop Improvement Association office in St. Paul or online at <http://www.mncia.org>

Interpretation of the Data

The presented data are the preliminary variety trial information for single (2021) and multiple year (2019-2021) comparisons in Minnesota. The yields are reported as a percentage of the location mean, with the overall mean (bu/acre) listed below. Two-year and especially one-year data are less reliable and should be interpreted with caution. In contrast, averages across multiple environments, whether they are different years and/or locations, provide a more reliable estimate of mean performance and are more predictive of what you may expect from the variety the next growing season. The least significant difference or LSD is a statistical method to determine whether the observed yield difference between any two varieties is due to true, genetic differences between the varieties or due to experimental error. If the difference in yield between two varieties equals or exceeds the LSD value, the higher yielding one was indeed superior in yield. If the difference is less, the yield difference may have been due to chance rather than genetic differences, and we are unable to differentiate the two varieties. The 5% or 10% unit indicates that, with either 95% or 90% confidence, the observed difference is indeed a true difference in performance. Lowering this confidence level will allow more varieties to appear different from each other, but also increases the chances that false conclusions are drawn.



The Authors and Contributors

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Matt Bickell, Dave Grafstrom, Tom Hoverstad, Michael Leiseth, Houston Lindell, Steve Quiring, Curt Reese, Susan Reynolds, Dimitri von Ruckert, Edward Schiefelbein, Nathan Stuart, Donn Vellekson, and Joe Wodarek supervised fieldwork at the various sites. Special thanks are also due to all cooperating producers.



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SPRING WHEAT

James Anderson, Jochum Wiersma, Susan Reynolds, Nathan Stuart, Houston Lindell, Ruth Dill-Macky, James Kolmer, Matt Rouse, and Yue Jin.

After having been the top acreage variety in Minnesota 5 years running, Linkert dropped to third place with just under 12% of Minnesota's spring wheat acreage. WB9590 was the most widely grown variety this past growing season with 18% of the acreage followed by SY Valda with nearly 13% of the acreage. WB9479 maintained its fourth overall rank. Newcomer NW-Torgy jumped to fifth place with just under 10% of the acreage.

First-time entrants in the 2021 trials were AP Smith, CAG Justify, CAG Reckless, CP3099A, CP3199A, CP3188, MS Cobra, and PFS Buns. Data for AP Gunsmoke CL2 and AP Smith are presented for the first time, but both varieties were tested as experimentals in 2020, so 2 year data is available. Testing of CP3055, CP3903, CP3910, Dyna-Gro Velocity, MS Chevelle, Rollag, SY Ingmar, and WB-Mayville was discontinued. WestBred continues to not test any HRSW varieties in the University of Minnesota variety trial system. WB9479, WB9590, however, were included in the testing in 2021 as they occupied more than 5% of the acreage in 2020.

The results of the variety performance evaluations for spring wheat are summarized in Tables 1 through 7. The varietal characteristics are presented in Tables 1 through 3. Tables 4, 5, and 6 present the relative grain yield of tested varieties in 1, 2, and 3-year comparisons. Table 7 presents the grain yield when fungal pathogens are controlled to the maximum extent possible compared to the same trials without the use of fungicides. The average yield across the six southern testing locations was 56 bu/acre in 2021. This average compares to a southern average of 66 bu/acre in 2020 and a three-year average of 62 bu/acre. The eight northern locations averaged 72 bu/acre in 2021 compared to 75 bu/acre last year and 75 bu/acre for the three-year average. Newcomers CP3099A, CP3119A, and CP3188 were among the highest yielding varieties in single year comparisons in both the north and southern portions of the state. LCS Trigger once again held the top spot for grain yield in the multiple year comparisons. Higher yielding cultivars tend to be lower in grain protein. Variety selection is one approach to avoid discounts for low protein, but N fertility management remains paramount to maximize grain yield and grain protein.

While not seen this past growing season, lodging remains a serious production risk. Varieties with a lodging score of 2 and 3 are considered exceptionally good and will only lodge in extreme cases, while varieties with a rating of 4 or 5 have adequate straw strength most years. Increasing seeding rates generally increases the risk of lodging for all but the strongest and shortest semi-dwarf HRSW varieties. Conversely, lower seeding rates will lower the risk of lodging, but commonly results in lower grain yield potential. Linkert continues to be rated superior for straw strength at a 2, while MS-Washburn is the only public release with a lodging rating of 3. Private releases that have a lodging rating of 3 include AP Smith, MS Barracuda, and all entries in the variety trials of both 21st Century Genetics (TCG) and WestBred.

Varieties with disease ratings of 4 or lower are considered the best defense against a particular disease. Varieties that are rated 7 or higher are likely to suffer significant economic losses under even moderate disease pressure. The foliar disease rating represents the total complex of leaf diseases other than the rusts, and includes the Septoria complex and tan spot. Although varieties may differ from their response to each of those diseases, the rating does not differentiate among them. Therefore, the rating should be used as a general indication and only for varietal selection in areas where these diseases



historically have been a problem or if the previous crop is wheat or barley. Control of leaf diseases with fungicides may be warranted, even for those varieties with an above average rating.

Bacterial leaf streak (BLS) cannot be controlled with fungicides. Variety selection of more resistant varieties is the only recommended practice at this time if you have a history of problems with this disease. CP3915, Dyna-Gro Ballistic, Lang-MN, LCS Rebel, LCS Trigger, MN-Torgy, MN-Washburn, ND Frohberg, SY Longmire, SY Valda, and TCG-Spitfire provide the best resistance against BLS.

Lang-MN, LCS Buster, and LCS Trigger provide the best resistance against FHB while another thirteen varieties have a rating of 4 for FHB. Combined, this group of varieties includes some of the top yielders and varieties with higher grain protein.

BARLEY

Kevin Smith, Ruth Dill-Macky, Jochum Wiersma,
Brian Steffenson, Karen Beaubien and Ed Schiefelbein

The results of the variety performance evaluations for spring barley are summarized in Tables 8 through 12. The varietal characteristics and disease reactions are presented in Tables 8 and 9. Tables 10 through 12 present the relative grain yield of the tested varieties in single and multiple year comparisons. The average yield across the 13 testing locations was 80 bu/acre in 2021 (Table 12). This is down from a state average of 95 bu/A in 2020. No doubt this is at least in part due to the extreme heat in June and subsequent drought in many parts of the state. The highest yields this year were recorded in Stephen with 114 bu/A (Table 10) while the lowest grain yields were recorded in Becker with 29 bu/A (Table 11).

This year's report contains several new entries that have only been tested in 2021. As always, one should exercise caution interpreting data from a single year. This is particularly true for this past year with extreme weather which may not be representative of future years. Given that caveat, BC Ellinor and BC Leandra were the highest yielding varieties based on the 2021 state average (Table 12). In general, the six-row varieties, with the exception of Quest, had lower stem breakage. Grain protein content varied between 11.2% and 12.9% with values not available for newer entries in the trial. Brewers in general require low grain protein with all-malt brewers desiring less protein than adjunct brewers.

Table 9 describes the reaction of this year's entries to four major diseases in the region. Disease reaction is based on data from at least two experiments and scored from 1–9; where 1 is most resistant and 9 is most susceptible. Net blotch can be an important disease, however we have only obtained useful data in 2020 which is not presented since it is only a single year of data. It is notable that Pinnacle is highly susceptible to net blotch. Conlon continues to be the variety with the best resistance to Fusarium head blight expressed as lower concentrations of vomitoxin or DON. All the varieties tested are susceptible to the QCC 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 (BLS) cannot be controlled by fungicides and there are some differences in resistance among the current varieties.



OATS

Kevin P. Smith, Ruth Dill-Macky, Dimitri von Ruckert, Karen Beaubien, Jochum Wiersma

Entries in the state oat variety trial were evaluated in 14 locations. In addition, entries were evaluated for disease resistance to crown rust, barley yellow dwarf virus (BYDV), and smut in dedicated, inoculated nurseries. This past summer, we observed no crown rust in our nursery in St. Paul due to extreme heat and drought. Therefore, the crown rust ratings are based on data from previous years.

The results of the variety evaluations are summarized in Tables 13 to 17. The origin and agronomic characteristics of the tested oat varieties are listed in Table 13. Maturity, height, and test weight data are presented as statewide averages from 2019-2021 except where noted. Lodging data is also a statewide average from the same period, but only from locations where lodging was present. Maturity, height, and lodging are important considerations for variety selection based on the intended location and expected end use of the crop.

Crown rust continues to be a major limiting factor to oat production in Minnesota that must be managed to achieve optimal yield. Buckthorn (*Rhamnus cathartica* L.), the alternate host of crown rust is widespread in Minnesota, allowing for a persistent and particularly aggressive pathogen population. 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 with little to no disease. Crown rust and other disease resistance ratings are listed in Table 14. All disease scores were converted to a 1-9 scale. A score of 1 is very resistant and a score of 9 is very susceptible. 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. Deon, Saddle and Warrior appear to be the best varieties for crown rust resistance.

Other important diseases include BYDV and smut which were evaluated in inoculated nurseries at the University of Illinois and the University of Minnesota, respectively. We observed little difference among the tested varieties for resistance to BYDV. A seed treatment and certified seed should be used to manage smut. Choose the varieties with the lowest disease ratings in an organic production system and plant as early as possible to reduce the risk of yield losses caused by BYDV or crown rust.

For grain production, lodging and grain quality traits should be considered when choosing a variety (Table 13). Oat varieties with high protein and low oil are preferred in the food market. High test weight, as a proxy for milling yield, is very important in both the food and feed markets. Contact your local elevator or buyer and ask whether they prefer particular varieties.

Tables 15 through 17 present the relative grain yield of the tested varieties in single and multiple year comparisons. For 2021, the highest yields were in Crookston and the lowest yields in Waseca. Hayden followed by Deon and MN-Pearl were the top yielding varieties in statewide averages for 2021. These same three varieties performed well in both the northern and southern regions in 2021. However, some varieties perform differently in the north and south. In general, earlier maturing varieties perform better in southern Minnesota because flowering can occur when it is cooler. Similarly, later performing varieties tend to perform better in northern Minnesota.



Table 1. Origin and agronomic characteristics of hard red spring wheat varieties in Minnesota in single-year (2021) 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) (pending)	1.3	55.6	26.2	4-5
AP Murdock	2020 AgriPro/Syngenta	PVP (94) (pending)	1.3	55.3	25.2	5
AP Smith	2021 AgriPro/Syngenta	PVP (94) (pending)	1.3	58.1	24.7	2-3
Bolles	2015 MN	PVP (94)	1.3	58.4	28.3	4
CAG Justify	2021 Champions Alliance Group	PVP (94) (pending)	1.3	57.5	26.8	-
CAG Reckless	2021 Champions Alliance Group	PVP (94) (pending)	1.3	56.3	27.3	-
CP3099A	2020 CROPLAN by WinField United	PVP (94) (pending)	1.3	60.9	27.0	-
CP3119A	2021 CROPLAN by WinField United	PVP (94) (pending)	1.3	61.0	26.3	-
CP3188	2020 CROPLAN by WinField United	PVP (94) (pending)	1.3	56.1	27.7	-
CP3530	2015 CROPLAN by WinField United	Patented	1.3	58.1	28.3	5
CP3915	2019 CROPLAN by WinField United	PVP (94) (pending)	1.3	57.2	26.3	4
Driver	2020 SDSU	PVP (94) (pending)	1.3	57.7	28.2	4
Dyna-Gro Ambush	2016 Dyna-Gro	PVP (94)	1.4	54.5	26.9	4
Dyna-Gro Ballistic	2018 Dyna-Gro	PVP (94)	1.1	57.0	26.3	5
Dyna-Gro Commander	2019 Dyna-Gro	PVP (94)	1.4	54.9	25.9	4
Lang-MN	2017 MN	PVP (94)	0.9	56.9	26.6	4
LCS Buster	2020 Limagrain Cereal Seeds	PVP (94) (pending)	1.3	60.0	27.7	5
LCS Cannon	2018 Limagrain Cereal Seeds	PVP (94)	1.3	53.5	25.5	4
LCS Rebel	2017 Limagrain Cereal Seeds	PVP (94)	1.3	55.0	27.8	6
LCS Trigger	2016 Limagrain Cereal Seeds	PVP (94)	1.3	60.2	26.4	5
Linkert	2013 MN	PVP (94)	1.3	55.2	25.8	2
MN-Torgy	2020 MN	PVP (94) (pending)	1.3	55.7	25.6	4
MN-Washburn	2019 MN	PVP (94)	1.3	57.3	25.3	3
MS Barracuda	2018 Meridian Seeds	PVP (94)	1.3	53.3	26.0	3
MS Cobra	2022 Meridian Seeds	PVP (94) (pending)	1.3	55.3	26.9	-
MS Rancho	2020 Meridian Seeds	PVP (94) (pending)	1.3	54.8	26.1	4-5
ND Frohberg	2020 NDSU	PVP (94) (pending)	1.3	56.8	28.2	4-5
PFS-Buns	2021 Peterson Farms Seed	PVP (94) (pending)	1.3	62.0	24.7	-
Prosper	2011 NDSU	PVP (94)	1.3	57.8	28.5	6
Shelly	2016 MN	PVP (94)	1.3	57.9	26.3	5
SY 611 CL2 ⁵	2019 AgriPro/Syngenta	PVP (94)	1.3	56.1	24.9	4
SY Longmire ⁶	2019 AgriPro/Syngenta	PVP (94)	1.3	56.9	26.1	4
SY McCloud	2019 AgriPro/Syngenta	PVP (94)	1.3	55.4	26.1	4
SY Valda	2015 AgriPro/Syngenta	PVP (94)	1.3	56.9	25.4	5
TCG-Heartland	2019 21st Century Genetics	PVP (94), Patent pending	1.6	54.3	24.9	3
TCG-Spitfire	2016 21st Century Genetics	PVP (94)	1.5	59.2	26.4	3
TCG-Wildcat	2020 21st Century Genetics	PVP (94) (pending), Patent pending	1.5	57.7	26.9	3
WB9479	2017 WestBred	Patented, PVP (94)	1.3	54.3	24.3	3
WB9590	2017 WestBred	Patented, PVP (94)	1.3	54.7	23.6	3
Mean				57.0	26.2	

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 2021 data

⁴ 1-9 scale in which 1=strongest straw, 9=weakest straw. Based on 2016-2021 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 has tolerance to Beyond® herbicide.

⁶ SY Longmire has solid stems.



Table 2. Grain quality of hard red spring wheat varieties in Minnesota in single-year (2021) and multiple-year comparisons.

Entry	Test Weight (lb/Bu)		Protein (%) ¹		Baking Quality ²	Pre-Harvest Sprouting ³
	2021	2 yr	2021	2 yr		
AP Gunsmoke CL2	60.8	-	15.0	-	-	3
AP Murdock	60.9	60.3	14.8	14.8	5	1
AP Smith	61.5	-	15.0	-	-	4
Bolles	61.2	60.1	16.5	16.6	1	1
CAG Justify	59.3	-	14.0	-	-	3
CAG Reckless	62.3	-	14.9	-	-	4
CP3099A	59.2	-	12.8	-	-	1
CP3119A	57.1	-	13.3	-	-	3
CP3188	59.6	-	13.3	-	-	3
CP3530	60.8	60.1	15.0	15.1	3	1
CP3915	62.2	61.4	15.0	15.0	4	1
Driver	63.1	-	14.0	-	-	3
Dyna-Gro Ambush	62.4	61.9	14.9	15.0	2	3*
Dyna-Gro Ballistic	61.1	60.2	14.0	14.1	5	3*
Dyna-Gro Commander	62.1	61.0	14.7	14.9	6	1
Lang-MN	61.8	61.1	15.0	15.2	3	1
LCS Buster	59.1	-	12.8	-	-	4
LCS Cannon	63.4	62.1	14.6	14.6	4	3*
LCS Rebel	63.0	62.1	15.0	15.1	3	5
LCS Trigger	61.0	60.5	13.4	13.1	7	1
Linkert	62.6	61.4	15.9	15.8	1	1
MN-Torgy	62.4	61.2	15.3	15.2	4	1
MN-Washburn	61.6	60.7	14.4	14.6	3	1
MS Barracuda	62.1	61.0	14.9	15.1	4	3
MS Cobra	62.3	-	14.8	-	-	4
MS Rancho	61.1	-	14.0	-	-	4
ND Frohberg	62.1	-	14.8	-	-	4
PFS-Buns	58.8	-	14.4	-	-	4
Prosper	61.1	60.3	14.2	14.3	5	1
Shelly	62.2	60.9	14.1	14.2	5	1
SY 611 CL2	62.3	61.3	14.7	15.0	6	2*
SY Longmire	62.0	60.8	14.9	15.1	3	2*
SY McCloud	63.0	62.0	15.6	15.6	3	2*
SY Valda	62.0	61.1	14.2	14.5	6	2
TCG-Heartland	62.6	61.8	15.3	15.5	2	2
TCG-Spitfire	60.8	60.3	14.2	14.2	3	3*
TCG-Wildcat	62.2	-	14.7	-	-	1
WB9479	62.0	-	15.7	-	2	1
WB9590	61.9	-	15.4	-	4	1
Mean	61.5	61.0	14.6	14.9		
No. Environments	11	21	11	21		

¹ 12% moisture basis.

² 2014-2020 crop years, where applicable

³ 1-9 scale in which 1 is best and 9 is worst. Values of 1-2 should be considered as resistant. Falling number data was collected from nine 2019 locations. Varieties with an * following their pre-harvest sprouting rating had lower than expected falling numbers based on their PHS rating.



Table 3. Disease reactions¹ 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	7	6	4
AP Murdock	3	-	1	4	6	7
AP Smith	6	-	1	4	4	6
Bolles	2	1	2	4	3	5
CAG Justify	-	-	2	-	-	-
CAG Reckless	-	-	1	-	-	-
CP3099A	-	-	8	-	-	-
CP3119A	-	-	2	-	-	-
CP3188	-	-	6	-	-	-
CP3530	3	3	1	4	4	4
CP3915	1	-	1	2	5	4
Driver	3	-	1	3-4	5	4
Dyna-Gro Ambush	2	-	2	5	4	4
Dyna-Gro Ballistic	3	-	3	3	5	5
Dyna-Gro Commander	2	-	1	4	6	5
Lang-MN	1	-	2	3	4	3
LCS Buster	2	-	1	4	3	3
LCS Cannon	3	-	2	5	7	4
LCS Rebel	6	-	2	3	4	4
LCS Trigger	1	-	2	2	3	3
Linkert	3	1	1	5	4	5
MN-Torgy	3	-	1	3	3	4
MN-Washburn	1	2	1	3	3	4
MS Barracuda	6	-	2	7	5	5
MS Cobra	-	-	1	-	-	-
MS Ranchero	1	-	1	6-7	3	4
ND Frohberg	3	-	1	3	4	5
PFS-Buns	-	-	1	-	-	-
Prosper	6	5	2	4	4	5
Shelly	3	1	2	6	4	4
SY 611 CL2	3	-	5	4	4	4
SY Longmire	5	-	1	3	5	7
SY McCloud	3	-	1	5	5	5
SY Valda	1	2	1	3	4	4
TCG-Heartland	3	-	2	5	5	6
TCG-Spitfire	4	-	2	3	4	5
TCG-Wildcat	3	-	3	6-7	7	6
WB9479	6	-	2	6	5	7
WB9590	6	-	2	6	6	7

¹ 1-9 scale where 1=most resistant, 9=most susceptible.

² Based on natural infections in 2015 at Kimball, Lamberton, and Waseca.

³ Stem rust levels have been very low in production fields in recent years, even on susceptible varieties.

⁴ Bacterial leaf streak symptoms are highly variable from one environment to the next. The rating of entries may change as more data is collected.

⁵ Combined rating of tan spot and septoria.



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

Entry	Crookston			Fergus Falls			Hallock			Oklee		
	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr
AP Gunsmoke CL2	107	106	-	100	101	-	102	101	-	107	113	-
AP Murdock	92	100	104	89	94	97	92	95	101	86	100	103
AP Smith	99	98	-	106	101	-	100	95	-	101	98	-
Bolles	90	92	96	99	96	95	88	91	94	91	91	92
CAG Justify	89	-	-	111	-	-	109	-	-	106	-	-
CAG Reckless	113	-	-	107	-	-	105	-	-	103	-	-
CP3099A	87	-	-	120	-	-	113	-	-	140	-	-
CP3119A	110	-	-	115	-	-	100	-	-	116	-	-
CP3188	112	-	-	107	-	-	102	-	-	106	-	-
CP3530	74	84	91	99	98	100	93	102	102	90	96	96
CP3915	86	95	100	95	98	102	108	99	99	94	91	96
Driver	99	99	-	108	107	-	103	108	-	121	114	-
Dyna-Gro Ambush	118	111	108	107	103	103	96	100	100	89	98	100
Dyna-Gro Ballistic	96	101	105	106	107	110	102	102	105	116	110	112
Dyna-Gro Commander	104	98	100	98	100	101	96	99	101	96	98	100
Lang-MN	104	101	100	91	97	97	98	100	98	89	93	96
LCS Buster	90	97	-	107	112	-	106	108	-	111	120	-
LCS Cannon	87	93	97	92	95	99	103	96	100	101	103	104
LCS Rebel	94	96	100	101	102	99	92	99	99	119	105	104
LCS Trigger	96	106	111	96	109	110	102	114	113	102	111	115
Linkert	111	100	98	92	94	93	104	100	99	78	86	89
MN-Torgy	104	105	103	98	103	104	99	96	100	94	101	102
MN-Washburn	89	94	97	88	95	98	101	99	100	96	97	100
MS Barracuda	81	88	93	94	95	95	102	98	97	111	106	107
MS Cobra	99	-	-	109	-	-	101	-	-	89	-	-
MS Rancho	127	113	-	95	95	-	101	104	-	100	102	-
ND Frohberg	119	105	-	97	101	-	89	88	-	104	101	-
PFS-Buns	105	-	-	98	-	-	98	-	-	116	-	-
Prosper	94	102	105	109	110	110	102	103	102	103	107	107
Shelly	98	102	105	109	109	112	103	106	108	102	104	105
SY 611 CL2	92	97	100	113	108	107	106	98	101	102	107	106
SY Longmire	92	94	98	101	99	102	95	94	96	98	95	99
SY McCloud	109	99	98	95	98	98	104	103	100	99	101	99
SY Valda	94	98	102	96	101	99	105	106	108	109	105	106
TCG-Heartland	101	101	100	92	97	96	93	90	90	95	94	94
TCG-Spitfire	95	102	103	118	112	110	106	98	98	92	99	101
TCG-Wildcat	88	95	-	107	104	-	100	98	-	101	99	-
WB9479	97	104	-	89	94	-	90	96	-	96	101	-
WB9590	98	106	-	102	102	-	93	106	-	90	98	-
Mean (Bu/Acre)	57.8	64.1	68.6	74.9	78.3	79.7	72.0	68.8	74.3	69.7	74.7	71.0
LSD (0.10)	24	14	9	11	9	7	10	13	8	18	14	10



and multiple-year comparisons (2019-2021).

Perley			Roseau			Stephen			Strathcona		
2021	2 Yr	3 Yr	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr
107	100	-	101	100	-	102	101	-	108	100	-
98	103	106	95	101	104	89	105	105	95	109	109
98	97	-	95	99	-	103	105	-	106	95	-
104	102	98	99	97	94	89	91	94	90	87	89
107	-	-	102	-	-	103	-	-	100	-	-
103	-	-	105	-	-	108	-	-	105	-	-
103	-	-	110	-	-	121	-	-	98	-	-
92	-	-	122	-	-	128	-	-	99	-	-
107	-	-	106	-	-	111	-	-	104	-	-
95	99	102	106	100	101	108	102	102	100	105	102
100	98	96	93	105	107	88	95	102	103	92	95
108	109	-	101	99	-	103	106	-	105	98	-
103	105	98	104	98	95	90	99	98	105	105	104
98	102	101	102	110	110	106	107	108	100	96	99
101	97	103	104	101	104	98	103	103	111	106	103
96	96	97	88	95	96	105	97	98	94	105	105
108	113	-	103	112	-	109	113	-	99	106	-
104	108	111	110	101	103	109	101	104	110	105	103
93	100	102	103	107	106	85	91	96	111	107	106
103	113	113	96	107	111	108	110	111	99	106	110
88	89	88	88	89	89	101	92	93	98	89	89
104	100	100	93	98	101	101	108	106	102	103	103
99	98	99	103	88	92	90	94	97	94	82	88
101	92	96	105	96	97	94	93	96	112	110	108
102	-	-	104	-	-	95	-	-	104	-	-
102	101	-	105	108	-	91	104	-	100	114	-
96	94	-	100	96	-	96	91	-	104	100	-
111	-	-	107	-	-	113	-	-	85	-	-
109	105	100	106	107	105	114	113	110	93	95	100
91	92	94	100	95	101	103	99	103	105	109	107
98	98	96	101	103	102	95	99	104	103	97	100
100	98	91	95	92	93	106	103	105	99	83	89
95	96	95	106	102	101	93	85	92	100	101	100
96	101	99	107	102	109	110	115	116	102	105	106
78	94	98	101	98	96	87	98	98	99	93	92
116	111	111	98	99	104	106	101	102	106	101	100
107	104	-	101	104	-	92	104	-	111	106	-
99	92	-	92	92	-	89	96	-	103	102	-
98	103	-	101	103	-	87	90	-	100	105	-
85.3	76.4	73.8	90.7	89.5	87.9	68.6	70.6	73.8	60.2	65.4	68.0
10	12	11	9	14	11	13	15	10	6	16	11



Table 5. Relative grain yield of hard red spring wheat varieties in southern Minnesota locations in single-year (2021) and multiple-year comparisons (2019-2021).

Entry	Becker ¹		Benson			Le Center			Lamberton			Morris			St. Paul			Waseca ²
	2021	2 Yr	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr	2 Yr
AP Gunsmoke CL2	104	-	96	100	-	110	106	-	106	91	-	105	103	-	89	94	-	-
AP Murdock	104	112	89	93	99	93	101	106	99	100	104	91	98	99	110	109	112	123
AP Smith	92	-	103	104	-	102	98	-	103	101	-	104	108	-	105	99	-	-
Bolles	79	83	102	100	100	89	87	87	90	96	91	101	100	99	101	99	100	99
CAG Justify	87	-	112	-	-	88	-	-	99	-	-	128	-	-	106	-	-	-
CAG Reckless	125	-	99	-	-	96	-	-	99	-	-	103	-	-	109	-	-	-
CP3099A	103	-	113	-	-	90	-	-	119	-	-	135	-	-	92	-	-	-
CP3119A	123	-	108	-	-	105	-	-	110	-	-	125	-	-	91	-	-	-
CP3188	108	-	110	-	-	109	-	-	121	-	-	125	-	-	107	-	-	-
CP3530	95	103	101	107	111	109	106	110	100	99	102	95	95	102	103	103	106	103
CP3915	109	102	99	94	99	95	96	95	100	103	104	97	100	104	77	82	86	84
Driver	104	-	109	103	-	100	98	-	118	113	-	106	106	-	103	102	-	-
Dyna-Gro Ambush	91	103	104	104	99	110	107	109	95	94	99	65	87	91	118	112	113	114
Dyna-Gro Ballistic	112	109	94	105	105	104	104	103	97	103	106	107	107	111	84	97	98	108
Dyna-Gro Commander	112	109	111	112	105	106	104	102	96	99	98	101	109	111	119	111	110	114
Lang-MN	98	98	90	95	95	99	97	99	96	94	99	98	101	98	115	106	105	106
LCS Buster	125	-	103	105	-	99	103	-	102	109	-	95	106	-	111	105	-	-
LCS Cannon	101	111	111	101	96	111	111	110	101	102	100	68	91	94	115	118	115	113
LCS Rebel	96	101	103	101	100	97	99	98	104	106	105	113	105	103	107	106	100	109
LCS Trigger	116	111	106	118	118	116	112	114	117	119	121	124	129	123	122	111	109	116
Linkert	98	100	92	97	93	100	94	91	94	92	91	91	91	91	101	101	99	91
MN-Torgy	105	102	102	102	104	105	106	106	95	104	103	104	107	108	112	105	104	106
MN-Washburn	94	92	96	93	93	100	102	100	96	100	97	111	102	100	102	95	101	101
MS Barracuda	93	106	95	95	94	109	108	107	99	100	91	71	81	84	116	114	113	101
MS Cobra	96	-	94	-	-	105	-	-	100	-	-	101	-	-	114	-	-	-
MS Rancho	92	-	111	102	-	102	96	-	97	95	-	90	96	-	103	109	-	-
ND Frohberg	101	-	109	104	-	102	99	-	97	98	-	103	106	-	102	103	-	-
PFS-Buns	100	-	106	-	-	102	-	-	99	-	-	112	-	-	85	-	-	-
Prosper	111	104	105	105	104	104	106	104	97	107	109	120	112	115	88	99	98	95
Shelly	97	100	103	107	103	105	106	103	102	101	95	109	112	109	117	106	107	102
SY 611 CL2	104	105	106	98	102	96	91	93	102	97	95	92	93	98	89	96	92	96
SY Longmire	107	90	99	94	97	96	94	92	107	109	106	114	105	96	63	78	81	71
SY McCloud	83	92	96	93	91	103	100	96	98	90	94	81	86	91	92	100	99	94
SY Valda	95	102	97	102	106	105	105	110	104	100	102	99	100	101	101	99	100	110
TCG-Heartland	92	100	88	95	97	97	96	93	97	96	91	88	87	90	91	97	101	101
TCG-Spitfire	107	103	111	109	114	106	103	105	118	122	124	104	117	116	95	96	100	94
TCG-Wildcat	108	-	96	96	-	103	103	-	114	110	-	106	103	-	110	104	-	-
WB9479	89	-	96	92	-	103	99	-	86	88	-	86	89	-	92	95	-	-
WB9590	86	-	97	98	-	101	105	-	104	103	-	86	91	-	96	103	-	-
Mean (Bu/Acre)	42.4	60.1	60.8	72.7	81.2	70.9	74.8	69.8	60.1	61.6	49.1	54.7	50.7	55.8	48.1	61.3	64.8	44.3
LSD (0.10)	19.2	16.0	11.0	10.8	10.4	8.0	8.4	8.0	17.5	14.3	13.6	18.7	18.3	14.5	8.9	10.6	8.8	15.6



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Table 6. Relative grain yield of hard red spring wheat varieties in Minnesota in single-year (2021) and multiple-year comparisons (2019-2021).

Entry	State			North			South		
	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr	2021	2 Yr	3 Yr
AP Gunsmoke CL2	103	101	-	104	102	-	102	100	-
AP Murdock	94	101	104	92	101	103	97	101	106
AP Smith	101	99	-	101	98	-	102	101	-
Bolles	94	94	94	94	93	94	94	95	95
CAG Justify	104	-	-	104	-	-	103	-	-
CAG Reckless	105	-	-	106	-	-	104	-	-
CP3099A	111	-	-	112	-	-	109	-	-
CP3119A	110	-	-	110	-	-	110	-	-
CP3188	109	-	-	107	-	-	114	-	-
CP3530	98	100	102	96	98	99	101	101	106
CP3915	96	96	98	96	97	99	96	95	97
Driver	106	105	-	106	105	-	107	104	-
Dyna-Gro Ambush	100	102	102	101	102	100	97	102	104
Dyna-Gro Ballistic	102	104	106	103	105	106	100	104	105
Dyna-Gro Commander	103	103	103	101	100	102	107	108	106
Lang-MN	96	98	99	95	98	98	99	99	99
LCS Buster	105	109	-	104	110	-	105	108	-
LCS Cannon	102	102	103	103	100	102	102	106	105
LCS Rebel	101	102	101	100	101	101	103	103	102
LCS Trigger	106	113	113	100	109	111	116	118	116
Linkert	95	93	92	94	92	92	96	95	94
MN-Torgy	101	102	103	99	101	102	104	104	105
MN-Washburn	97	95	97	96	93	96	100	99	98
MS Barracuda	99	98	99	100	97	98	98	100	99
MS Cobra	101	-	-	101	-	-	102	-	-
MS Rancho	101	103	-	102	105	-	100	99	-
ND Frohberg	101	99	-	100	97	-	102	102	-
PFS-Buns	103	-	-	104	-	-	101	-	-
Prosper	104	105	105	104	105	105	104	105	105
Shelly	103	103	104	101	102	104	105	105	103
SY 611 CL2	100	99	100	101	101	102	98	95	97
SY Longmire	98	95	95	98	95	96	98	95	92
SY McCloud	98	96	96	100	98	97	93	93	94
SY Valda	102	103	105	103	104	105	100	101	104
TCG-Heartland	93	95	95	93	96	95	93	95	96
TCG-Spitfire	106	105	106	105	103	103	107	108	109
TCG-Wildcat	103	102	-	101	102	-	106	103	-
WB9479	94	95	-	94	97	-	93	93	-
WB9590	96	101	-	96	102	-	96	100	-
Mean (Bu/Acre)	65.4	68.1	69.0	72.4	73.6	74.9	56.2	60.9	61.6
LSD (0.10)	5	4	3	6	5	3	9	5	5
No. Environments	14	28	43	8	16	24	6	12	19



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

Entry	North						South						State					
	2021		2-year		3-year		2021		2-year		3-year		2021		2-year		3-year	
	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int
AP Gunsmoke CL2	76.6	83.5	78.8	83.9	-	-	60.4	70.6	54.1	61.3	-	-	68.5	77.1	66.5	72.6	-	-
AP Murdock	69.7	71.2	77.2	81.3	81.3	84.2	54.6	61.6	55.7	58.3	55.2	60.2	62.2	66.4	66.4	69.8	68.2	72.2
AP Smith	71.6	73.7	75.7	75.4	-	-	59.6	68.0	58.5	59.7	-	-	65.6	70.9	67.1	67.6	-	-
Bolles	70.9	74.9	72.6	73.9	74.1	74.9	54.4	61.3	54.7	58.7	52.1	56.9	62.6	68.1	63.7	66.3	63.1	65.9
CAG Justify	71.7	88.8	-	-	-	-	64.7	70.2	-	-	-	-	68.2	79.5	-	-	-	-
CAG Reckless	80.5	81.9	-	-	-	-	57.9	61.1	-	-	-	-	69.2	71.5	-	-	-	-
CP3099A	75.0	88.2	-	-	-	-	72.6	87.6	-	-	-	-	73.8	87.9	-	-	-	-
CP3119A	87.3	101.0	-	-	-	-	67.3	77.7	-	-	-	-	77.3	89.3	-	-	-	-
CP3188	80.4	89.2	-	-	-	-	70.7	73.7	-	-	-	-	75.6	81.5	-	-	-	-
CP3530	69.3	75.9	71.6	80.9	75.5	84.1	56.0	64.5	54.6	60.6	54.6	60.7	62.6	70.2	63.1	70.7	65.1	72.4
CP3915	66.9	81.4	77.3	83.9	81.2	85.3	56.6	67.7	57.2	61.8	53.8	59.9	61.7	74.6	67.2	72.9	67.5	72.6
Driver	74.4	88.1	76.1	80.6	-	-	64.5	65.7	61.7	60.2	-	-	69.4	76.9	68.9	70.4	-	-
Dyna-Gro Ambush	81.0	78.4	79.3	77.5	78.9	76.6	46.1	64.4	51.5	59.5	51.1	60.1	63.5	71.4	65.4	68.5	65.0	68.3
Dyna-Gro Ballistic	73.7	87.3	81.5	84.3	84.5	88.9	58.3	66.8	58.9	65.2	57.9	65.0	66.0	77.0	70.2	74.7	71.2	76.9
Dyna-Gro Commander	77.3	83.0	76.8	80.2	80.0	83.1	56.6	64.8	58.1	61.1	56.3	59.3	66.9	73.9	67.4	70.6	68.2	71.2
Lang-MN	69.8	73.3	74.8	76.6	76.7	80.0	55.5	65.0	54.6	60.6	53.3	60.2	62.6	69.2	64.7	68.6	65.0	70.1
LCS Buster	72.4	87.8	81.2	87.2	-	-	56.9	78.6	60.8	70.7	-	-	64.6	83.2	71.0	79.0	-	-
LCS Cannon	75.1	82.3	74.9	80.4	78.4	82.9	49.0	71.6	54.6	64.4	52.6	60.9	62.1	77.0	64.8	72.4	65.5	71.9
LCS Rebel	73.9	82.2	78.4	79.7	80.9	80.1	62.1	61.8	59.2	59.2	55.8	59.0	68.0	72.0	68.8	69.4	68.4	69.6
LCS Trigger	71.3	82.8	81.7	83.8	87.0	90.2	68.9	77.2	69.1	74.4	64.3	71.6	70.1	80.0	75.4	79.1	75.7	80.9
Linkert	71.9	69.6	71.9	74.6	72.6	76.7	53.0	66.3	51.5	58.7	48.7	54.8	62.4	67.9	61.7	66.7	60.7	65.7
MN-Torgy	72.0	73.7	77.3	77.3	79.6	82.3	56.9	66.6	59.3	59.8	57.4	59.0	64.4	70.1	68.3	68.6	68.5	70.6
MN-Washburn	72.4	74.6	69.5	82.5	73.5	83.8	59.4	66.0	56.9	59.3	55.0	59.2	65.9	70.3	63.2	70.9	64.2	71.5
MS Barracuda	70.8	80.0	71.1	75.5	74.8	78.2	49.2	61.4	51.6	56.0	47.7	53.5	60.0	70.7	61.3	65.8	61.3	65.9
MS Cobra	75.9	80.5	-	-	-	-	57.6	66.6	-	-	-	-	66.7	73.6	-	-	-	-
MS Ranchoero	84.5	81.6	84.3	79.7	-	-	53.7	63.8	53.8	54.9	-	-	69.1	72.7	69.1	67.3	-	-
ND Frohberg	79.8	80.9	76.7	77.2	-	-	57.2	62.0	57.5	58.7	-	-	68.5	71.4	67.1	68.0	-	-
PFS-Buns	78.9	91.0	-	-	-	-	60.4	72.1	-	-	-	-	69.7	81.5	-	-	-	-
Prosper	75.1	83.6	80.3	84.8	82.4	88.8	62.0	71.7	61.4	66.7	60.0	66.3	68.5	77.7	70.8	75.7	71.2	77.5
Shelly	73.5	82.7	75.2	85.5	80.4	87.6	60.4	73.4	59.4	62.2	55.6	61.2	67.0	78.1	67.3	73.9	68.0	74.4
SY 611 CL2	72.5	79.6	77.3	81.4	79.1	86.2	56.0	65.7	53.5	58.9	51.9	56.8	64.2	72.7	65.4	70.2	65.5	71.5
SY Longmire	69.6	76.7	71.5	78.3	74.7	81.2	63.5	69.2	60.0	62.3	54.9	58.9	66.5	73.0	65.7	70.3	64.8	70.0
SY McCloud	79.6	73.0	77.3	75.5	77.7	78.4	51.6	63.7	49.6	55.3	48.9	53.9	65.6	68.3	63.4	65.4	63.3	66.2
SY Valda	75.8	84.0	77.2	84.3	82.7	88.3	58.1	71.8	56.3	62.8	54.6	60.9	67.0	77.9	66.7	73.6	68.7	74.6
TCG-Heartland	75.2	75.4	76.5	79.0	76.4	80.5	53.2	69.0	51.6	57.7	49.3	56.0	64.2	72.2	64.0	68.3	62.8	68.3
TCG-Spitfire	72.0	85.9	77.0	87.7	81.2	89.7	63.9	74.9	67.7	71.1	63.6	67.5	67.9	80.4	72.3	79.4	72.4	78.6
TCG-Wildcat	71.0	81.7	77.4	83.5	-	-	63.2	63.0	60.2	60.2	-	-	67.1	72.4	68.8	71.8	-	-
WB9479	70.1	73.3	74.3	75.3	-	-	49.4	62.7	49.5	55.5	-	-	59.7	68.0	61.9	65.4	-	-
WB9590	74.4	83.0	80.2	85.2	-	-	54.7	60.3	55.1	58.0	-	-	64.5	71.0	67.7	71.6	-	-
Mean (Bu/Acre)	74.3	80.1	76.8	79.8	78.5	82.6	57.4	67.6	56.3	60.6	53.9	59.4	65.8	73.8	66.5	70.2	66.2	71.0
LSD (0.10)	11.7	9.9	7.8	7.7	5.9	6.0	8.7	9.1	5.8	6.0	4.8	4.8	7.6	6.5	5.0	4.8	3.8	3.8
No. Environments	2	2	4	4	6	6	2	2	4	4	6	6	4	4	8	8	12	12

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High Protein

Visit the Minnesota Agricultural Experiment Station at www.maes.umn.edu or check your state or local variety trials.
For a list of seed producers, visit the Minnesota Crop Improvement Association at www.mncia.org or call 1-800-510-6242.

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Table 8. Origin and agronomic characteristics of barley varieties in multiple-year comparisons (2019-2021).

Variety	Origin ¹	Year of Release	Legal Status	Days to Heading (days)	Plant Height (inches)	Stem Breakage (%)	Plump ⁴ (%)	Protein ⁴ (%)
2-row								
AAC Connect ¹	AAFC	2017	Yes	59	28	13	-	-
AAC Synergy	AAFC	2012	Yes	60	28	16	92	11.4
ABI Cardinal ²	ABI	NA	Yes	61	28	9	-	-
BC Ellinor ²	LCS/BC	NA	NA	61	29	11	-	-
BC Leandra ²	LCS/BC	NA	NA	62	26	22	-	-
BC Lexi ²	LCS/BC	NA	NA	61	27	22	-	-
Conlon	ND	1996	Yes	56	27	56	92	12.3
KWS Fantex ¹	KWS	NA	Pending	62	26	25	-	-
ND Genesis	ND	2015	Yes	59	29	20	96	11.2
6-row								
Lacey	MN	2000	Yes	57	30	0	92	12.4
Quest ¹	MN	2010	Yes	57	30	63	-	-
Rasmusson ¹	MN	2008	Yes	57	28	0	92	11.3
Robust	MN	1984	Expired	57	32	7	92	11.8
Tradition	ABI	2003	Yes	56	30	0	91	12.9
No. Environments				8	8	6	3	3

¹ Line tested in 2020 and 2021

² Line tested in 2021 only

³ Agriculture and Agri-Food Canada (AAFC), Anheuser-Busch InBev (ABI), Limagrain Breun (LCS/BC), North Dakota State University (ND), KWS Lochow GmbH (KWS), University of Minnesota (MN)

⁴ Data available from 3 locations in 2019 only.

Table 9. Disease reactions of barley varieties in multiple year comparisons (2019-2021).

Variety	DON ^{3,4}	Spot Blotch ^{3,4}	Stem Rust ^{3,5}	Bacterial Leaf Streak ³
----- (1-9) -----				
2-row				
AAC Connect ¹	3	1	4	3
AAC Synergy	8	1	5	3
ABI Cardinal ²	-	-	4	4
BC Ellinor ²	-	-	7	3
BC Leandra ²	-	-	7	4
BC Lexi ²	-	-	6	2
Conlon	2	7	3	5
KWS Fantex ¹	3	9	4	6
ND Genesis	4	2	6	5
6-row				
Lacey	5	0	5	5
Quest	3	4	4	5
Rasmusson	7	0	6	5
Robust	7	0	4	4
Tradition	3	1	4	6
No. Environments	4	2	3	4

¹ Line tested in 2020 and 2021

² Line tested in 2021 only

³ Trait measured on a scale from 0-9 where 1=resistant and 9=susceptible, NA=not available. Deoxynivalenol (DON) is the mycotoxin produced by the Fusarium head blight pathogen.

⁴ Data for 2019 and 2020 only.

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



Table 10. Relative grain yield of barley varieties in northern Minnesota locations in a single-year (2021) and multiple-year comparisons (2019-2021).

Variety	Crookston			Hallock			Oklee			Perley			Roseau		Stephen			Strathcona			
	2021	3 yr ³		2021	2 yr	3 yr	2021	2 yr	3 yr	2021	2 yr	3 yr	2021	3 yr ³	2021	2 yr	3 yr	2021	2 yr	3 yr	
-----(% of mean)-----																					
2-row																					
AAC Connect ¹	102	-		108	113	-	98	98	-	116	109	-	95	-		99	97	-	104	130	-
AAC Synergy	96	102		100	107	106	95	106	102	103	103	101	104	104		112	110	103	93	123	127
ABI Cardinal ²	109	-		114	-	-	98	-	-	97	-	-	106	-		98	-	-	92	-	-
BC Ellinor ²	114	-		102	-	-	110	-	-	104	-	-	114	-		117	-	-	104	-	-
BC Leandra ²	111	-		101	-	-	114	-	-	119	-	-	99	-		102	-	-	101	-	-
BC Lexi ²	97	-		102	-	-	106	-	-	99	-	-	114	-		99	-	-	112	-	-
Conlon	82	92		97	97	99	101	92	94	87	91	89	105	99		99	110	104	102	67	67
KWS Fantex ¹	110	-		102	103	-	97	95	-	84	89	-	101	-		95	92	-	94	123	-
ND Genesis	105	112		97	94	103	111	110	109	116	115	109	104	104		97	101	100	106	88	108
6-row																					
Lacey	98	104		88	86	87	109	101	99	99	96	98	101	108		99	103	101	100	96	107
Quest ¹	92	-		91	87	-	92	97	-	91	94	-	78	-		93	95	-	96	100	-
Rasmusson ¹	102	-		114	108	-	102	100	-	104	97	-	109	-		83	87	-	99	109	-
Robust	92	92		90	94	97	79	92	93	85	95	96	80	91		101	102	95	95	78	92
Tradition	89	98		94	111	108	89	108	104	96	112	108	90	94		105	102	98	102	87	98
Mean (bu/acre)	90	104		101	97	85	61	90	90	111	102	98	74	86		114	97	105	89	75	75
LSD (0.05)	15	12		21	22	19	18	20	16	14	26	18	19	16		24	17	14	9	55	35

¹ Line tested in 2020 and 2021

² Line tested in 2021 only

³ Trial data is from 2019 and 2021

Table 11. Relative grain yield of barley varieties in southern Minnesota locations in single-year (2021) and multiple-year comparisons (2019-2021).

Variety	Becker		Fergus Falls			Lamberton		Le Center			New Ulm		Rochester			St. Paul				
	2021 ³		2021	2 yr	3 yr	2021	2 yr ⁴	2021	2 yr	3 yr	2021	2 yr ⁴	2021	2 yr	3 yr	2021	2 yr	3 yr		
-----(% of mean)-----																				
2-row																				
AAC Connect ¹	93		100	108	-	102	102		110	101	-	108	107		111	88	-	102	111	-
AAC Synergy	142		98	103	100	101	109		89	99	101	73	90		95	100	100	100	115	117
ABI Cardinal ²	131		115	-	-	114	-		83	-	-	96	-		68	-	-	94	-	-
BC Ellinor ²	112		105	-	-	96	-		101	-	-	103	-		96	-	-	123	-	-
BC Leandra ²	113		107	-	-	120	-		108	-	-	101	-		101	-	-	130	-	-
BC Lexi ²	106		95	-	-	88	-		104	-	-	108	-		111	-	-	122	-	-
Conlon	61		94	91	89	86	83		106	95	97	89	91		91	83	79	82	73	72
KWS Fantex ¹	88		85	97	-	68	77		82	99	-	76	88		85	81	-	137	125	-
ND Genesis	120		96	101	105	102	99		105	107	108	114	107		109	101	102	91	105	111
6-row																				
Lacey	96		104	98	99	109	111		103	99	99	116	109		107	110	112	77	100	107
Quest ¹	125		99	96	-	122	97		104	104	-	107	100		109	104	-	75	89	-
Rasmusson ¹	89		102	106	-	112	117		102	103	-	109	111		126	120	-	101	105	-
Robust	63		98	96	99	89	96		97	90	92	99	93		89	103	98	64	84	92
Tradition	60		101	104	108	90	108		104	105	103	100	104		104	109	108	101	94	102
Mean (bu/acre)	29		81	96	79	58	62		70	88	86	99	84		84	95	90	57	71	66
LSD (0.05)	8		11	16	10	13	2		10	20	12	11	32		10	29	16	14	23	18

¹ Line tested in 2020 and 2021

² Line tested in 2021 only

³ Trial data is from 2021 only.

⁴ Trial data is from 2021 and 2020 only.



Table 12. Relative grain yield of barley varieties in a single-year (2021) and multiple year comparisons (2019-2021)

Variety	State			North			South		
	2021	2yr	3yr	2021	2yr	3yr	2021	2yr	3yr
	-----(% of mean)-----								
2-row									
AAC Connect ¹	104	105	-	104	108	-	105	102	-
AAC Synergy	98	106	105	101	108	106	94	103	104
ABI Cardinal ²	100	-	-	102	-	-	96	-	-
BC Ellinor ²	107	-	-	109	-	-	104	-	-
BC Leandra ²	108	-	-	107	-	-	110	-	-
BC Lexi ²	104	-	-	103	-	-	105	-	-
Conlon	93	90	89	96	93	92	90	86	85
KWS Fantex ¹	93	98	-	97	101	-	87	94	-
ND Genesis	105	104	106	105	103	106	105	104	106
6-row									
Lacey	101	101	102	98	97	100	104	104	106
Quest ¹	97	97	-	91	94	-	105	100	-
Rasmusson ¹	104	105	-	101	101	-	108	110	-
Robust	90	93	94	90	92	94	89	93	94
Tradition	97	103	103	96	103	102	98	103	105
Mean (bu/acre)	80	84	84	92	91	92	68	78	75
LSD (0.05)	6	7	5	8	11	8	10	8	6
No. Environments	14	25	36	7	12	19	7	13	17

¹ Line was tested for yield in 2021 only. Refer to 2018 and prior years' reports for additional data.

Table 13. Origin and agronomic characteristics of oat varieties in Minnesota in multiple-year comparisons (2019-2021).

Variety	Origin	Year of Release	Legal Status	Seed Color	Days to Heading (days)	Plant Height (inches)	Straw Strength ³ (1-9)	Test Weight (lbs/bu)	Grain Protein ^{4,5} (%)	Grain Oil ^{4,5} (%)	Grain Beta-glucan ^{4,5} (%)
Antigo	WI	2017	PVP(94)	Yellow	55.8	30.4	2.6	36.9	17.3	7.1	5.2
CS Camden ¹	Meridian Seeds	2013	PVP(94)	White	61.2	31.0	2.2	31.5	14.2	6.5	5.1
Deon	MN	2014	PVP(94)	Yellow	59.5	31.4	2.8	35.4	14.3	6.8	4.8
Esker 2020	WI	2020	PVP(94)	Yellow	57.2	30.6	2.9	33.6	14.9	5.8	5.3
Hayden	SD	2015	PVP(94)	White	59.3	32.7	3.4	34.0	13.4	7.4	5.1
MN-Pearl	MN	2018	PVP(94)	White	58.9	33.9	2.9	35.8	12.8	7.4	4.6
ND Heart ²	ND	2020	PVP(94)	White	59.2	32.6	3.1	34.5	15.7	6.6	5.6
Reins	IL	2016	PVP(94)	White	56.0	29.3	1.5	35.7	14.9	6.2	4.8
Rushmore	SD	2020	Pending	White	57.4	30.8	2.6	36.6	15.0	6.0	4.9
Saddle	SD	2018	PVP(94)	White	55.4	30.3	1.4	35.2	14.9	6.1	4.5
Shelby 427	SD	2011	PVP(94)	White	56.7	32.0	3.1	36.1	14.1	7.0	4.6
Streaker ³	SD	2016	PVP(94)	Hulless	57.4	30.0	3.7	42.5	14.9	7.1	5.1
Sumo	SD	2017	PVP(94)	White	54.1	30.7	2.6	34.9	16.4	5.8	4.5
Warrior	SD	2019	PVP(94)	White	57.8	28.8	1.6	35.4	14.7	6.4	4.5

¹ Line tested in 2020 and 2021; developed by Lantmannen Seed in Sweden.

² Line tested in 2020 and 2021

³ Hulless oat

⁴ 1-9 scale where 1=most resistant, 9=most susceptible

⁵ 12% Grain moisture

⁶ Trait measured for 3 locations in 2019 and 3 locations in 2020



Table 14. Disease characteristics of oat varieties.

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

¹ Line tested in 2020 and 2021
² Tested in 2019, 2020, and 2021 with a mixed race population of crown rust; 1 = most resistant, 9 = most susceptible. Data is from 2019 and 2020 only; 2021 trial failed due to drought
³ Tested in 2019 and 2020; 1 = most resistant, 9 = most susceptible
⁴ Tested in 2021; 1 = most resistant, 9 = most susceptible

Table 15. Relative grain yield of oat varieties in northern Minnesota locations in single-year (2021) and multiple-year comparisons (2019-2021).

Variety	Crookston		Fergus Falls ⁴		Roseau		Stephen	
	2021	3yr	2021	2 yr	2021	3yr	2021	3yr
	-----(% of mean)-----							
Antigo	100	102	89	96	65	88	85	85
CS Camden ¹	116	-	110	-	99	-	113	-
Deon	105	100	90	100	116	114	113	115
Esker 2020	107	-	83	-	105	-	101	-
Hayden	119	121	111	115	123	109	106	108
MN-Pearl	111	110	120	126	112	120	116	118
ND Heart ²	96	-	102	-	98	-	107	-
Reins	98	96	101	92	106	104	101	108
Rushmore	113	-	115	-	117	-	125	-
Saddle	89	99	93	91	100	106	105	105
Shelby 427	98	102	95	95	99	98	94	95
Streaker ³	75	84	101	101	72	75	68	75
Sumo	75	69	61	76	84	92	81	90
Warrior	97	-	116	-	121	-	99	-
Mean (bu/acre)	165	132	146	143	101	118	155	138
LSD (0.05)⁵	27	19	38	33	35	25	26	20

¹ Data presented from 2020 and 2021, see previous years' reports for additional data
² Line was tested in 2020 and 2021 only
³ Hullless oat
⁴ Location was tested in 2020 and 2021
⁵ A large LSD suggests large variability from year to year for the specific location



Table 16. Relative grain yield of oat varieties in southern Minnesota locations in single-year (2021) and multiple-year comparisons (2019-2021).

Variety	Becker ⁴		Kimball ⁵		Lamberton		Le Center		Rochester		St. Paul ⁶		Waseca	
	2021		2019		2021	3 yr	2021	3 yr	2021	3 yr	2020		2021	3 yr
	-----(% of mean)-----													
Antigo	84		104		81	94	102	101	109	107		84	101	95
CS Camden ¹	113		-		107	-	106	-	78	-		99	147	-
Deon	96		99		114	120	105	103	110	109		109	126	117
Esker 2020	114		98		117	106	87	101	98	101		100	116	107
Hayden	119		102		110	93	110	109	116	109		118	115	102
MN-Pearl	104		104		119	120	106	110	94	104		128	140	123
ND Heart ²	97		-		93	-	95	-	100	-		91	56	-
Reins	93		98		92	89	103	98	96	103		102	87	101
Rushmore	101		108		98	114	104	112	115	113		98	102	114
Saddle	93		112		80	88	100	107	103	102		97	53	89
Shelby 427	111		99		99	84	103	105	115	103		104	89	88
Streaker ³	72		78		85	71	77	71	79	70		77	87	74
Sumo	97		90		104	106	98	91	82	90		79	94	92
Warrior	106		107		102	115	103	94	106	90		113	89	98
Mean (bu/acre)	81		154		95	101	123	139	126	127		127	46	82
LSD (0.05)⁷	18		38		21	22	22	24	19	22		13	13	19

¹ Data presented from 2020 and 2021, see previous years' reports for additional data

² Line was tested in 2020 and 2021 only

³ Hulless oat

⁴ Location was tested in 2021 only

⁵ Location was tested in 2019 only

⁶ Location was tested in 2020 only

⁷ A large LSD suggests large variability from year to year for the specific location

Table 17. Relative grain yield of oat varieties in Minnesota in single-year (2021) and multiple-year comparisons (2019-2021).

Variety	North			South			State		
	2021	2yr	3yr	2021	2yr	3yr	2021	2yr	3yr
	-----(% of mean)-----								
Antigo	85	86	89	97	96	98	91	91	94
CS Camden ¹	111	111	-	104	101	-	107	106	-
Deon	116	110	110	109	109	109	112	109	110
Esker 2020	101	100	102	104	102	103	102	101	102
Hayden	112	113	112	114	111	106	113	112	109
MN-Pearl	116	115	116	108	112	113	112	114	114
ND Heart ²	103	102	-	92	94	-	97	98	-
Reins	85	94	95	96	98	98	91	96	97
Rushmore	106	112	112	105	109	111	105	111	112
Saddle	93	95	98	91	94	99	92	94	98
Shelby 427	98	97	97	106	101	98	102	99	98
Streaker ³	76	78	81	79	77	72	78	78	76
Sumo	88	80	81	94	94	93	91	88	87
Warrior	110	108	106	103	102	100	106	105	103
Mean (bu/acre)	108	125	119	94	110	114	100	117	116
LSD (0.05)	16	13	11	14	10	9	11	8	7
No. Environments	4	8	11	5	10	15	9	18	26

¹ Data presented from 2020 and 2021, see previous years' reports for additional data

² Line was tested in 2020 and 2021 only

³ Hulless oat



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OATS

Deon – Proven High Yield

MN-Pearl – High Yielding, White Oat

BARLEY

Lacey – Yield and Quality

Quest – Scab Resistant

Rasmusson – High Yield

Visit the Minnesota Agricultural Experiment Station at www.maes.umn.edu or check your state or local variety trials.
For a list of seed producers, visit the Minnesota Crop Improvement Association at www.mncia.org or call 1-800-510-6242.

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'Good peace of mind': 'Millennial Farmer' enrolls in the MAWQCP



Zach Johnson, aka the "Millennial Farmer," has a lot going on between the rows on his family farm in Pope County. He grows corn and soybeans, raises three children with his wife, Becky, and is one of the most prominent farmers on social media.

Johnson can now add his voluntary enrollment in the Minnesota Agricultural Water Quality Certification Program (MAWQCP) to his growing list of credentials and accolades.

"Sometimes, you don't know what you're getting into, what you're signing up for," he said. "But after we talked to the local NRCS office, they reassured us that there isn't a negative to be in the program, and they were right."

In July, Johnson, a social media creator and influencer, announced his participation in MAWQCP to his more than a quarter-million followers on Instagram. His post received nearly 10,000 likes, helping to generate an online conversation about water and soil health.

"I think it's good peace of mind for everyone involved, including consumers who may be wondering, 'What are farmers doing out here?'" said Johnson, who's also a member of the Minnesota Soybean Growers Association. "Now, they can look and see and see that farmers are volunteering for this program, and we're doing pretty good out there."

Several months ago, the Pope County Soil & Water Conservation District reached out to Johnson to encourage him to join MAWQCP. Johnson agreed, and after working with Soil & Water Conservation District (SWCD) officials, he completed the process in summer 2021. While working with his local SWCD, Johnson realized he was already using many of the same policies that help to earn certification.

"We didn't have to change much at all," he said. "The big thing we're going to work on now moving forward is some of our drain tiling intakes. We've got some older intakes that need some work, and we're going to work on those and clean those up and look at other options besides open intakes."

Farmers can contact their local SWCD to apply for MAWQCP certification and then complete a series of steps with local certifiers using a 100% site-specific



Zach Johnson, the Millennial Farmer, is active on Instagram and his YouTube channel.

risk-assessment process. By law, all data is kept private, and only by signing a formal release can a farmer's name be released publicly. After becoming certified, farmers like Johnson receive a 10-year contract ensuring they will be deemed in compliance with any new water quality laws, an official MAWQCP sign to display on their farm and other benefits developed by local MAWQCP providers.

"For me, it's important (farmers) understand it's a volunteer program," Johnson said. "We're not getting a bunch of dollars to be a part of this program and do things different. We basically give MDA info and they let us know what we're doing well and what need to work on, and then they work with us moving forward to make sure we stay in compliance in case anything changes."

More than 1,100 producers are currently certified in the MAWQCP, covering more than 790,000 certified acres, and implementing more than 2,220 new conservation practices. Gov. Tim Walz has set a goal of enrolling 1 million acres in the MAWQCP by the end of 2022.

"We applaud Zach for using his voice and platform to support water quality efforts," MAWQCP Project Manager Brad Jordahl Redlin said.

Johnson said he's been encouraged by the comments he's received from farmers and consumers, and has spoken with other growers in his area who are also water quality certified.

"Everything I've received is positive," he said. "I've never heard anyone say they regret it, and that's always good."

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To get started and learn more, contact your local soil and water conservation district or go to:

MyLandMyLegacy.com



Coming Soon: North Dakota Spring Wheat and Durum Variety Trials

The North Dakota Hard Red Spring Wheat Variety Trial Results for 2021 and the Durum 2021 Variety Trials were not available at press time. However, they will be available in the On-Farm Cropping Trials Northwest & West Central Minnesota and 2021 Minnesota Wheat Research Review book

given out at the Prairie Grains Conference held on Thursday, December 9th at the Alerus Center in Grand Forks. The trials can also be found online at:

- www.ag.ndsu.edu/varietytrials/spring-wheat
- www.ag.ndsu.edu/varietytrials/durum



Learn more about North Dakota's Spring Wheat and Durum Variety Trials at the 2021 Prairie Grains Conference.



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21st Century Genetics (TCG) Hard Red Spring Wheat (HRS) Trials in 2021

2021 was a drought year with extreme heat in June; record setting, there was no early rain in most places, with yield depending on stored soil moisture, and hit and miss showers. There were no real problems with lodging and disease. Grain harvest went smoothly for the most part. However, rains came late in some places and did present some preharvest sprouting (PHS) and falling number (FN) issues for late variable emerging grain. With no lodging problems, the taller varieties often rose to the top, in replicated yield trials. Yield performance for 2021 is presented in Table 1 with a 4-year summary depicted in Table 2. As a group the TCG varieties performed well in the drought when compared to historic averages.

TCG-Spitfire with proven drought

tolerance performed very well in 2021 in trials and farmers' fields across the region. It is our best performing HRS year in and year out, with big yield and medium protein and test weight across environments, and excellent tolerance to BLS, not a problem in 2021. TCG-Spitfire is slightly susceptible to preharvest sprouting (PHS), so it should be harvested in a timely fashion, not a big problem in 2021.

TCG-Wildcat, our newest variety, was designed as a high yielding, high protein, high TW, management wheat for the RRV. TCG-Wildcat is much like TCG-Spitfire, but has higher protein and TW, with earlier maturity, and quicker dry down and good tolerance to PHS. In its first year of full commercial production, it performed very well, both in and outside the RRV. It yields

right with TCG-Spitfire in most places with the previously mentioned advantages. It quickly became a grower favorite. TCG-Wildcat is a certified seed only (CSO) variety.

TCG-Heartland performed very well in 2021 as an early, very high protein, high TW, good standing, high yielding variety. It has performed best on well drained and medium to lighter soils. It handled the drought pressure of 2021 very well in its area of adaptation. It has stood up well to PHS pressure with good FNs in the areas affected in both 2020 and 2019, not a big problem in 2021. TCG-Heartland is a certified seed only (CSO) variety.

TCG-Wildfire continues to look very good as a high yielding,

Continued on Page 51

	NEW CSO	NEW CSO		
TCG-SPITFIRE	CG-HEARTLAND	TCG-WILDCAT	TCG-WILDFIRE	TCG-GLENNVILLE
Top Yield, Standability and Drought Tolerance Region Wide	Excellent combination of Standability, Protein, TW and Yield	Management Wheat for the RRV's heavy clay soils	Good Yields with consistent Protein on Tough Alkali Ground	Very early and short High protein and test weight
Medium Protein	Adapted to well drained, light-medium texture soils	Excellent combination of Yield, Standability, TW, and Protein		Strong yield north of US Highway 2
Good tolerance to BLS	Tolerance to preharvest sprouting	Good Tolerance to preharvest sprouting		

Visit tcgwheat.com to find a TCG seed associate near you.
 All TCG wheat varieties are PVPA 1994 or pending. TCG-Heartland and TCG-Wildcat are Patent pending.

medium high protein option on water impacted alkali ground. It showed excellent drought tolerance in these areas, its area of adaptation. Places like the Devil’s Lake area.

TCG-Glennville continues to perform as a short, very early, good standing, high-quality management HRS for good environments North of Highway 2, planted at high seeding rates. It too did well in its area of adaptation

under drought conditions in 2021. All the TCG HRS varieties are good standing, management wheats in their areas of adaptation, with MS scab ratings of varying strengths. They are meant to be treated with fungicide.

Data on the TCG durum varieties, TCG-Bright and TCG-Webster, is presented in the NDSU Trials. TCG-Bright is a high quality, high HVAC durum for Western ND, it performed very well

under the droughty conditions of 2021. Our newest variety TCG-Webster is a very early, short, good standing management durum with very rapid dry down, it comes off about the same time as barley, allowing for very timely harvest, preserving grain quality.

In addition to the TCG data presented here, you can find data on most of these varieties in University Trials throughout the region.

Table 1. 2021 TCG HRS Wheat trial results in 6 environments

Variety	Site Yield bu/a						Average Across 6 Sites		
	North Dakota			Minnesota			Yield	Protein	Test Weight
	Casselton	Thompson ¹	Crystal ¹	Crookston ¹	Fisher ¹	Fisher	bu/a	%	lbs/bu
TCG-Spitfire	88.0	84.6	49.9	45.0	42.0	44.1	58.9	14.4	60.6
Prosper	90.2	79.2	47.1	41.9	40.4	37.1	56.0	14.6	60.2
LCS Trigger	84.9	72.0	48.8	43.5	40.0	39.5	54.8	13.0	60.0
SY-Valda	82.8	76.5	42.2	52.9	44.1	28.3	54.5	14.6	61.3
TCG-Wildcat	83.4	74.1	50.1	44.3	29.4	33.9	52.5	15.2	61.2
LCS Rebel	78.7	73.0	50.7	42.7	34.4	29.3	51.5	15.5	61.8
MN-Torgy	79.2	76.9	50.4	50.3	23.1	26.1	51.0	14.9	61.7
Boost	75.9	72.3	38.8	35.7	44.6	38.0	50.9	15.5	60.4
WB-Mayville	69.3	70.3	50.6	36.8	38.7	35.6	50.2	16.2	61.6
LCS Cannon	80.8	68.6	47.5	31.3	23.4	34.1	47.6	15.4	62.6
TCG-Cornerstone	68.0	75.0	39.4	38.8	27.1	36.8	47.5	15.8	60.3
TCG-Glennville	71.6	69.7	44.9	25.6	36.1	35.2	47.2	16.3	63.0
Linkert	64.0	67.2	41.6	30.8	34.7	42.0	46.7	16.4	62.2
Shelly	64.0	72.1	57.7	28.6	24.7	30.3	46.2	15.1	61.8
TCG-Heartland	66.5	66.5	45.1	33.0	34.4	31.1	46.1	16.4	62.0
AP Murdock	66.5	60.9	43.2	39.2	30.3	33.3	45.6	15.6	59.7
TCG-Wildfire	78.2	73.1	29.1	36.0	29.3	27.6	45.5	15.4	59.4
TCG-Climax	71.8	68.3	47.9	41.2	21.2	19.9	45.1	16.2	61.1
Bolles	75.0	66.6	31.8	32.0	32.4	27.8	44.3	16.9	59.9
Barlow	70.6	66.6	41.1	35.6	27.0	22.6	43.9	15.7	62.1
SY-Ingmar	71.8	63.9	38.7	35.1	20.5	26.4	42.7	15.9	61.0
	¹ Sites treated with fungicide								

Table 2. Four year average performance of TCG varieties and checks across 6-7 environments

Variety	Average yield bu/a				4 year averages				
	2018	2019	2020	2021	Yield	Protein	Test Weight	Lodging	BLS ³
					bu/a	%	lbs/bu	Score ^{1, 2}	Score ^{2, 4}
TCG-Spitfire	77.3	71.8	68.3	58.9	69.1	14.3	58.6	0.1	1.7
TCG-Wildcat	72.6	64.3	66.1	52.5	63.9	15.3	60.4	0.0	3.3
SY-Valda	70.1	65.4	63.4	54.5	63.4	14.6	59.4	1.8	3.3
WB-Mayville	66.0	63.6	66.4	50.2	61.5	15.9	60.0	0.1	3.7
Shelly	76.6	63.1	59.9	46.2	61.5	15.0	60.1	2.3	4.0
Prosper	72.6	62.0	55.0	56.0	61.4	14.7	59.2	3.4	2.7
TCG-Heartland	69.5	60.9	62.6	46.1	59.8	16.1	60.4	0.0	2.9
TCG-Cornerstone	66.3	62.8	61.9	47.5	59.6	15.5	59.4	0.0	2.9
Boost	70.9	58.3	56.9	50.9	59.2	15.0	59.3	2.6	0.4
TCG-Wildfire	65.4	60.4	64.0	45.5	58.8	15.2	58.9	1.2	2.2
SY-Ingmar	70.8	59.4	60.2	42.7	58.3	15.5	60.4	0.4	2.3
TCG-Climax	68.8	58.6	60.1	45.1	58.1	16.0	61.1	0.9	3.5
Linkert	64.3	58.4	57.3	46.7	56.7	16.1	60.3	0.0	3.0
TCG-Glennville	59.6	56.5	58.0	47.2	55.3	16.1	60.9	0.0	1.9
Bolles	69.9	59.8	46.1	44.3	55.0	16.7	58.9	2.6	3.6
Barlow	66.9	56.7	50.8	43.9	54.6	15.5	60.7	2.9	3.2
¹ Average of 3 years: 2018, 2019, & 2020 ² 0 = least, 10 = most ³ Bacterial Leaf Streak ⁴ Average of 2 years: 2019 & 2020									



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Limagrain Cereal Seeds 2021 Spring Wheat Data and Season Review

By Russell Oberg, LCS
Northern Plains Regional
Commercial Manager

I've been in some form of the ag business all my life, and the saying that every year is different never gets overused. 2021 was another year of challenges, setting drought records that haven't been seen in years — if ever. Limagrain Cereal Seeds (LCS) had 10 research plots planted between western Minnesota and central Montana in 2021, and we were only able to get good variety data from six of them. One silver lining: We now have extensive notes for drought research.

LCS seed dealers started the year with early sales and a lot of optimism for a wheat market that continued to net higher prices and indicate brighter future prospects. Growers hauled old crop wheat to town and thought about contracting new crop as prices got stronger. But when

the weather got dryer and planting conditions became less optimal, other crop options took acres away from wheat in many parts of the region. The plus side of that is there's not a large carry-over of wheat.

Pent-up demand and favorable market pricing will make for an exciting 2022 season. Many growers will be looking for seed early, and many seed dealers will be considering selling their extra seed as grain. Premium wheat seed may be in short supply come April. I recommend getting in touch with your LCS seed dealer and letting them know your needs sooner rather than later.

LCS is dedicated to wheat research and creating an evolving, elite pipeline of varieties — from the lab to the greenhouse to exhaustive trialing, then into production and onto your fields. We continue to diversify our portfolio with

products for every market. Whether you're looking for the top-yielding variety in the market or the best grain quality available or a combination of the two, we have a wheat for every acre.

LCS Buster is our newest release with outstanding yield punch. As the name implies, it really is a bin buster! It also carries excellent tolerance to stem and leaf rust with intermediate tolerance to head scab and bacterial leaf streak. With the limited seed production of 2021, most of this year's supply will be going to seed production. Get in touch now if you want some on your farm — LCS Buster will sell out.

LCS Cannon is selling quickly, as farmers recall from last season that it was the first thing they harvested, and had very strong straw with great yield and protein. By finishing grain fill 6 to 10 days earlier, LCS Cannon was able to beat

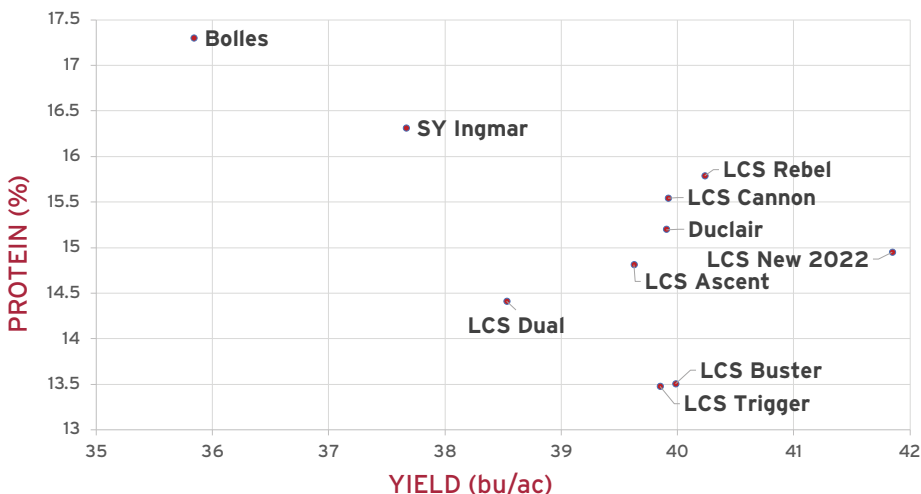
the heat in June and make better use of the early moisture. It had a great year in performance trials that favored early varieties. Keep an eye on LCS Cannon in upcoming Northern Plains university trials.

LCS Trigger is all about yield. It's still the yield leader in South Dakota, with continued acre increases in North Dakota and Minnesota. In addition to National Wheat Yield Contest-winning harvests, LCS Trigger also boasts late-season plant health, a lack of leaf diseases and good tolerance to head scab. LCS Trigger will give you a whole new look at yield.

LCS Rebel is a grain quality game-changer, consistently leading in protein and test weight. Sought after by millers and bakers, LCS Rebel has been used as a Wheat Council quality check since 2019 and is an industry standard. The variety performs well in the west with very good early growth, and it stoles out well in good conditions. We get comments about how good LCS Rebel looks in the field around spraying time every year.

Stay tuned for our next elite releases: **LCS Dual**, a very consistent yielder through all kinds of soil types and moisture conditions with a great disease tolerance package, and **LCS Ascent**, with excellent grain quality, medium maturity and good resistance to Fusarium head blight. LCS Dual has some seed available, so if you like to try new things give me a call.

YIELD VS. PROTEIN 2021



YIELD PERFORMANCE 2021

Red bold numbers are top 25%

	2-Year	2021 Avg.	2021 Yield					
	15 Sites	6 Sites	Glyndon, ND	Great Falls, MT	Havre, MT	Onida, SD	Steele, ND	Thompson, ND
Bolles	47.2	35.8	62.1	12.4	15.7	21.9	32.3	70.7
Duclair	51.5	39.9	68.3	22.8	24.0	24.8	32.7	66.9
LCS Ascent	52.0	39.6	68.1	20.5	22.1	24.6	32.2	70.3
LCS Buster	54.1	40.0	68.6	20.7	24.2	18.8	32.6	74.9
LCS Cannon	50.9	39.9	75.0	18.8	19.2	21.7	32.3	72.6
LCS Dual	51.5	38.5	71.5	14.8	22.0	21.6	32.8	68.5
LCS New 2022	52.1	41.8	75.8	17.0	22.2	25.4	32.6	78.2
LCS Rebel	50.4	40.2	71.1	21.6	20.5	21.7	32.7	73.7
LCS Trigger	55.1	39.9	71.3	15.8	24.9	22.0	32.3	72.8
SY Ingmar	50.9	37.7	62.8	16.0	19.4	24.3	32.3	71.3
WB 9668	44.7	31.6	55.0	16.4	15.3	15.3	31.9	55.7

AGRONOMIC PERFORMANCE 2021

Red bold numbers are top 25%

	Protein	Test Weight	Height	Heading	Maturity	Lodging	Shattering
Bolles	16.2	59.3	Medium	Late	Medium	None	Moderate
Duclair	14.6	61.2	Medium	Medium	Early	Some	None
LCS Ascent	14.2	61.9	Medium	Medium	Medium	Some	Moderate
LCS Buster	13.4	60.8	Short	Late	Late	None	None
LCS Cannon	14.8	61.9	Short	Early	Early	Some	Some
LCS Dual	14.5	61.6	Medium	Medium	Early/Med	—	Moderate
LCS New 2022	15.0	61.1	Medium	Early	Early	Some	None
LCS Rebel	15.5	61.5	Tall	Medium	Medium	Some	—
LCS Trigger	13.6	61.1	Medium	Late	Med/Late	Some	—
SY Ingmar	15.6	61.5	Short	Medium	Medium	Some	Some
WB 9668	16.7	60.6	Short	Early	Early/Med	None	None

DISEASE TOLERANCE 2021

Compiled LCS and university disease and insect data

R: resistant, MR: moderately resistant, I: intermediate, MS: moderately susceptible, S: susceptible, — insufficient data

	Stem Rust	Leaf Rust	Stripe Rust	Head Scab	BLS	Sawfly
Bolles	R	MR	MR	I	I	70%
Duclair	R	I	MR	—	—	33%
LCS Ascent	R	R	R	MR	—	50%
LCS Buster	R	R	I	MR	—	7%
LCS Cannon	MR	MR	S	I	—	62%
LCS Dual	R	MR	MR	MR	—	52%
LCS New 2022	R	I	MR	I	—	67%
LCS Rebel	R	MS	MR	I	MR	55%
LCS Trigger	R	R	MR	MR	MR	25%
SY Ingmar	R	MR	I	I	MR	50%
WB 9668	—	MR	R	MS	MR	31%



Russell Oberg
Regional Commercial Manager

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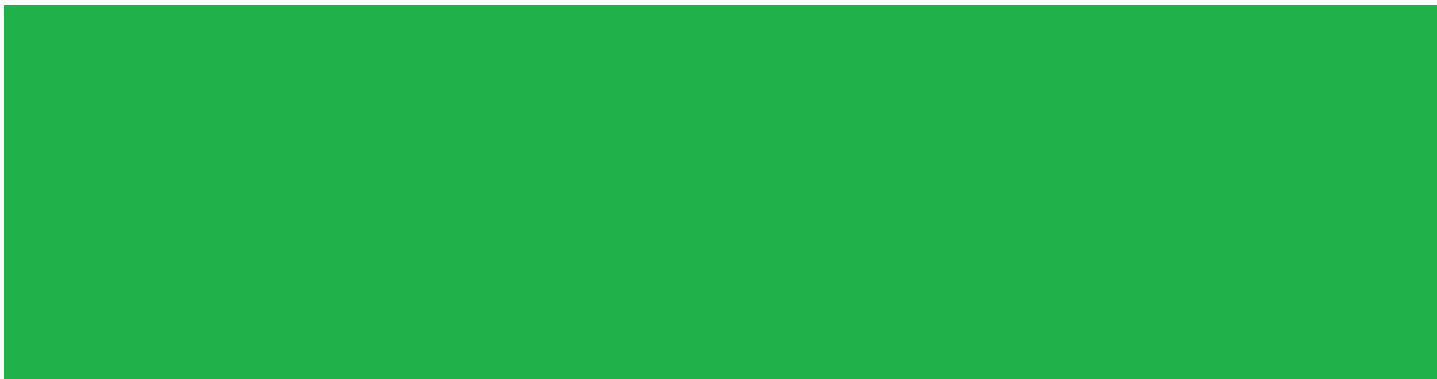
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2021 South Dakota Spring Wheat Performance Trial Highlights

Jonathan Kleinjan
SDSU Extension Agronomist

The 2021 small grain growing season in South Dakota was characterized by an early spring planting followed by heat and near-record dryness in many areas of the state. Yields at several trial locations were negatively impacted by heat and drought during flowering and grain fill. Harvest progressed rapidly and produced below average yields in most areas of the state. According to the USDA-NASS on September 30th, total spring wheat production in South Dakota was down 52% from 2020, with an estimated average yield of 29 bu/acre. There were no widespread disease outbreaks in the spring wheat crop.

Spring wheat variety characteristics and disease ratings are reported in Tables 1 & 2. Multi-year yield results for eastern South Dakota are reported in Tables 3. Wheat is unique as the total revenue received by the producer is a combination of yield and a protein premium (discount). In some years high-protein varieties may actually provide more revenue than high-yielding varieties. In 2021, due to drought conditions, nearly all spring wheat varieties had good grain protein content which made it impractical to rank varieties by revenue (the combination of yield and

protein). The table reporting this revenue ranking is not included in 2021.

Spring wheat yields from the South Dakota State University Crop Performance Testing (CPT) program averaged 52 bu/acre in eastern SD (Brookings, Claire City, Frankfort, and South Shore), ranging from 36 bu/acre at Claire City to 64 bu/acre at Brookings. Varieties yielding in the top 1/3 of the eastern SD trials over the past three years were **AP Murdock, CP3530, Driver, LCS Trigger, MN-Torgy, Shelly, and SY Valda**. Promising varieties with a good two-year yield average include **CP3099A, LCS Buster, and WB9606**. Yields in central South Dakota (Aberdeen, Agar, Highmore, and Selby) averaged 37 bu/acre, ranging from 21 bu/acre at Highmore to 56 bu/acre at Aberdeen. Varieties yielding in the top 1/3 of the central SD trials over the past three years were **CP3530, CP3915, Driver, LCS Trigger, MN-Torgy, Shelly, and SY Valda**. Promising varieties in central SD with a good two-year yield average include **CP3099A, LCS Buster, and WB9606**. The trials in western SD (Draper, Sturgis, and Wall) averaged 40 bu/acre, ranging from 24 bu/acre at Draper to 49 bu/acre at Wall. Varieties yielding in the top 1/3 over three years in western SD were **LCS Cannon, LCS**

Rebel, LCS Trigger, MN-Torgy, Shelly, Surpass, and SY Valda. Promising varieties in western SD with a good two-year yield average include **LCS Buster, and WB9606**. The protein content of the crop averaged 15.4%, 16.7%, and 16.8% in eastern, central, and western SD, respectively. Detailed trial results for each trial location are available at: <https://extension.sdstate.edu/spring-wheat-variety-trial-results>.

Consider as much performance information as possible when selecting a variety and give more weight to information from trials close to home, as some varieties may be better suited to certain geographic areas. Also pay close attention to relative performance over many locations. This type of performance is an indication of “yield stability”. Good yield stability refers to the ability of a variety to exhibit high yield potential at many locations over multiple years. For example, a variety that ranks in the upper 40% at all locations exhibits better yield stability than a variety that is number one for yield at one location but ranks in the lower 40% at some other locations. Performance over multiple years is also very important. Growing conditions in a single season may favor certain varieties, providing a poor representation of yield potential over time. A good

rule of thumb is to plant 65%-75% of your acres to varieties with a proven track record (i.e. a good multi-year average) and plant the remaining 25%-35% to a promising new variety.

It is important to remember that varieties may differ by 5 bu/acre or even more and still be statistically similar. This is due to inherent variability in the environment and the yield testing process. Varieties that are statistically similar to the top performing variety at each location can be calculated by subtracting the least significant difference (LSD) value from the top performing variety. The LSD is a statistic used to determine if varieties are truly different from one another.

The coefficient of variation (CV) listed at the bottom of each data column, which is often expressed as a percentage of a given trait mean, is a relative measure of the amount of test variation for that trait. Generally, in yield trials, a CV of 15% is considered acceptable and a CV of 10% or less indicates good quality data. Higher variability (and thus higher CVs) can be caused by several environmental factors, such as stand loss due to residue cover or heavy precipitation and reduces the ability to detect true differences between varieties.



**SOUTH DAKOTA STATE
UNIVERSITY EXTENSION**

2021 South Dakota Spring Wheat Variety Trial Results Variety List

Table 1. List of spring wheat varieties tested in 2021 along with origin, agronomic and grain quality characteristics.

Variety	Testing and Origin		Agronomic Characteristics			Grain Quality	
	Years tested in SD trials	Origin†-Year	Relative Heading (days)‡	Height (inches)	Lodging Score (1-5)§	2021 Test Wt. (lb/bu)#	2021 Protein (%)#
AP Gunsmoke CL2	new	AP-21	4	23	1.0	59.4	16.9
AP Murdock	3	AP-19	3	21	1.0	58.5	16.6
AP Revolution	new	AP-22	2	22	1.0	58.3	16.1
Bolles	5+	MN-15	5	25	1.0	59.1	18.2
Boost	5+	SD-15	6	26	1.0	60.0	16.8
CP3099A	2	WF-20	9	27	1.0	58.2	14.9
CP3119A	new	WF-21	8	26	1.0	56.5	15.0
CP3188	new	WF-20	4	24	1.0	59.0	15.1
CP3530	5+	WF-16	6	26	1.0	59.4	16.1
CP3915	3	WF-19	5	24	1.0	60.9	16.5
Driver	5+	SD-19	4	26	1.0	60.8	16.0
Focus	5+	SD-15	0	26	1.0	60.5	17.6
Lang-MN	5+	MN-17	4	24	1.0	59.5	16.4
LCS Buster	2	LCS-20	7	23	1.0	59.4	15.0
LCS Cannon	4	LCS-18	1	23	1.0	61.2	16.1
LCS Rebel	5+	LCS-17	2	26	1.0	60.8	16.7
LCS Trigger	5+	LCS-15	8	25	1.0	60.5	15.0
MN-Torgy	3	MN-20	5	23	1.0	61.6	16.9
MN-Washburn	4	MN-19	5	22	1.0	59.9	16.2
MS Barracuda	4	MS-18	1	22	1.0	59.3	16.8
MS Cobra	new	MS-22	4	24	1.0	59.6	16.5
MS Ranchero	2	MS-20	2	22	1.0	59.0	15.8
ND Frohberg	2	ND-20	4	25	1.0	59.3	16.7
PFS Buns	new	PFS-22	9	23	1.0	58.0	16.4
Prevail	5+	SD-13	3	22	1.0	59.5	16.3
Shelly	5+	MN-16	6	22	1.0	60.9	15.8
Surpass	5+	SD-15	1	22	1.0	60.0	16.5
SY Ingmar	5+	AP-14	6	22	1.0	60.4	16.4
SY Rustler	5+	AP-16	3	22	1.0	58.0	16.2
SY Valda	5+	AP-15	4	22	1.0	60.3	15.9
WB9590	5+	WB-18	2	20	1.0	59.4	17.1
WB9606	2	WB-20	4	24	1.0	60.8	15.5
WB9719	5+	WB-18	6	23	1.0	61.1	16.6
Trial Averages	-	-	-	24	1.0	59.7	16.3

† AP, AgriPro; LCS, Limagrain Cereal Seeds; MN, Minnesota; MS, Meridian Seeds; ND, North Dakota; PFS, Peterson Farms Seed; SD, South Dakota, WI, Winfield; WB, WestBred; and - (Year of Release).
‡ Difference in days to heading compared to Focus (2021 eastern and central locations - Julian date 161 - June 10th).
§ Lodging score: 1, perfectly standing; to 5, completely flat (eastern and central locations). Note: there was no lodging in 2021.
Test weight and protein are statewide averages.



**SOUTH DAKOTA STATE
UNIVERSITY EXTENSION**

2021 South Dakota Spring Wheat Variety Trial Results Disease Ratings

Table 2. Spring wheat variety disease ratings.

Variety	Disease Ratings†					
	Stripe Rust	Stem Rust	2021 Leaf Rust	2021 Tan Spot	2021 Bacterial Leaf Streak	2021 Fusarium Head Blight
AP Gunsmoke CL2	‡	(MR)§	(R)	(MR)	6	1
AP Murdock	-	(MR)	(R)	6	3	6
AP Revolution	-	(R)	(MR)	(MR)	9	1
Bolles	MS	-	4	7	2	4
Boost	S	-	4	7	1	4
CP3099A	-	-	5	7	7	9
CP3119A	-	-	8	6	2	4
CP3188	-	-	7	7	6	4
CP3530	S	(R)	(MR)	-	8	4
CP3915	-	(MR)	4	7	7	3
Driver	-	-	4	7	2	2
Focus	S	-	4	8	6	2
Lang-MN	MS	(R)	7	-	4	3
LCS Buster	-	(R)	(R)	-	1	5
LCS Cannon	(R)	(R)	5	6	9	3
LCS Rebel	(MR)	(R)	7	8	3	2
LCS Trigger	MS	(R)	3	6	1	4
MN-Torgy	-	-	3	7	3	3
MN-Washburn	-	(R)	3	8	5	5
MS Barracuda	MR	(R)	7	8	8	5
MS Cobra	(R)	(R)	4	6	6	5
MS Rancho	(R)	(R)	7	5	8	7
ND Frohberg	(MR)	(R-MR)	7	8	8	3
PFS Buns	-	-	4	6	5	6
Prevail	MR	MR	6	7	1	2
Shelly	MR	-	6	6	3	4
Surpass	S	-	6	8	2	2
SY Ingmar	S	(R)	4	6	8	4
SY Rustler	MS	(MR)	5	5	5	3
SY Valda	S	(R)	(MR)	(MR)	1	2
WB9590	S	(R)	7	8	2	5
WB9606	(MS)	(MR)	7	6	8	6
WB9719	S	(R)	7	4	7	5

† Disease ratings: R, resistant; MR, moderately resistant; MS, moderately susceptible; S, susceptible; or 1, most resistant to 9, most susceptible. Note: SDSU does not perform nursery screenings for all listed pathogens in each growing season.
‡ A dash (-) signifies no rating provided/available.
§ Parenthesis denote estimated ratings/rankings (X) based on information provided by the program that submitted the variety.



2021 South Dakota Spring Wheat Variety Trial Results Eastern Summary

SOUTH DAKOTA STATE UNIVERSITY EXTENSION

Table 3. 2021 spring wheat variety performance trial results for testing sites in eastern South Dakota. Varieties ranking in the top third of each trial category are shaded light blue.

Variety	2019	2020	2021			2-year			3-year		
	Yield (bu/a)	Yield (bu/a)	Yield (bu/a)	Test Wt (lbs)	Protein %	Yield (bu/a)	Test Wt (lbs)	Protein %	Yield (bu/a)	Test Wt (lbs)	Protein %
LCS Trigger	46.3	72.3	59.9	61.6	13.8	66.1	61.1	13.5	59.0	58.6	13.6
SY Valda	49.8	63.8	54.1	60.6	15.0	58.9	60.7	14.9	55.0	58.2	15.3
MN-Torgy	46.2	63.4	51.7	62.3	16.3	57.5	61.1	15.8	54.9	59.3	16.0
CP3530	48.7	65.9	51.6	60.0	15.4	58.8	60.3	15.2	54.7	58.3	15.7
Driver	40.9	65.1	56.6	62.4	15.3	60.8	61.9	15.1	53.6	58.9	15.5
Shelly	38.4	65.6	56.7	61.7	14.8	61.2	60.9	14.5	53.0	58.1	15.0
AP Murdock	48.3	63.4	47.8	58.7	15.6	55.6	59.1	15.2	52.3	57.4	15.3
SY Ingmar	50.9	58.6	50.3	60.8	15.4	54.4	60.8	15.5	52.2	58.6	15.8
WB9719	43.6	61.1	54.0	62.8	15.9	57.6	62.2	15.5	52.2	59.8	15.5
Prevail	47.0	61.5	49.3	60.4	15.1	55.4	60.1	14.7	51.7	58.4	15.0
SY Rustler	48.6	59.2	48.2	57.9	15.1	53.7	58.7	15.1	51.0	57.0	15.5
WB9590	46.1	58.9	50.0	60.7	16.3	54.5	60.0	16.2	50.8	57.8	16.3
CP3915	43.8	60.0	50.8	62.2	15.8	55.4	61.5	15.4	50.8	59.1	15.7
Surpass	47.0	59.1	47.7	61.0	15.4	53.4	60.0	15.4	50.3	57.9	15.8
Boost	43.7	58.5	50.0	60.9	16.1	54.3	60.7	15.8	50.0	58.5	16.0
MN-Washburn	37.6	61.4	51.5	61.0	15.3	56.5	60.2	14.9	49.5	57.6	15.3
Lang-MN	39.6	59.4	50.6	60.0	15.6	55.0	60.4	15.5	49.2	58.4	15.9
LCS Cannon	38.0	60.2	51.0	61.5	15.3	55.6	61.5	15.0	49.0	59.2	15.5
LCS Rebel	37.0	54.9	51.7	61.7	16.1	53.3	61.2	15.9	47.1	59.1	16.2
Bolles	36.3	59.0	48.0	59.8	17.9	53.5	59.8	17.2	47.1	57.3	17.6
Focus	41.2	58.7	42.0	60.8	17.2	50.4	60.7	16.4	46.4	58.8	16.6
MS Barracuda	35.3	56.8	47.5	60.2	15.8	52.1	59.9	15.8	45.8	57.6	16.4
LCS Buster	-	68.8	58.1	60.3	13.7	63.5	59.7	13.5	-	-	-
WB9606	-	62.4	58.4	61.7	14.3	60.4	60.8	13.9	-	-	-
CP3099A	-	56.9	58.5	59.4	13.5	57.7	57.5	13.3	-	-	-
ND Froberg	-	58.2	52.8	60.8	15.8	55.5	60.7	15.5	-	-	-
MS Rancho	-	56.9	49.6	59.3	14.6	53.2	58.6	14.8	-	-	-
CP3119A	-	-	56.3	57.9	14.2	-	-	-	-	-	-
PFS Buns	-	-	54.2	59.1	15.3	-	-	-	-	-	-
AP Gunsmoke CL2	-	-	53.8	59.6	16.2	-	-	-	-	-	-
CP3188	-	-	53.0	58.5	14.1	-	-	-	-	-	-
MS Cobra	-	-	50.2	60.7	15.7	-	-	-	-	-	-
AP Revolution	-	-	47.8	59.1	15.1	-	-	-	-	-	-
Trial Average#	43.7	60.8	52.2	60.6	15.4	56.7	60.3	15.2	53.0	58.9	15.6
LSD(0.05)†	6.6	1.9	2.3	0.5	0.3	5.5	1.6	0.6	6.2	1.4	0.6
C.V.%‡	7.7	4.8	6.4	1.2	5.7	5.3	1.2	2.0	6.0	1.4	2.2

Trial averages may include values from experimental lines that are not reported.
 † Value required (\geq LSD) to determine if varieties are significantly different from one another.
 ‡ C.V. is a measure of variability or experimental error, 15% or less is considered acceptable.

Syngenta Data, 2019-2021

Three-Year Northeast Summary, Northern Plains Ranked by Three-Year Yield Average



Variety	Yield (bu/ac)			Protein % 3-yr Avg	Economic Return ¹		Agronomics and Disease				
	3-yr Avg	2-yr Avg	2021		Gross \$/A	\$/Bu	Heading 1-9	Height 1-9	Lodging 1-9	BLS 1-9	FHB 1-9
Faller	80.8	77.3	79.3	14.1	\$704.7	8.72	6	6	7	3	3
SY Valda	78.5	75.1	77.3	14.2	\$688.8	8.77	5	5	5	4	4
AP Murdock	75.6	72.1	68.6	14.6	\$679.0	8.98	4	4	4	4	4
SY 611 CL2	74.9	73.8	78.2	14.6	\$672.8	8.98	5	4	4	4	3
LCS Cannon	74.6	70.8	72.2	14.6	\$670.1	8.98	2	4	4	4	3
AP Smith	73.2	68.9	67.0	14.8	\$665.1	9.09	6	4	2	3	4
MN-Washburn	72.9	69.1	69.9	14.3	\$643.4	8.83	6	5	3	3	3
Shelly	72.9	70.5	75.0	14.2	\$639.6	8.77	6	5	6	5	4
SY Ingmar	71.4	69.1	69.0	15.2	\$663.6	9.29	5	5	3	3	3
SY McCloud	69.7	65.7	71.2	15.2	\$647.8	9.29	4	5	4	5	4
SY Longmire	68.8	67.0	70.6	15.0	\$632.3	9.19	5	5	5	4	5

2019 Locations: Cando, Hillsboro, Glyndon, McVilleville, Park River, ND; and Crookston, MN; 2020 Locations: Cando, Glyndon, McVilleville, Park River, ND; and Crookston, MN; 2021 Locations: Crookston and Glyndon, MN

Three-Year West Summary, Northern Plains Ranked by Three-Year Yield Average

Variety	Yield (bu/ac)			Protein % 3-yr Avg	Economic Return ¹		Agronomics and Disease				
	3-yr Avg	2-yr Avg	2021		Gross \$/A	\$/Bu	Heading 1-9	Height 1-9	Lodging 1-9	BLS 1-9	FHB 1-9
Faller	73.0	69.2	33.5	13.9	\$630.6	8.64	6	6	7	3	3
SY Valda	71.4	63.4	32.2	14.2	\$626.5	8.77	5	5	5	4	4
Shelly	70.0	62.9	32.9	14.0	\$606.9	8.67	6	5	6	5	4
Elgin-ND	68.9	63.7	33.9	14.8	\$626.0	9.09	4	7	7	4	5
AP Gunsmoke CL2	66.8	59.7	35.7	14.8	\$606.9	9.09	5	5	4	5	4
SY 611 CL2	66.6	59.0	32.8	14.5	\$594.7	8.93	5	4	4	4	3
AP Smith	65.3	59.2	32.7	14.8	\$593.3	9.09	6	4	2	3	4
Vida	65.2	59.3	34.3	14.7	\$589.0	9.03	6	6	4	5	5
SY McCloud	64.7	58.5	34.0	15.1	\$598.0	9.24	4	5	4	5	4
SY Ingmar	64.4	59.1	32.5	15.0	\$591.8	9.19	5	5	3	3	3
Reeder	64.4	58.1	33.5	15.0	\$591.8	9.19	4	6	5	4	NA
AP Murdock	64.3	57.6	31.1	14.6	\$577.5	8.98	4	4	4	4	4
SY Rockford	64.3	54.5	34.3	14.7	\$580.9	9.03	6	6	4	7	3
SY Longmire	64.0	57.8	33.3	14.6	\$574.9	8.98	5	5	5	4	5
LCS Cannon	63.1	54.8	30.4	14.6	\$566.8	8.98	2	4	4	4	3

2019 Locations: New Leipzig, Coleharbor, Kenmare, Hettinger, ND; and Scobey, MT; 2020 Locations: New Leipzig, Coleharbor, and Kenmare, ND;

2021 Locations: New Leipzig, Velva, ND

Numerical ratings: Heading: 1 = early; Height: 1 = short; Lodging: 1 = no lodging; Disease 1 = tolerant

¹ Three-year economic return calculated using Sept. local cash grain price of \$8.67 for 14% protein and 10-year average MGE protein premium/discounts (Mendota Wheat & Milling Associates).

These agronomic assessments are made by Syngenta scientists and reflect each variety's relative performance within these characteristics through the 2020 crop year. Specific conditions may cause variations within those characteristics. These relative protection values are based on current pest and disease populations. These have been known to shift periodically and may cause changes in specific evaluations. Resistance to many other diseases and pests is sensitive to environmental conditions, plant development stages and the presence and intensity of other diseases which may result in specific evaluation inconsistencies. This chart is updated annually to reflect the most current trends.

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Syngenta Data, 2019-2021

Three-Year South Dakota Summary, Northern Plains Ranked by Three-Year Yield Average



Variety	Yield (bu/ac)			Protein % 3-yr Avg	Economic Return ¹		Agronomics and Disease				
	3-yr Avg	2-yr Avg	2021		Gross \$/A	\$/Bu	Heading 1-9	Height 1-9	Lodging 1-9	BLS 1-9	FHB 1-9
Faller	55.3	52.3	43.5	15.6	\$525.5	9.50	6	6	7	3	3
WB9719	53.8	51.5	43.3	16.0	\$522.4	9.71	6	5	3	4	6
SY Valda	53.6	52.0	40.3	15.9	\$517.7	9.66	5	5	5	4	4
SY 611 CL2	50.8	48.0	42.0	16.3	\$493.3	9.71	5	4	4	4	3
Surpass	50.0	47.3	36.1	16.1	485.50	9.71	3	6	7	5	5
LCS Trigger	50.8	45.3	37.3	16.4	\$493.3	9.71	6	6	NA	3	2
CP3530	50.6	48.6	39.7	16.9	\$491.3	9.71	6	6	6	4	3
AP Murdock	49.7	45.5	33.7	16.1	\$482.6	9.71	4	4	4	4	4
SY Ingmar	49.5	47.5	41.0	16.6	\$480.7	9.71	5	5	3	3	3
SY Rustler	49.5	45.6	36.2	16.4	\$480.7	9.71	4	5	4	5	5
Boost	48.0	45.3	37.3	16.9	\$466.10	9.71	6	6	6	3	4
Prevail	47.6	44.9	35.0	16.0	\$462.20	9.71	4	6	5	5	4
SY Soren	44.0	43.0	35.7	16.8	\$427.2	9.71	4	4	3	5	4
AP Gunsmoke CL2		49.2	44.1				5	5	4	5	4

Numerical ratings: Heading: 1 = early; Height: 1 = short; Lodging: 1 = no lodging; Disease 1 = tolerant

2019 Locations: Northville and Selby, SD; 2020 Locations: Agar, Northville, and Selby, SD; 2021 Locations: Northville and Selby, SD

¹ Three-year economic return calculated using Sept. local cash grain price of \$8.67 for 14% protein and 10-year average MGE protein premium/discounts (Mendota Wheat & Milling Associates).

These agronomic assessments are made by Syngenta scientists and reflect each variety's relative performance within these characteristics through the 2020 crop year. Specific conditions may cause variations within those characteristics. These relative protection values are based on current pest and disease populations. These have been known to shift periodically and may cause changes in specific evaluations. Resistance to many other diseases and pests is sensitive to environmental conditions, plant development stages and the presence and intensity of other diseases which may result in specific evaluation inconsistencies. This chart is updated annually to reflect the most current trends.

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AROUND THE PRAIRIE

By Prairie Grains Magazine staff

Minnesota Wheat announces staff opening

Minnesota Wheat is seeking a dynamic agronomic and communications professional to help grow the organization in 2022 and beyond.

That's right, dear reader, Minnesota Wheat is hiring!

The position of Project Lead is a dynamic role with a variety from day-to-day. This position works in three primary areas: 1) Agronomy/Research 2) Communications/Coordination and 3) Office Support. This position reports to Executive Director Charlie Vogel and is an integral part of a four-person team at Minnesota Wheat's headquarters in Red Lake Falls.

This position is employed by the Minnesota Wheat Research and Promotional Council (MWRPC) and will also work on projects for the Minnesota Association of Wheat Growers (MAWG). The two organizations together (MWRPC + MAWG) are unofficially referred to as MN Wheat. This is a full-time position with competitive compensation and benefits. Salary will vary depending on experience.

For more information, visit mnwheat.org/council/job-opportunities/. To apply, send a resume to cvogel@mnwheat.com.

MWRPC chair places in National Wheat Yield Contest

In October, the National Wheat Foundation (NWF) announced the state winners for the 2021 National Wheat Yield Contest, which includes 64 growers from 21 states, including states from Prairie Grains coverage area.

Grant County farmer Scott Swenson, chair of the Minnesota Wheat Research and Promotion Council, placed third in the Spring Wheat – Dryland category, with an average of 83.24 bushels/acre. Dallas Diesen earned top state honors with an acreage average of 114.81 bushels and Ryan Biss finished second (101.5

bushels/acre).

North Dakota farmer John Hofer won the national Spring Wheat- Dryland contest with an average of 122.2277 bushels/acre.

The Foundation's National Wheat Yield

Contest (NWYC) offers growers the opportunity to compete with farmers from across the United States and improve their production practices through new and innovative techniques. To see the full list, visit yieldcontest.wheatfoundation.org/.

Funds available to improve safety on Minnesota farms

Minnesota farmers who want to improve safety on their farms can now apply for funding through two programs from the Minnesota Department of Agriculture (MDA) that help with the cost of buying, shipping and installing eligible safety equipment.

Now in its second year, the Grain Storage Facility Safety Cost-Share program reimburses up to 75% of the cost to buy, ship, and install eligible safety equipment for on-farm grain bins or silos. The program will pay up to \$400 per bin or silo, with a limit of \$2,400 per farm per year.

For more information and to apply, visit MDA's Grain Storage Facility Safety Cost-Share webpage via www.mda.state.mn.us/.



The Rollover Protective Structures (ROPS) Rebate Program makes tractor safety equipment affordable and simple to order. Minnesota's program reimburses farmers and schools at least 70% of the cost to purchase, ship and install a rollover protection kit, limiting the cost to no more than \$500 per tractor.

For more information, visit the MDA's ROPS Rebate Program webpage. Both programs are accepting applications through June 30, 2022, or until all funds are exhausted.

Montana Grain Growers Association holding Annual Convention and Trade Show

The Montana Grain Growers Association's Annual Convention and Trade Show returns for its 66th year. Held Nov. 30 – Dec. 2, the Annual Convention and Trade Show at the Heritage Inn in Grant Falls, Mont., offers farmers a chance to gather following the growing season and regroup for 2022. This year's theme is: "Modernizing Old Technologies into New Innovations." Nearly 900 members of the regional farm community have attended in recent years, giving participants the inside track on ag's latest innovations from more than 80 exhibitors. To register, visit www.mgga.org/events/convention/.

Northern Crops Institute unveils name of new facility

The Northern Crops Institute's new headquarters will be named the Peltier Complex, North Dakota State University announced in October. NCI said it's excited to foster learning in a new facility that is named after a family that has worked hard for generations to carry out the same mission. NCI might not be where it is today without the Peltier family.

"The Peltiers have been longtime leaders in agriculture in the region, and NCI is no exception," NCI Director Mark Jirik said. "We are so grateful to the entire Peltier family and their commitment to NDSU, the In Our Hands campaign and our collective future."

The Peltier family made leadership philanthropic gifts to support the private fundraising portion of the project, which partnered with the North Dakota Legislature to complete the overall financing package.

A groundbreaking and naming ceremony for the Peltier Complex was held in November.

NAWG activates advocacy campaign

The National Association of Wheat Growers' advocacy campaign launched in September to protect family farms and farmers is still in action. So far, 150 participants have joined the campaign, meaning 76 congressional offices have been reached with more than 470 messages. As Congress keeps negotiating a path for the reconciliation bill, it is crucial to continue to make our voices heard. Now is a critical time for protecting tax law affecting farmers — visit wheatworld.org/campaigns/ to participate in the campaign and follow the instructions to send a message to your Member of Congress.

Advertorial

SELECTING A SPRING WHEAT VARIETY

Evaluating this year's data for next year's decision.

By Peter Comis, WestBred® Regional Commercial Manager, Northern Region

Harvest is long finished, and trial data of all types are becoming available. It is an exciting time of year for evaluating 2021 spring wheat variety performance and making 2022 variety plans. With over 50 registered varieties across Minnesota, North and South Dakota, deciding which varieties to plant can be a challenge. Here are things to consider in making your decisions:

- **Local seed growers/dealers/independent crop consultants** are one of the best resources to help with making the decision on which new variety to plant. These are generally farmers, professional seedsmen or independent crop consultants who are familiar with local needs and see the varieties first, as well as broadly.
- **Field days** are a good way to look at many varieties on a smaller scale.
- **Winter meetings** will be an upcoming option for hearing messages about variety performance. Attend these meetings with three to four agronomic needs in mind and note the varieties discussed that fit those needs.
- **Plot data reports** can be useful, but what looks good on paper may not always be right for your farm. Look for trends across years and plots and ask yourself a few questions: Did I see the plot? Was there variability across the plot? Do the production practices, soil types and region match my farm? Small plot research is conducted using approximately 5 feet by 20 feet plots (1/450 of an acre), and there are two statistical values you must consider:
 - **Coefficient of variation (CV)** is a measure of trial variability between replications at a trial location. Anything greater than 12%-15% variation for wheat grain yield should be scrutinized or disregarded.
 - **Least significant difference (LSD)** indicates whether two means have a statistical probability of being different for a certain trait (e.g. yield). The highest-yielding variety is not always the plot winner; there could be others that yield less, yet are statistically the same. The confidence in trial results is determined by the alpha value, so an LSD ($\alpha = 0.10$) means there is a 90% chance that if the trial were repeated, the results would be the same.

For additional wheat management tips, contact Peter Comis, WestBred® Regional Commercial Manager, Northern Region at peter.comis@bayer.com.

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TAKES ONE TO KNOW ONE

MAWG members are

part of a vast network of wheat farmers, industry experts, and stakeholders. A membership in MAWG means a wheat family who focuses on legislative issues such as crop insurance, the farm bill, wheat research funds, water quality and other environmental issues.

Choose the type of membership that is best for you and your farm operation.



Call the MAWG office at 218-253-4311 or visit mnwheat.org to join today.