



# 2023 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.

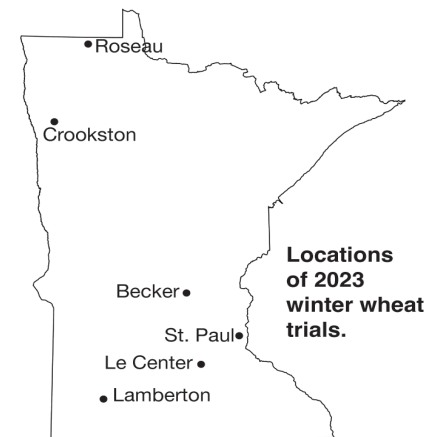
The results of the variety performance evaluations are summarized in Tables 1 through 3. The winter wheat performance trials were conducted near Lamberton, Le Center, St. Paul, Becker, Crookston, and Roseau in 2023. Testing of AAC Goldrush, Bobcat, Flathead, KWS317, KWS361, Redfield, and SY100 was discontinued.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

Winter hardiness, days to heading, plant height, and resistance to lodging have been converted to a 1-9 scale to allow for easier interpretation of the data (Table 1). Differences for all four characteristics are generally much less in the southern half of the

state, while in the northern half of the state, the gap in characteristics widens. Presenting averages of the actual data therefore can be misleading. Likewise, differences in test weight and grain protein are converted to a 1-9 scale. Varieties with lodging scores greater than 4 should be chosen with caution as lodging can reduce harvestability, yield, and quality. This is especially important if your soils are highly fertile.

For comparison, the single year and 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 73.6 bu/acre in 2023. This compares to a three-year average of 86.7 bu/acre. The extremely dry conditions this summer across much of Minnesota affected the trials near Lamberton, St. Paul in particular.

While all winter wheat varieties should be considered susceptible to very susceptible to Fusarium head blight (scab) when compared to spring wheat varieties, they head earlier than spring wheat varieties and thereby have a better chance of escaping losses in grain yield, test weight, and presence of deoxynivalenol or vomitoxin, a major food safety concern that can result in steep discounts. Most winter wheat varieties are also considered susceptible to very susceptible to the leaf diseases - including powdery mildew. Although AAC Vortex, AC Emerson, ND



Noreen, and Winner provide some of the better genetic resistance among winter wheat varieties (Table 3), research results in the region indicate that fungicides applications to control leaf diseases early in the season and suppress scab at anthesis are nearly always warranted and should be considered an integral part of your production practices. Disease ratings for leaf diseases, stripe, leaf, and stem rust, and scab are provided by South Dakota State University and USDA-ARS.

## Authors and Researchers

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**Table 1. Agronomic characteristics of winter wheat varieties.**

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

<sup>1</sup>MSU = Michigan State University, MT = Montana State University, NE = University of Nebraska/Husker Genetics, NDSU = North Dakota State University, SDSU = South Dakota State University

<sup>2</sup>CWRW = Canadian Western Red Winter Wheat, HRWW = Hard Red Winter Wheat, and SWWW = Soft White Winter Wheat

<sup>3</sup>1 = highest and 9 = lowest

<sup>4</sup>1 = earliest and 9 = latest

<sup>5</sup>1 = shortest and 9 = tallest

<sup>6</sup>1 = least prone and 9 = most prone to lodging

<sup>5</sup>The reported rated is a statistical prediction based on 2023 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 (2023) and multiple-year comparisons (2021-2023).**

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

<sup>1</sup>The 3 year average is a statistical prediction based on 2 years of data.

<sup>2</sup>

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

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

<sup>1</sup>Includes tan spot and Septoria complex.

<sup>2</sup>Data provided by SDSU and USDA-ARS.

<sup>3</sup>1 = most resistant and 9 = least resistant.