2024 Spring Wheat Field Crop Trials Results

Minnesota Agricultural Experiment Station and the College of Food, Agricultural and Natural Resource Sciences

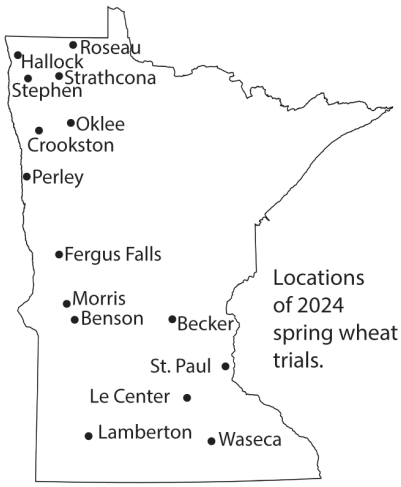
Spring wheat varieties were sown in trial plots at Becker, Crookston, Lamberton, Roseau, St. Paul, and Waseca and on-farm sites near Benson, Fergus Falls, Hallock, Le Center, Oklee, Perley, Stephen, and Strathcona. The Fergus Falls site was abandoned due to hail and data from the Waseca site is not reported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

Variety Selection Criteria

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

Stripe rust was observed at the Becker, Le Center, and Oklee trials this year and affected susceptible varieties. The majority of varieties are resistant or moderately resistant to stripe rust and leaf rust, but a few are moderately susceptible. Stripe rust can be very damaging when temperatures remain unseasonably cool into early July. Carefully consider a variety's rating for leaf and stripe rust and plan to use a fungicide if a variety is rated 5 or higher and disease levels warrant treatment. Varieties with ratings of 4 or better should not experience economic levels of damage in most years. Stem rust ratings are included in the disease tables because there are differences in variety reaction. Although the levels of this disease have been very low in production fields in recent years, even on susceptible varieties, CP3099A had significant damage due to stem rust at several locations in 2024.

Bacterial leaf streak was assessed at only two naturally infected locations in 2024, so the ratings of this disease on newer varieties may change by as much as one rating point as more data is collected. This disease cannot be controlled with fungicides. Selection of more resistant varieties is the only recommended practice at this time to reduce losses caused by this disease.



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

WB9590 was the no. 1 variety grown in Minnesota in 2024, seeded on 23.4% of the 1.5 million acres. The next most seeded varieties were MN-Rothsay (21.7%), MN-Torgy (11.9%), SY Valda (10.2%), WB9479 (6.6%), and AP Murdock (4.4%).

Varieties tested for the first time in 2024 were AP Elevate, CAG Ceres, CP3055, CP3360AX, Dyna-Gro 8582, Dyna-Gro Rocker, LCS Hammer

AX, ND Thresher, PFS Rolls, TCG-Badlands, TCG-Zelda, TW Olympic, TW Starlite, and TW Trailfire. ND Stampede was in the 2023 trials under its experimental number and results are reported for the first time this year. WestBred did not submit any HRSW varieties for testing, but WB9479 and WB9590 were both tested in 2024 because each occupied more than 5% of the state's acreage in 2023.

Since 2004 we have been conducting an "intensive" management trial in which fungicides are applied at the time of herbicide application (Feekes 5), flag leaf emergence (Feekes 9), and at the onset of flowering (Feekes 10.51). The additional performance evaluations were carried out adjacent to the conventional (no fungicides applied) trials, so results can be compared directly. The practice of three fungicide applications during the growing season is not recommended. This fungicide regime is implemented to measure the varieties' performance when fungal diseases are controlled to the maximum extent possible. Decisions regarding fungicide applications should be based on the available decision support systems and used only if and when disease levels are forecasted to reach economically damaging levels.

Project Leaders

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Test Plot Managers

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

Hard red spring wheat seeding rate calculator

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

The general formula for calculating a seeding rate is:

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

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

Example: Early variety.

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

Table 1. Origin and agronomic characteristics of hard red spring wheat varieties in Minnesota in single-year (2024) 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 Elevate	2024 AgriPro/Syngenta	PVP (94) pending	1.3	60.0	31.9	4–5
AP Gunsmoke CL2[5]	2021 AgriPro/Syngenta	PVP (94)	1.3	56.5	33.5	5
AP Murdock	2020 AgriPro/Syngenta	PVP (94)	1.3	57.1	32.6	5
AP Smith	2021 AgriPro/Syngenta	PVP (94)	1.3	60.8	32.2	3
Ascend-SD	2021 SDSU	PVP (94)	1.3	59.9	37.0	5
Brawn-SD	2022 SDSU	PVP (94) pending	1.3	57.9	35.4	5
CAG Ceres	2024 Champions Alliance Group	PVP (94) pending	1.3	56.8	33.4	3–4
CAG Justify	2021 Champions Alliance Group	PVP (94)	1.2	59.9	35.4	5
CAG Reckless	2021 Champions Alliance Group	PVP (94)	1.3	57.6	35.5	5
CAG Recoil	2022 Champions Alliance Group	PVP (94) pending	1.4	64.5	32.2	4
CP3055	2020 Winfield United	PVP (94) pending	1.3	64.7	35.8	4
CP3099A	2020 CROPLAN	PVP (94) pending	1.3	63.7	36.4	4
CP3188	2021 CROPLAN	PVP (94) pending	1.3	58.7	35.5	6
CP3322	2022 CROPLAN	PVP (94) pending	1.3	63.5	34.1	4
CP3360AX[6]	2023 Winfield United	PVP (94) pending	1.3	56.3	33.7	3–4
CP3915	2019 CROPLAN	PVP (94) pending	1.3	58.5	33.1	4
Driver	2019 SDSU	PVP (94)	1.3	60.1	34.9	4
Dyna-Gro 8582	2024 Nutrien Ag Solutions	PVP (94) pending	1.5	55.8	33.1	2–3
Dyna-Gro Ambush	2017 Dyna-Gro	PVP (94) pending	1.5	55.7	33.4	5
Dyna-Gro Ballistic	2018 Dyna-Gro	PVP (94) pending	1.5	58.3	35.1	5
Dyna-Gro Commander	2019 Dyna-Gro	PVP (94) pending	1.5	56.1	34.7	4
Dyna-Gro Rocker	2023 Nutrien Ag Solutions	PVP (94) pending	1.5	61.0	35.1	6
LCS Ascent	2022 Limagrain Cereal Seeds	PVP (94)	1.3	55.5	33.3	5
LCS Boom	2023 Limagrain Cereal Seeds	PVP (94)	1.3	54.5	32.3	4
LCS Buster	2020 Limagrain Cereal Seeds	PVP (94)	1.3	63.2	36.4	5
LCS Cannon	2018 Limagrain Cereal Seeds	PVP (94)	1.3	54.5	32.1	4
LCS Dual	2021 Limagrain Cereal Seeds	PVP (94)	1.3	57.3	33.7	4
LCS Hammer AX[6]	2022 Limagrain Cereal Seeds	PVP (94)	1.3	57.2	31.8	2–3
LCS Trigger	2016 Limagrain Cereal Seeds	PVP (94)	1.3	63.8	36.1	5
Linkert	2013 MN	PVP (94)	1.3	58.1	31.7	2
MN-Rothsay	2022 MN	PVP (94)	1.3	61.1	31.0	3
MN-Torgy	2020 MN	PVP (94)	1.3	57.2	33.4	4
MS Charger	2023 Meridian Seeds	PVP (94)	1.2	56.8	33.1	5
MS Cobra	2022 Meridian Seeds	PVP (94)	1.4	57.7	32.7	4
ND Heron	2021 NDSU	PVP (94)	1.3	55.5	34.2	6
ND Stampede	2024 NDSU	PVP (94) pending	1.3	56.3	34.9	4
ND Thresher	2023 NDSU	PVP (94) pending	1.3	60.0	32.7	5
PFS Buns	2021 Peterson Farm Seeds	PVP (94) pending	1.3	64.6	33.0	4
PFS Rolls	2025 Peterson Farms Seed	PVP (94) pending	1.3	59.9	35.4	4–5
Shelly	2016 MN	PVP (94)	1.3	61.0	32.0	5
SY 611 CL2[5]	2019 AgriPro/Syngenta	PVP (94)	1.3	56.8	31.5	4
SY Valda	2015 AgriPro/Syngenta	PVP (94)	1.3	58.4	33.3	5
TCG-Badlands	2023 21st Century Genetics	Patnet pending	1.3	57.4	34.0	3–4
TCG-Teddy	2022 21st Century Genetics	Patented	1.3	59.3	30.2	3
TCG-Wildcat	2020 21st Century Genetics	PVP (94), Patent pending	1.3	59.4	34.1	3
TCG-Zelda	2023 21st Century Genetics	Patent pending	1.3	57.3	31.3	3–4
TW Olympic	2022 Thunder Seed	PVP (94)	1.3	58.4	34.3	5
TW Starlite	2022 Thunder Seed	PVP (94)	1.3	61.4	41.5	5–6
TW Trailfire	2024 Thunder Seed	PVP (94)	1.3	55.0	34.2	6
WB9479	2017 WestBred	Patented, PVP (94)	1.3	56.8	30.5	3
WB9590	2017 WestBred	Patented, PVP (94)	1.3	56.2	30.2	3
Mean				58.9	33.5	

[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] Heading is days after planting. 2024 data from Crookston, Lamberton, Roseau, and St. Paul.

[4] 1-9 scale in which 1 is the strongest straw and 9 is the weakest. Based on 2014-2024 data. The rating of newer entries may change by as much as one rating point as more data are collected.

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

[6] CP3360AX and LCS Hammer AX have tolerance to Agressor AX® herbicide.

Table 2. Grain quality of hard red spring wheat varieties in Minnesota in single-year (2024) and multiple-year comparisons.

Entry	Test Weight (lb/Bu)		Protein (%)[1]		Baking Quality[2]	Pre-Harvest Sprouting[3]
	2024	2yr	2024	2yr		
AP Elevate	58.5	–	14.2	–	–	2
AP Gunsmoke CL2	57.8	59.4	14.9	14.8	5	2
AP Murdock	57.9	58.9	13.8	13.9	5	1
AP Smith	58.2	59.7	14.4	14.4	3	3
Ascend-SD	58.8	60.2	14.3	14.2	5	5
Brawn-SD	59.5	61.0	13.3	13.1	–	1
CAG Ceres	58.5	–	13.4	–	–	2
CAG Justify	56.0	57.4	13.3	13.2	7	3
CAG Reckless	58.8	60.3	13.9	14.0	3	4
CAG Recoil	56.8	58.3	14.3	14.1	–	1
CP3055	54.0	–	12.5	–	–	1
CP3099A	51.2	55.2	10.6	11.1	6	1
CP3188	55.2	57.4	12.9	12.7	6	2
CP3322	54.4	57.0	13.2	13.0	–	2
CP3360AX	58.7	–	13.0	–	–	1
CP3915	57.8	59.6	14.1	14.1	4	1
Driver	58.6	60.1	13.9	13.9	6	2
Dyna-Gro 8582	58.6	–	13.9	–	–	2
Dyna-Gro Ambush	59.2	60.6	14.4	14.4	2	3
Dyna-Gro Ballistic	57.3	58.8	13.5	13.4	5	3
Dyna-Gro Commander	58.4	59.9	13.9	14.1	6	1
Dyna-Gro Rocker	55.4	–	14.1	–	–	2
LCS Ascent	58.4	60.0	13.0	13.4	–	3
LCS Boom	59.5	61.1	14.2	14.2	–	3
LCS Buster	56.1	57.7	12.3	12.1	7	5
LCS Cannon	59.2	60.9	14.1	14.1	4	3
LCS Dual	58.4	59.9	13.6	13.6	–	2
LCS Hammer AX	56.1	–	13.6	–	–	1
LCS Trigger	58.6	59.7	12.0	12.1	7	1
Linkert	58.3	60.1	14.8	15.0	1	1
MN-Rothsay	58.1	59.8	13.9	14.0	5	2
MN-Torgy	59.1	60.4	14.2	14.3	4	1
MS Charger	57.6	59.3	12.7	12.8	–	1
MS Cobra	58.1	59.9	14.0	14.1	3	4
ND Heron	59.2	60.8	14.6	14.7	–	2
ND Stampede	57.6	59.2	13.8	13.9	–	6
ND Thresher	56.2	–	14.6	–	–	2
PFS Buns	54.5	56.6	13.1	13.0	–	4
PFS Rolls	56.7	–	13.9	–	–	2
Shelly	58.0	59.7	13.3	13.4	5	1
SY 611 CL2	59.3	60.5	14.1	14.2	6	2
SY Valda	58.4	59.8	13.6	13.7	6	2
TCG-Badlands	57.7	–	13.6	–	–	5
TCG-Teddy	56.2	58.5	14.6	14.4	–	2
TCG-Wildcat	58.0	59.8	14.2	14.3	4	1
TCG-Zelda	57.9	–	14.1	–	–	2
TW Olympic	58.8	–	14.1	–	–	3
TW Starlite	58.7	–	14.5	–	–	1
TW Trailfire	57.6	–	14.3	–	–	2
WB9479	57.7	59.6	14.9	15.1	1	1
WB9590	57.5	59.3	14.2	14.5	4	2
Mean	57.8	59.5	13.9	13.9		
No. of Environments	10	20	11	22		

[1] 12% moisture basis.
[2] 2014-2022 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.

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

Entry	Leaf Rust	Stripe Rust[2]	Stem Rust[3]	Bacterial Leaf Streak[4]	Other Leaf Diseases[5]	Scab
AP Elevate	3	1	–	3–4	4	4
AP Gunsmoke CL2	3	4	1	8	7	5
AP Murdock	3	1	1	4	6	7
AP Smith	6	2	2	4	4	6
Ascend-SD	3	2	1	3	6	3
Brawn-SD	1	2	2	3	6	4
CAG Ceres	4	1	–	3	5	7–8
CAG Justify	3	2	2	4	4	4
CAG Reckless	1	1	1	2	4	4
CAG Recoil	2	1	1	2	5	7
CP3055	3	2	–	3–4	4	4–5
CP3099A	6	2	8	5	5	7
CP3188	1	3	6	5	6	5
CP3322	7	3	2	5	4	7
CP3360AX	2	1	–	6	6	5
CP3915	1	2	1	2	4	4
Driver	2	1	1	3	4	4
Dyna-Gro 8582	8	2	–	5	5	3–4
Dyna-Gro Ambush	4	2	1	4	4	4
Dyna-Gro Ballistic	4	2	3	4	5	5
Dyna-Gro Commander	4	1	1	4	6	5
Dyna-Gro Rocker	6	2	–	5	6	5
LCS Ascent	4	1	1	6	6	4
LCS Boom	3	1	1	5–6	6	3
LCS Buster	3	2	2	3	3	3
LCS Cannon	4	1	1	5	7	4
LCS Dual	3	2	2	4	5	5
LCS Hammer AX	7	3	–	6	7	7–8
LCS Trigger	1	3	1	2	3	3
Linkert	3	1	1	4	5	5
MN-Rothsay	4	2	1	4	3	4
MN-Torgy	3	1	1	3	4	3
MS Charger	2	4	2	5	6	5
MS Cobra	2	1	1	5	4	5
ND Heron	5	2	1	6	5	3
ND Stampede	3	7	2	5	6	4
ND Thresher	2	2	–	4	5	4
PFS Buns	4	5	1	2	3	6
PFS Rolls	3	3	–	5	4	3–4
Shelly	5	1	1	5	4	4
SY 611 CL2	4	1	5	3	4	3
SY Valda	4	3	1	4	5	4
TCG-Badlands	3	1	–	5	5	4–5
TCG-Teddy	2	1	1	5	6	5
TCG-Wildcat	3	2	3	5	6	7
TCG-Zelda	3	2	–	3–4	5	5
TW Olympic	4	2	–	3	3	3–4
TW Starlite	6	1	–	4	4	3
TW Trailfire	6	1	–	5	6	4
WB9479	6	3	1	5	5	7
WB9590	7	2	2	6	6	7

[1] 1-9 scale where 1=most resistant, 9=most susceptible
[2] Based on natural infections in 2024 at Becker.
[3] CP3099A is the only variety that had significant damage due to stem rust in 2024. Ratings of other varieties is based on inoculated trials.
[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, septoria, and powdery mildew.

Table 4. Relative grain yield of hard red spring wheat varieties in northern Minnesota locations in single-year (2024) and multiple-year comparisons (2022-2024).

	Crookston			Fergus Falls[1]	Hallock			Oklee			Perley			Roseau[2]		Stephen			Strathcona		
Entry	2024	2yr	3yr	2yr	2024	2yr	3yr	2024	2yr	3yr	2024	2yr	3yr	2024	2yr	2024	2yr	3yr	2024	2yr	3yr
AP Elevate	95	–	–	–	101	–	–	103	–	–	104	–	–	105	–	101	–	–	112	–	–
AP Gunsmoke CL2	104	94	94	101	93	98	98	97	95	96	96	96	91	89	93	88	98	96	89	98	98
AP Murdock	105	97	100	92	98	96	94	102	97	98	98	99	105	98	99	104	96	99	106	98	102
AP Smith	97	101	100	97	104	98	96	105	99	104	98	96	98	100	94	103	99	98	102	97	95
Ascend-SD	110	101	100	107	100	101	100	101	102	99	98	101	101	104	106	94	96	102	88	94	102
Brawn-SD	97	96	99	109	102	99	100	96	96	100	108	108	109	104	102	94	96	99	98	99	97
CAG Ceres	93	–	–	–	105	–	–	94	–	–	88	–	–	97	–	103	–	–	108	–	–
CAG Justify	112	104	100	102	104	108	110	103	110	106	107	106	105	112	114	97	106	105	97	109	110
CAG Reckless	96	95	93	100	102	105	103	99	101	99	102	97	97	104	103	94	93	96	97	102	102
CAG Recoil	103	100	102	101	96	95	95	105	99	98	99	97	102	106	95	94	95	95	96	89	90
CP3055	100	–	–	–	95	–	–	107	–	–	104	–	–	104	–	95	–	–	94	–	–
CP3099A	66	92	101	117	111	104	107	65	90	98	101	113	110	106	111	98	111	108	97	107	109
CP3188	87	95	98	98	101	103	100	107	105	103	102	105	101	97	99	102	104	101	108	112	109
CP3322	77	90	–	–	92	102	–	95	99	–	99	107	–	102	–	99	102	–	65	82	–
CP3360AX	114	–	–	–	102	–	–	112	–	–	103	–	–	98	–	104	–	–	101	–	–
CP3915	96	101	99	98	101	100	99	102	96	97	96	91	96	89	92	98	98	99	98	96	102
Driver	102	98	100	105	97	102	102	105	99	101	100	95	99	103	107	95	95	95	93	99	99
Dyna-Gro 8582	110	–	–	–	95	–	–	109	–	–	104	–	–	97	–	101	–	–	99	–	–
Dyna-Gro Ambush	104	102	97	103	95	96	99	97	96	100	103	100	98	94	97	97	101	104	106	105	104
Dyna-Gro Ballistic	111	115	108	110	106	109	106	111	106	103	106	104	98	102	97	99	107	106	96	102	102
Dyna-Gro Commander	108	111	107	92	104	100	99	111	104	103	104	98	101	100	98	106	101	100	99	107	104
Dyna-Gro Rocker	69	–	–	–	104	–	–	79	–	–	95	–	–	92	–	102	–	–	99	–	–
LCS Ascent	112	108	103	101	108	103	103	106	100	101	109	105	100	102	104	109	105	104	102	100	101
LCS Boom	110	94	–	–	96	97	–	104	103	–	91	94	–	97	–	102	96	–	108	107	–
LCS Buster	117	117	114	110	106	110	110	108	109	108	109	112	110	117	107	98	106	105	100	104	102
LCS Cannon	101	99	97	97	93	96	93	105	103	102	89	92	96	97	101	98	98	99	111	107	105
LCS Dual	95	96	98	102	99	94	96	91	95	92	104	105	104	101	97	96	98	98	83	96	96
LCS Hammer AX	76	–	–	–	104	–	–	86	–	–	81	–	–	91	–	104	–	–	91	–	–
LCS Trigger	120	113	112	109	101	105	108	118	119	118	102	106	112	116	114	95	99	102	99	104	106
Linkert	94	89	92	86	90	91	90	87	90	89	93	91	91	82	84	90	90	91	91	92	91
MN-Rothsay	102	107	106	101	101	103	105	107	97	99	109	104	104	111	108	99	105	105	107	102	101
MN-Torgy	107	102	102	103	102	101	102	102	101	96	108	104	103	100	99	94	95	101	107	103	99
MS Charger	106	109	111	107	102	103	104	118	110	109	115	107	105	109	108	102	106	102	101	105	105
MS Cobra	92	94	96	92	100	98	98	98	99	99	99	97	96	105	100	103	103	100	109	108	102
ND Heron	97	90	91	94	94	93	93	93	95	96	99	96	93	98	102	96	97	95	110	110	103
ND Stampede	112	108	–	–	107	107	–	101	103	–	105	107	–	106	–	111	114	–	123	113	–
ND Thresher	93	–	–	–	93	–	–	97	–	–	100	–	–	96	–	95	–	–	86	–	–
PFS Buns	96	107	–	–	102	106	–	108	104	–	110	111	–	116	–	98	98	–	78	85	–
PFS Rolls	100	–	–	–	105	–	–	102	–	–	98	–	–	100	–	101	–	–	93	–	–
Shelly	106	103	102	108	105	107	108	105	100	100	103	101	101	99	105	106	107	106	103	100	101
SY 611 CL2	118	110	105	102	101	102	99	107	104	104	105	103	106	103	103	108	102	102	106	100	98
SY Valda	116	107	100	104	97	102	103	111	110	109	110	107	109	105	102	106	105	105	92	94	94
TCG-Badlands	87	–	–	–	97	–	–	95	–	–	96	–	–	95	–	104	–	–	99	–	–
TCG-Teddy	79	92	–	–	91	95	–	100	98	–	89	97	–	92	–	93	94	–	96	96	–
TCG-Wildcat	92	97	100	92	105	100	100	94	98	98	94	98	98	99	102	114	104	103	110	107	105
TCG-Zelda	100	–	–	–	106	–	–	100	–	–	107	–	–	104	–	114	–	–	110	–	–
TW Olympic	95	–	–	–	107	–	–	102	–	–	98	–	–	107	–	103	–	–	86	–	–
TW Starlite	111	–	–	–	102	–	–	93	–	–	97	–	–	98	–	99	–	–	93	–	–
TW Trailfire	99	–	–	–	98	–	–	100	–	–	97	–	–	96	–	98	–	–	112	–	–
WB9479	96	100	99	88	103	99	98	98	100	98	96	93	94	94	91	102	96	95	106	98	99
WB9590	110	108	105	98	102	103	102	96	98	100	93	95	95	97	97	102	103	100	101	101	101
Mean (Bu/Acre)	83.7	87.6	91.3	79.0	116.7	115.5	104.6	107.3	106.3	94.9	85.6	95.0	95.7	95.0	89.5	100.7	99.1	96.7	77.0	78.2	80.9
LSD (0.10)	9.5	13.0	9.3	5.7	6.3	8.3	6.2	5.6	11.5	9.3	7.8	7.2	7.1	5.6	7.5	7.5	9.3	7.5	6.8	9.1	7.1

[1] 2024 Fergus Falls was abandoned due to hail. 2 yr data is 2022 & 2023.
[2] 2023 Roseau was abandoned due to hail. 2 yr data is 2022 & 2024.

Table 5. Relative grain yield of hard red spring wheat varieties in southern Minnesota locations in single-year (2024) and multiple-year comparisons (2022-2024).

	Becker			Benson[1]		Lamberton			Le Center			Morris[2]	St Paul			Waseca[3]
Entry	2024	2yr	3yr	2024	2yr	2024	2yr	3yr	2024	2yr	3yr	2022	2024	2yr	3yr	2yr
AP Elevate	101	–	–	106	–	103	–	–	116	–	–	–	95	–	–	–
AP Gunsmoke CL2	106	107	105	91	92	98	88	96	98	99	99	114	78	92	96	98
AP Murdock	108	94	93	105	98	119	108	105	115	105	104	111	105	97	91	92
AP Smith	106	104	101	101	98	87	94	95	113	104	102	91	103	100	98	101
Ascend-SD	105	105	108	110	104	124	115	114	110	114	111	128	116	111	106	109
Brawn-SD	112	111	111	109	105	105	104	106	115	113	112	117	91	109	110	114
CAG Ceres	113	–	–	95	–	116	–	–	114	–	–	–	103	–	–	–
CAG Justify	109	106	103	109	108	107	96	101	95	102	103	128	107	104	105	109
CAG Reckless	98	98	101	105	103	113	116	113	113	107	103	114	98	109	109	97
CAG Recoil	105	101	91	95	96	99	102	99	102	101	103	102	100	95	92	101
CP3055	102	–	–	106	–	102	–	–	104	–	–	–	95	–	–	–
CP3099A	101	104	99	96	102	70	99	104	70	96	101	92	42	74	79	125
CP3188	99	104	100	105	107	90	85	86	103	111	108	110	99	93	94	99
CP3322	70	90	–	87	95	68	91	–	64	88	–	–	78	88	–	–
CP3360AX	119	–	–	107	–	123	–	–	117	–	–	–	123	–	–	–
CP3915	109	101	99	109	102	90	99	101	95	93	94	86	99	108	110	90
Driver	102	98	99	90	95	87	81	89	91	98	99	107	104	105	109	100
Dyna-Gro 8582	103	–	–	102	–	132	–	–	112	–	–	–	121	–	–	–
Dyna-Gro Ambush	101	103	103	98	96	117	109	109	110	101	103	106	100	103	103	97
Dyna-Gro Ballistic	122	118	107	111	110	106	103	103	118	109	105	101	101	111	111	110
Dyna-Gro Commander	111	107	102	105	101	119	107	101	126	109	105	104	107	105	105	105
Dyna-Gro Rocker	107	–	–	78	–	50	–	–	63	–	–	–	68	–	–	–
LCS Ascent	109	106	107	112	105	127	106	104	112	103	102	108	94	106	109	99
LCS Boom	112	105	–	100	96	123	108	–	102	99	–	–	111	113	–	–
LCS Buster	97	102	102	115	109	110	109	107	88	95	100	96	93	103	101	117
LCS Cannon	113	105	109	100	97	119	94	98	105	97	98	112	108	101	111	98
LCS Dual	94	95	101	97	97	99	99	101	100	103	101	104	76	90	92	103
LCS Hammer AX	101	–	–	79	–	83	–	–	92	–	–	–	84	–	–	–
LCS Trigger	108	98	96	119	111	134	126	120	110	105	106	108	119	118	111	118
Linkert	89	91	94	88	91	94	91	93	94	90	90	92	92	92	96	87
MN-Rothsay	92	93	94	103	102	93	92	90	92	98	96	90	105	103	98	102
MN-Torgy	107	104	104	105	102	107	100	101	107	106	104	88	102	105	92	101
MS Charger	103	104	109	113	110	132	112	112	115	109	108	109	102	100	105	106
MS Cobra	102	100	102	96	100	96	95	97	99	98	98	84	100	105	108	98
ND Heron	105	104	104	96	93	112	93	93	98	94	93	92	93	98	104	90
ND Stampede	101	107	–	109	105	115	116	–	118	113	–	–	122	119	–	–
ND Thresher	97	–	–	110	–	100	–	–	100	–	–	–	101	–	–	–
PFS Buns	86	84	–	116	113	95	104	–	100	108	–	–	95	88	–	–
PFS Rolls	106	–	–	99	–	93	–	–	99	–	–	–	105	–	–	–
Shelly	93	97	93	100	100	93	94	99	101	101	99	93	100	104	104	105
SY 611 CL2	111	101	105	100	101	105	107	103	110	100	98	96	90	91	94	99
SY Valda	100	97	97	111	107	116	109	106	120	107	108	98	116	104	107	100
TCG-Badlands	109	–	–	100	–	87	–	–	101	–	–	–	102	–	–	–
TCG-Teddy	100	102	–	86	96	86	95	–	95	98	–	–	93	94	–	–
TCG-Wildcat	96	101	104	94	96	74	101	102	87	93	96	118	111	109	103	98
TCG-Zelda	124	–	–	98	–	88	–	–	109	–	–	–	104	–	–	–
TW Olympic	105	–	–	104	–	110	–	–	108	–	–	–	107	–	–	–
TW Starlite	94	–	–	104	–	109	–	–	88	–	–	–	105	–	–	–
TW Trailfire	104	–	–	92	–	128	–	–	116	–	–	–	105	–	–	–
WB9479	99	92	93	89	88	103	100	99	102	95	95	89	85	90	94	88
WB9590	106	102	102	101	97	110	102	97	116	100	99	94	90	97	101	92
Mean (Bu/Acre)	55.8	63.2	60.0	87.7	92.8	53.7	64.3	63.2	63.8	77.0	78.8	59.0	66.9	61.3	58.7	60.1
LSD (0.10)	7.3	7.5	5.3	7.0	7.2	5.9	11.6	8.4	6.3	10.1	7.1	18.4	7.0	10.7	9.1	17.0

[1] 2022 Benson was abandoned due to early season flooding.
[2] The Morris location has not been seeded since 2022.
[3] 2024 Waseca was discarded due to excessive rainfall. 2 yr data is 2022-2023.

Table 6. Relative grain yield of hard red spring wheat varieties in Minnesota in single-year (2024) and multiple-year comparisons (2022-2024).

	State			North			South		
Entry	2024	2yr	3yr	2024	2yr	3yr	2024	2yr	3yr
AP Elevate	103	–	–	103	–	–	104	–	–
AP Gunsmoke CL2	94	96	97	94	96	96	93	96	98
AP Murdock	104	98	99	101	97	99	110	99	98
AP Smith	102	99	98	102	99	98	102	100	99
Ascend-SD	104	103	105	99	100	102	113	109	110
Brawn-SD	102	103	104	100	100	101	106	109	110
CAG Ceres	101	–	–	98	–	–	107	–	–
CAG Justify	105	106	106	105	107	106	105	104	106
CAG Reckless	101	102	101	99	100	99	105	105	105
CAG Recoil	100	98	97	100	97	97	100	99	97
CP3055	101	–	–	100	–	–	102	–	–
CP3099A	87	102	104	92	104	107	76	100	100
CP3188	100	102	101	101	103	101	100	101	100
CP3322	86	97	–	91	99	–	75	92	–
CP3360AX	109	–	–	105	–	–	117	–	–
CP3915	99	98	98	97	96	98	101	100	99
Driver	98	98	100	99	99	101	95	96	99
Dyna-Gro 8582	106	–	–	102	–	–	113	–	–
Dyna-Gro Ambush	101	100	101	99	99	100	104	101	102
Dyna-Gro Ballistic	107	108	105	105	107	104	111	110	107
Dyna-Gro Commander	107	104	102	105	103	101	113	105	103
Dyna-Gro Rocker	86	–	–	92	–	–	73	–	–
LCS Ascent	108	104	103	107	104	102	110	105	105
LCS Boom	103	99	–	101	98	–	109	101	–
LCS Buster	106	109	107	108	110	109	101	106	105
LCS Cannon	102	98	100	99	99	99	108	98	102
LCS Dual	95	97	98	96	98	98	93	97	99
LCS Hammer AX	90	–	–	91	–	–	87	–	–
LCS Trigger	111	110	110	107	109	110	118	112	110
Linkert	90	90	90	89	90	90	91	90	92
MN-Rothsay	102	102	101	105	103	104	98	98	97
MN-Torgy	104	102	101	103	101	101	105	103	100
MS Charger	109	107	107	108	107	106	113	107	109
MS Cobra	100	99	99	101	100	98	98	99	100
ND Heron	98	96	96	98	96	96	100	95	96
ND Stampede	110	109	–	109	108	–	113	111	–
ND Thresher	97	–	–	94	–	–	102	–	–
PFS Buns	101	104	–	102	104	–	100	104	–
PFS Rolls	100	–	–	100	–	–	100	–	–
Shelly	102	102	102	104	103	103	98	100	99
SY 611 CL2	105	102	101	106	103	102	102	100	100
SY Valda	108	104	104	105	104	103	112	104	104
TCG-Badlands	97	–	–	96	–	–	100	–	–
TCG-Teddy	92	96	–	92	95	–	92	97	–
TCG-Wildcat	98	100	100	101	100	100	93	99	101
TCG-Zelda	105	–	–	106	–	–	104	–	–
TW Olympic	102	–	–	100	–	–	106	–	–
TW Starlite	99	–	–	99	–	–	100	–	–
TW Trailfire	102	–	–	100	–	–	107	–	–
WB9479	98	95	95	100	97	96	95	92	93
WB9590	101	100	99	100	100	100	104	98	98
Mean (Bu/Acre)	82.8	85.0	81.5	95.1	95.3	92.2	65.6	71.8	67.5
LSD (0.10)	3.0	3.0	1.4	3.7	4.0	1.6	5.0	4.5	3.4
No. Environments	12	25	39	7	14	22	5	11	17

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

	North						South[1]				State					
	2024		2-year		3-year		2024		2-year		2024		2-year		3-year	
Entry	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int	Conv	Int
AP Elevate	89.9	105.5	–	–	–	–	55.0	60.1	–	–	78.3	90.3	–	–	–	–
AP Gunsmoke CL2	85.9	97.9	84.9	92.7	85.6	96.9	52.8	53.4	62.9	65.7	74.9	83.1	76.9	82.9	77.1	85.2
AP Murdock	90.7	102.6	89.4	97.5	91.0	101.9	63.9	67.3	63.2	65.9	81.7	90.8	83.1	90.0	80.6	88.4
AP Smith	88.2	103.0	92.6	98.9	89.6	98.4	46.7	56.3	53.2	62.1	74.4	87.4	81.1	88.2	76.0	84.8
Ascend-SD	95.5	108.5	93.7	99.5	94.0	101.4	66.5	65.1	69.8	71.9	85.9	94.0	86.9	90.9	84.9	90.3
Brawn-SD	90.0	108.3	90.6	104.3	91.4	102.3	56.2	61.0	64.2	70.4	78.7	92.6	82.0	93.5	81.2	90.4
CAG Ceres	84.8	107.8	–	–	–	–	62.1	63.4	–	–	77.3	93.0	–	–	–	–
CAG Justify	100.3	112.3	98.2	105.3	96.8	106.5	57.5	58.0	67.3	65.0	86.0	94.2	88.0	93.5	85.8	91.0
CAG Reckless	89.4	99.9	90.4	98.0	88.8	96.5	60.9	63.7	64.6	66.6	79.9	87.8	83.0	89.4	79.7	85.3
CAG Recoil	93.4	102.1	93.9	99.8	90.7	98.0	53.2	56.3	56.6	59.6	80.0	86.8	83.7	89.0	77.9	83.6
CP3055	91.4	113.7	–	–	–	–	54.9	54.8	–	–	79.2	94.1	–	–	–	–
CP3099A	78.2	117.4	89.4	111.2	96.1	113.2	37.5	54.2	54.0	63.8	64.7	96.3	76.4	96.9	80.3	94.7
CP3188	82.2	105.0	88.0	99.4	90.3	102.3	48.4	54.1	55.9	62.2	71.0	88.0	78.1	88.1	77.4	87.3
CP3322	80.6	96.6	86.8	101.6	–	–	36.4	36.0	–	–	65.8	76.4	74.2	85.2	–	–
CP3360AX	94.6	113.3	–	–	–	–	66.1	67.2	–	–	85.1	98.0	–	–	–	–
CP3915	82.3	106.2	89.0	98.0	88.0	100.0	48.4	49.3	54.3	59.7	71.0	87.3	78.9	85.8	75.4	84.9
Driver	91.7	101.4	91.9	95.1	94.0	98.3	46.8	50.6	58.1	62.2	76.8	84.5	80.7	84.0	80.6	84.8
Dyna-Gro 8582	92.2	108.0	–	–	–	–	70.6	65.8	–	–	85.0	93.9	–	–	–	–
Dyna-Gro Ambush	88.6	104.9	91.2	103.6	89.0	102.5	63.0	62.2	64.1	69.3	80.1	90.7	84.1	93.2	79.6	90.1
Dyna-Gro Ballistic	94.9	108.2	101.5	106.4	95.3	103.6	56.7	56.9	59.8	64.0	82.1	91.1	90.3	94.0	82.0	88.8
Dyna-Gro Commander	92.6	112.3	98.7	105.5	94.8	103.7	63.6	62.6	59.8	63.1	83.0	95.8	90.0	94.8	81.6	88.5
Dyna-Gro Rocker	72.9	96.3	–	–	–	–	26.6	35.9	–	–	57.5	76.1	–	–	–	–
LCS Ascent	95.4	106.1	97.3	101.7	94.9	103.0	68.2	70.8	63.9	71.5	86.4	94.3	90.0	94.0	83.2	91.2
LCS Boom	92.0	103.8	87.0	93.8	–	–	65.8	63.9	–	–	83.3	90.5	81.7	86.3	–	–
LCS Buster	104.5	115.0	107.4	110.2	102.1	109.2	59.0	59.8	59.4	65.9	89.3	96.6	95.3	97.6	86.1	92.9
LCS Cannon	88.4	105.2	90.4	97.0	90.5	99.4	63.8	64.9	64.7	68.3	80.2	91.8	83.8	89.0	80.8	87.7
LCS Dual	87.8	100.9	90.0	97.1	89.4	97.7	53.2	53.8	59.5	63.1	76.2	85.2	80.8	86.3	78.2	84.8
LCS Hammer AX	75.3	98.2	–	–	–	–	44.5	50.2	–	–	65.0	82.2	–	–	–	–
LCS Trigger	105.5	115.2	105.0	110.8	103.2	111.0	72.1	71.9	67.5	74.4	94.3	100.8	96.8	101.1	89.8	97.2
Linkert	78.1	90.7	79.4	86.4	81.6	89.2	50.3	46.9	54.4	58.4	68.9	76.1	72.1	76.5	71.4	77.6
MN-Rothsay	95.4	108.9	99.8	104.6	97.7	105.5	50.0	51.4	51.9	57.7	80.3	89.7	87.3	91.3	80.5	87.6
MN-Torgy	92.2	99.0	93.1	94.7	92.8	97.5	57.5	64.6	57.9	65.6	80.6	87.5	84.2	87.2	79.7	85.5
MS Charger	96.5	113.9	100.4	107.3	100.4	107.9	70.9	68.9	67.8	71.7	88.0	98.9	93.0	97.7	88.2	94.3
MS Cobra	88.3	104.2	89.8	99.0	89.2	98.6	51.5	53.1	54.4	59.4	76.1	87.2	80.2	87.5	76.1	83.9
ND Heron	87.3	95.9	85.5	92.6	87.3	93.4	60.3	58.1	56.8	63.0	78.3	83.3	79.2	84.0	75.9	82.0
ND Stampede	97.0	117.8	98.8	111.2	–	–	61.9	72.6	–	–	85.3	102.8	89.6	101.5	–	–
ND Thresher	84.5	97.8	–	–	–	–	53.6	51.7	–	–	74.2	82.5	–	–	–	–
PFS Buns	95.3	103.6	101.3	104.5	–	–	50.8	57.8	–	–	80.5	88.4	88.7	92.8	–	–
PFS Rolls	89.0	104.6	–	–	–	–	50.0	47.7	–	–	76.0	85.6	–	–	–	–
Shelly	91.6	107.2	93.3	102.7	94.2	104.3	49.9	52.0	57.2	60.4	77.7	88.8	82.5	90.0	80.3	87.8
SY 611 CL2	98.5	107.0	98.6	101.6	95.4	101.8	56.5	60.2	57.1	62.9	84.5	91.4	88.0	91.3	81.0	87.2
SY Valda	98.7	109.9	97.6	104.6	92.6	103.6	62.2	62.1	60.2	68.9	86.5	94.0	88.8	94.0	80.5	90.6
TCG-Badlands	81.9	99.2	–	–	–	–	46.5	51.2	–	–	70.1	83.2	–	–	–	–
TCG-Teddy	76.6	99.0	85.0	98.7	–	–	46.1	52.2	–	–	66.4	83.4	75.3	87.1	–	–
TCG-Wildcat	85.1	103.1	90.0	100.2	92.4	103.1	39.5	43.6	57.4	64.8	69.9	83.3	77.4	86.0	79.3	88.8
TCG-Zelda	91.4	109.1	–	–	–	–	47.1	54.4	–	–	76.6	90.9	–	–	–	–
TW Olympic	90.5	107.2	–	–	–	–	59.0	59.6	–	–	80.0	91.3	–	–	–	–
TW Starlite	92.8	103.4	–	–	–	–	58.5	64.4	–	–	81.4	90.4	–	–	–	–
TW Trailfire	87.0	100.7	–	–	–	–	68.8	68.0	–	–	80.9	89.8	–	–	–	–
WB9479	85.1	99.7	90.4	97.1	88.2	97.1	55.6	57.5	56.0	62.1	75.3	85.6	81.7	87.2	76.1	84.0
WB9590	92.2	98.4	96.1	97.4	93.3	100.6	58.9	60.5	56.0	64.5	81.1	85.8	86.8	88.1	79.3	87.0
Mean (Bu/Acre)	89.4	103.3	92.1	99.2	91.7	100.4	53.7	56.3	58.6	64.0	77.5	87.6	82.8	88.7	79.3	86.7
LSD (0.10)	9.3	9.4	9.2	8.3	6.8	5.3	5.9	6.5	6.9	5.7	7.4	7.4	7.9	7.2	5.3	4.3
No. Environments	2	2	3	3	5	5	1	1	3	3	3	3	4	4	8	8

[1] There were no intensive trials in southern locations in 2023. 2-year is 2022 & 2024.

2024 Winter Wheat Field Crop Trials Results

Minnesota Agricultural Experiment Station and the College of Food, Agricultural and Natural Resource Sciences

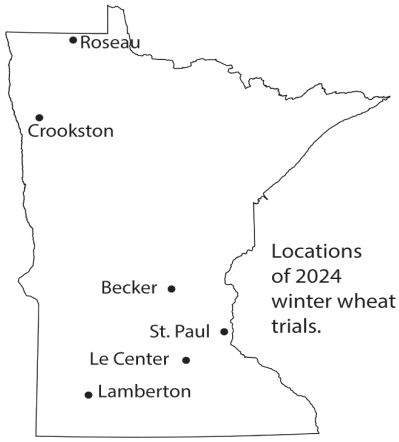
The yield potential of winter wheat is higher than spring wheat, especially in the southern half of Minnesota, but fall establishment and winter survival are key to it reaching that potential. Ideally, a well-established winter wheat crop will have started to tiller in the fall prior to freezing temperatures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

The results of the variety performance evaluations are summarized in Tables 1 through 3. The winter wheat performance trials were conducted near Lamberton, Le Center, St. Paul, Becker, Crookston, and Roseau in 2024. Testing of Ruth was discontinued. LCS Radar, LCS Steel AX, and LCS Warbird AX were tested for the first time.

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

For comparison, the single year and 3-yr average of grain yield of tested varieties as a percentage of the trial mean is presented in Table 2. The average yield across the six testing locations was 93 bu/acre in 2023. This compares to a three-year average of 88 bu/acre.

While all winter wheat varieties should be considered susceptible to very susceptible to Fusarium head blight (scab) when compared to spring wheat varieties, they head earlier than spring wheat varieties and thereby have a better chance of escaping losses in grain yield, test weight, and presence of deoxynivalenol or vomitoxin, a major food safety concern that can result in steep discounts. Most winter wheat



varieties are also considered susceptible to very susceptible to the leaf diseases - including powdery mildew. Research results in the region indicate that fungicides applications to control leaf diseases early in the season and suppress scab at anthesis are nearly always warranted and should be considered an integral part of your production practices. Disease ratings for leaf diseases, stripe, leaf, and stem rust, and scab are provided by South Dakota State University and USDA-ARS.

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Table 1. Agronomic characteristics of winter wheat varieties.

Entry	Agent or Breeder[1]	Year of Release	Class[2]	Legal Status	Winter Hardiness	Days to Heading	Plant Height	Straw Strength	Test Weight	Grain Protein
					(1-9)[3]					
AAC Vortex	Meridian Seeds	2021	CWRW	PVP Pending	1	6	6	1	3	3
AC Emerson	Meridian Seeds	2010	CWRW	PVP(94)	3	7	7	3	3	1
AP Bigfoot	AgriPro/Syngenta	2020	HRWW	PVP Pending	3	2	2	3	4	9
FourOSix	MT	2018	HRWW	PVP(94)	4	5	4	4	5	5
Jupiter	MSU	2012	SWWW	PVP(94)	3	5	1	3	9	9
Keldin	WestBred	2011	HRWW	PVP(94)	5	6	6	5	4	9
LCS Radar	LCS	2024	HRWW	PVP Pending	-	1	1	-	3	4
LCS Steel AX[4]	LCS	2021	HRWW	PVP(94)	-	6	4	-	5	9
LCS Warbird AX[4]	LCS	2024	HRWW	PVP Pending	-	1	1	-	2	3
MS Sundown[5]	Meridian Seeds	2023	HRWW	PVP	3	1	4	3	4	9
MT WarCat[5]	MT	2023	HRWW	PVP Pending	-	9	2	-	4	3
ND Noreen	NDSU	2019	HRWW	PVP(94)	3	6	9	3	1	4
SD Andes	SDSU	2020	HRWW	PVP(94)	4	6	5	4	2	9
SD Midland	SDSU	2021	HRWW	PVP(94)	4	4	5	4	3	5
SD Pheasant[5]	SDSU	2023	HRWW	PVP Pending	5	5	6	5	4	9
SY Wolverine	AgriPro/Syngenta	2019	HRWW	PVP(94)	4	1	1	4	4	9
Viking 211	Viking Seed	2020	HRWW	Patent	4	2	3	4	3	6
WB4309	WestBred	2019	HRWW	PVP(94)	1	2	2	4	4	4
WB4422[5]	WestBred	2022	HRWW	PVP(94)	3	4	3	1	3	5
Winner	SDSU	2019	HRWW	PVP(94)	4	4	4	4	3	9
LSD (0.1)					1	2	1	1	1	1

[1] LCS= Limagrain Cereal Seeds, MSU= Michigan State University, MT = Montana State University, NE= University of Nebraska/Husker Genetics, NDSU = North Dakota State University, SDSU = South Dakota State University
[2] CWRW = Canadian Western Red Winter Wheat, HRWW=Hard Red Winter Wheat, SWWW=Soft White Winter Wheat
[3] 1=highest 9=lowest
[4] Variety with tolerance to Agressor AX® herbicide.
[5] Agronomic ratings are a statistical prediction based on 2 year data.

Winter Wheat
Planting Rate and Date

Bushel Weight, Pounds.....60
Seeds/Pound.....14,500
Planting Rate, Pounds Acre.....75+
Planting Rate, Seeds/Sq. Ft.....25
Planting Date.....Sept. 1 - Oct. 1

Table 2. Relative grain yield of winter wheat cultivars in Minnesota in single-year (2024) and mutiple-year comparisons (2022-2024).

	Lamberton		Le Center		St. Paul		Becker (irrigated)		Crookston		Roseau		State	
Entry	2024	3yr	2024	3yr	2024	3yr	2024	3yr	2024	3yr	2024	3yr	2024	3yr
AAC Vortex	132	118	104	97	92	90	109	99	109	108	105	99	105	101
AC Emerson	110	102	93	83	88	83	86	91	89	92	95	85	93	89
AP Bigfoot	66	88	110	106	118	108	96	92	109	92	102	100	105	99
FourOSix	117	102	94	94	84	90	95	97	93	95	107	107	97	97
Jupiter	84	95	103	108	104	97	104	121	74	79	115	111	99	102
Keldin	139	120	111	108	111	114	117	111	105	101	121	117	117	110
LCS Radar	40	-	118	-	106	-	99	-	102	-	91	-	96	-
LCS Steel AX[1]	99	-	104	-	111	-	106	-	105	-	103	-	104	-
LCS Warbird AX[1]	62	-	111	-	117	-	93	-	95	-	101	-	100	-
MS Sundown[2]	60	77	119	110	109	110	100	84	97	95	95	102	99	99
MT WarCat[2]	99	112	90	91	84	84	105	104	92	102	92	90	92	96
ND Noreen	116	117	99	97	92	94	100	100	107	105	103	98	100	101
SD Andes	121	121	112	107	112	110	102	105	113	110	105	110	109	109
SD Midland	119	124	117	109	108	103	102	105	102	103	98	103	106	106
SD Pheasant[2]	97	98	94	100	109	104	106	102	106	109	99	99	102	102
SY Wolverine	65	79	101	107	105	100	80	95	105	95	88	89	96	97
Viking 211	104	97	97	97	103	105	94	108	101	99	91	96	99	101
WB4309	88	91	109	111	113	109	95	99	97	96	93	104	103	103
WB4422[2]	98	83	99	100	116	109	90	85	107	101	96	94	100	96
Winner	121	124	113	114	100	105	104	109	115	101	96	97	108	106
Mean (bu/acre)	57.2	58.9	99.0	90.5	111.1	86.4	73.0	71.5	113.7	102.3	101.9	90.3	93.1	88.1
LSD(0.1)	20	19	8	9	17	13	10	11	11	9	8	10	8	5

[1] Variety with tolerance to Agressor AX® herbicide.
[2] Relative grain yields reported are a statisical prediction based on two year data.

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

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

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