

North Dakota Hard Red Winter Wheat

Variety Trial Results for 2024 and Selection Guide

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During the 2023-24 growing season, 155,000 acres of winter wheat were planted and 120,000 acres were harvested. Winter wheat yield in North Dakota was estimated at 54 bushels per acre (bu/a) statewide, compared to 2023's yield of 56 bu/a. Across much of the state, 2024 winter wheat yields were high due largely to the cool, wet spring and favorable weather conditions during crop vegetative growth.

SY Wolf, a Syngenta/AgriPro release, was reported as the most commonly planted winter wheat variety in the state at 16.4% of acres. In second place was the NDSU release, ND Noreen. Jerry and Emerson were tied for third place at 9.4% of acres each and the new NDSU release, ND Allison, was in fourth place at 6.6% of acres. Approximately one-third of the acres surveyed planted other varieties or did not respond.

Characteristics of hard red winter wheat varieties adapted for production in North Dakota are described in Table 1. Information on the agronomic and quality performance of selected varieties is summarized in subsequent tables. Yields are expressed on a 13.5% moisture basis and protein on a 12% basis, which are the industry standards.

Successful winter wheat production depends on numerous production practices, including selecting the right variety for a particular area. The information included in this publication is meant to help growers choose that variety or group of varieties. Characteristics to consider when selecting a variety are winter hardiness, yield potential in your area, test weight, protein content when grown with proper fertility, straw strength, plant height, reaction to important diseases and maturity.

The recommended seeding dates for winter wheat are Sept. 1-15 north of North Dakota Highway 200 and Sept. 15-30 in southern regions. Planting after the recommended dates reduces winter survival and grain yield. Planting prior to the recommended date may deplete soil moisture reserves unnecessarily. It also increases the risk of wheat streak mosaic virus and may reduce winter survival.

Winter wheat should be seeded at a rate of 1 million to 1.2 million pure live seeds per acre. The higher seeding rates of this recommended range should be used for late seeding or with poor seedbed conditions. Producers should consider only the most winter-hardy varieties available when growing winter wheat in North Dakota. Relative ratings for winter hardiness are found in Table 1.

Phosphorus aids winter survival by stimulating root growth and fall tillering. The secondary root system that develops during tillering is essential for a healthy, deep-rooted plant capable of withstanding stress. If winter wheat is planted on bare soil or following fallow, an application of phosphorus is recommended if soil phosphorous levels are low. While important, the contribution of phosphorus to winter survival is secondary to varietal hardiness.

Data from several years and locations should be used when selecting varieties. The idea that data from a single location nearest your farm will indicate which variety will perform the best for you next year is incorrect. You should select varieties that, on average, perform the best at multiple trial locations near your farm across several years.

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Table 1. 2024 North Dakota hard red winter wheat variety description and agronomic traits.

Variety	Agent or Origin ²	Year	Reaction to Disease ¹					Days to Heading ³	Straw Strength ⁴	Height ⁵ (inches)	Winter ⁶ Hardiness
			Stripe Rust	Leaf Rust	Stem Rust	Scab	Tan Spot				
AAC Coldfront	AAFC	2022	4	4	4	5	NA	0	4	31	4
AAC Goldrush	AAFC	2021	5	3	5	5	NA	1	4	33	4
AAC Overdrive	AAFC	2022	3	4	3	4	NA	0	4	30	3
AAC Vortex	AAFC	2021	4	4	4	4	8	1	3	32	2
AAC Wildfire	AAFC	2015	1	5	8	4	6	3	3	34	2
AC Emerson	Meridian	2011	1	6	1	3	5	1	2	34	5
Jerry	ND	2001	8	3	1	8	8	0	5	35	3
Keldin	WB	2011	2	3	3	5	6	2	5	30	5
LCS Chrome	Limagrain	2017	1	7	NA	6	5	-1	4	31	5
LCS Steel AX	Limagrain	2022	7	7	9	8	4	0	4	32	5
MS Maverick	Meridian	2020	2	6	5	8	4	-2	5	29	4
ND Allison	ND	2023	7	5	4	4	NA	1	4	34	4
ND Noreen	ND	2020	3	3	1	3	4	1	4	35	4
Northern	MT	2015	1	8	1	8	6	1	4	32	4
SD Andes	SD	2020	2	8	NA	5	6	-1	3	32	2
SD Midland	SD	2021	1	8	7	6	8	-1	4	32	4
SD Pheasant	SD	2023	NA	NA	NA	5	NA	-1	4	32	4
SY Monument	Agripro	2014	3	3	1	8	8	-2	4	29	4
WB 4309	WB	2019	4	8	5	7	5	-2	5	29	4
WB 4422	WB	2023	8	6	6	8	5	-2	3	28	4
Winner	SD	2019	5	NA	3	4	5	-4	4	30	4

¹Disease reaction scores from 1-9, with 1 = resistant and 9 = very susceptible, NA = not available.

²MT = Montana State University; ND = North Dakota State University; SD = South Dakota State University;

WB = WestBred; AAFC = Agriculture and Agri-Food Canada.

³Days to heading relative to Jerry.

⁴Straw strength: 1 = strongest, 9 = weakest. Based on field observations from limited sites.

⁵Based on the average of several environments, and should be used for comparing varieties. The environment can impact the height of varieties.

⁶Relative winter hardiness rating: 1 = excellent, 10 = no survival. These values are subject to change as additional information becomes available.

Bold varieties are those recently released or the first time tested, so data are limited and rating values may change.

Table 2. Yield of winter wheat varieties grown at 6 locations in North Dakota in 2024, with three-year averages (2022-24).

	<u>Casselton</u>	<u>Carrington</u>		<u>Langdon</u>		<u>Hettinger</u>		<u>Minot</u>		<u>Williston</u>		<u>Avg. N.D.</u>	
			3-Yr.		3-Yr.		3-Yr.		3-Yr.		3-Yr.		
Variety	2024	2024	Avg.	2024	Avg.	2024	Avg.	2024	Avg.	2024	Avg.	2024	Avg.
(bu/a).....												
AAC Coldfront	111.6	73.5	--	101.1	--	68.39	--	64.9	--	78.0	-	82.9	--
AAC Goldrush	107.9	64.7	--	84.6	--	60.3	--	58.9	--	74.5	-	75.2	--
AAC Overdrive	115.1	76.6	--	95.5	--	63.8	--	65.7	--	67.9	-	80.7	--
AAC Vortex	116.0	84.4	74.8	104.4	85.6	70.6	75.8	57.0	58.0	71.6	47.8	84.0	68.4
AAC Wildfire	102.8	69.8	68.5	87.1	74.5	73.4	75.3	64.7	60.9	72.9	-	78.5	69.8
AC Emerson	98.0	72.9	67.2	92.0	71.4	62.5	65.4	67.7	55.3	59.2	37.5	75.4	59.4
Jerry	104.6	77.9	72.6	80.4	74.7	57.0	64.6	56.5	59.3	59.9	37.5	72.7	61.8
Keldin	115.3	76.6	79.1	94.8	75.7	74.1	77.1	66.5	56.6	52.9	40.6	80.0	65.8
LCS Chrome	102.4	71.2	--	94.1	--	58.8	--	61.7	--	70.5	--	76.4	--
LCS Steel AX	116.8	70.8	--	88.5	--	60.4	--	67.1	--	69.5	--	78.9	--
MS Maverick	98.8	83.2	75.1	88.4	71.1	62.3	68.4	68.5	52.1	74.9	41.7	79.3	61.7
ND Allison	118.8	79.8	--	97.9	84.0	62.1	69.5	--	--	72.3	--	86.2	--
ND Noreen	112.2	74.8	72.7	97.9	81.6	66.4	72.0	67.1	61.1	82.4	51.5	83.5	67.8
Northern	111.6	66.8	72.5	87.7	72.8	71.4	74.6	63.5	61.2	84.4	49.1	80.9	66.0
SD Andes	116.7	79.2	78.1	96.9	83.2	71.7	76.5	72.1	67.7	82.9	49.9	86.6	71.1
SD Midland	118.8	77.7	78.4	97.1	81.5	69.2	75.0	66.3	59.9	79.2	47.2	84.7	68.4
SD Pheasant	115.5	81.3	--	78.6	--	54.4	--	65.1	--	55.1	--	75.0	--
SY Monument	112.5	71.0	71.1	81.2	67.2	58.0	64.1	59.4	56.3	64.8	41.3	74.5	60.0
WB 4309	107.3	58.1	64.3	78.4	67.3	55.9	57.6	87.4	60.1	64.2	38.9	75.2	57.6
WB 4422	121.0	75.5	--	87.8	--	59.6	--	90.6	--	57.1	--	81.9	--
Winner	109.0	74.9	73.6	99.0	79.4	69.1	69.4	71.6	--	83.5	47.1	84.5	67.4
Mean	111.1	73.3	72.9	90.5	76.4	63.1	69.0	65.2	59.0	69.6	44.2	79.9	65.0
CV (%)	7.1	3.7	--	7.6	--	8.1	--	9.8	--	8.7	--	8.8	--
LSD 0.10	7.4	3.1	--	8.2	--	4.7	--	8.8	--	8.3	--	6.8	--

Table 3. Test weight of winter wheat varieties grown at six locations in North Dakota in 2024.

Variety	Casselton	Carrington	Langdon	Hettinger	Minot	Williston	Average
.....(lb/bu).....							
AAC Coldfront	59.8	59.5	57.7	63.3	60.2	63.2	60.6
AAC Goldrush	60.3	58.5	57.0	61.7	58.1	62.2	59.6
AAC Overdrive	59.4	58.4	56.2	61.4	55.9	61.4	58.8
AAC Vortex	59.8	60.4	58.3	62.7	60.0	63.4	60.8
AAC Wildfire	59.6	57.5	55.1	62.6	59.7	62.5	59.5
AC Emerson	60.1	60.1	58.0	63.1	60.6	63.0	60.8
Jerry	58.8	59.8	56.1	61.2	58.6	60.6	59.2
Keldin	60.5	58.7	56.1	61.8	58.2	60.0	59.2
LCS Chrome	60.7	60.6	57.5	61.9	58.6	62.0	60.2
LCS Steel AX	59.6	59.0	54.1	60.5	56.6	61.1	58.5
MS Maverick	60.3	61.4	56.3	62.7	59.3	62.7	60.4
ND Allison	59.2	59.9	57.1	61.7	--	62.1	60.0
ND Noreen	60.0	60.9	58.9	63.4	61.8	64.4	61.6
Northern	58.9	56.7	53.9	62.3	57.7	62.8	58.7
SD Andes	61.1	60.7	57.8	63.6	60.3	64.6	61.4
SD Midland	60.0	60.5	57.7	62.8	60.1	63.4	60.8
SD Pheasant	60.1	59.6	55.0	60.4	58.3	60.3	58.9
SY Monument	59.4	58.4	53.3	59.0	56.7	58.5	57.5
WB 4309	60.2	58.4	55.7	61.7	57.6	61.8	59.2
WB 4422	61.4	60.6	55.7	60.6	58.2	59.8	59.4
Winner	59.7	60.9	57.1	63.8	60.5	63.7	60.9
Mean	59.9	59.6	56.2	62.0	58.8	61.9	59.8
CV (%)	1.0	1.0	1.4	1.1	2.6	1.7	1.5
LSD 0.10	0.6	0.7	0.9	0.6	2.1	1.5	0.9

Note: 58.0 lb/bu test weight is required for US No. 1 grade Hard Red Winter Wheat

Table 4. Grain protein content at 12% moisture of winter wheat varieties grown at six locations in North Dakota in 2024.

Variety	Casselton	Carrington	Langdon	Hettinger	Minot	Williston	Average
.....(%).....							
AAC Coldfront	11.3	12.2	11.2	10.7	12.0	12.4	11.6
AAC Goldrush	11.6	12.3	12.0	11.5	12.7	13.5	12.3
AAC Overdrive	12.0	12.8	12.3	10.9	12.5	12.1	12.1
AAC Vortex	12.4	12.6	12.4	11.4	12.2	14.1	12.5
AAC Wildfire	11.5	12.5	11.8	11.0	12.1	11.3	11.7
AC Emerson	12.2	12.8	12.0	11.9	12.5	13.1	12.4
Jerry	11.4	12.1	12.1	10.8	12.4	11.0	11.6
Keldin	11.4	12.6	12.1	11.1	12.5	14.9	12.4
LCS Chrome	11.9	13.1	12.1	11.2	13.1	13.4	12.5
LCS Steel AX	10.7	11.4	11.1	9.8	11.4	11.8	11.0
MS Maverick	12.6	13.1	13.0	11.5	12.8	13.1	12.7
ND Allison	10.7	11.4	11.0	9.7	--	12.0	11.0
ND Noreen	11.1	12.0	11.7	11.3	12.3	14.5	12.2
Northern	11.4	12.9	12.1	11.6	12.2	13.3	12.2
SD Andes	11.7	12.2	11.7	11.4	11.9	13.0	12.0
SD Midland	11.7	12.1	11.2	11.1	11.4	12.7	11.7
SD Pheasant	11.8	12.2	11.6	10.3	12.4	11.3	11.6
SY Monument	11.6	12.7	12.18	10.17	11.7	12.2	11.7
WB 4309	12.9	14.2	12.92	11.11	13.1	12.6	12.8
WB 4422	12.4	13.6	12.23	10.79	13	13.1	12.5
Winner	12.2	12.7	12.35	11.09	11.9	13.9	12.4
Mean	11.7	12.6	12.0	11.0	12.2	12.8	12.0
CV (%)	3.9	1.5	2.6	3.14	3.9	8.0	4.2
LSD 0.10	0.6	0.2	0.4	0.3	0.7	1.4	0.5

Table 5. Analytical milling and baking characteristics of selected varieties evaluated at Casselton, North Dakotain 2023.

Variety	Kernel				Flour				Farinograph				Loaf	
	Test Weight ¹ (lb/bu)	1,000 Kernel Weight ² (gram)	Whole Wheat Protein 12 MB ³ (%)	Falling Number ⁴ (seconds)	Flour Protein 14 MB (%)	Flour Ash 14 MB (%)	Milling Extraction ⁵ (%)	Wet Gluten (%)	Abs ⁶ (%)	Peak Time (min)	Stability ⁷ (min)	Mixing Tolerance Index (BU)	Loaf Volume ⁸ (cc)	Crumb Color (1-10) ⁹
AAC Goldrush	59.6	32.3	12.9	408	12.2	0.5	72.3	30	56.5	5.2	10.1	41	925	9
AAC Vortex	59.1	33.7	13.6	365	12.5	0.6	73.0	30	56.8	4.9	13.1	18	885	8
AAC Wildfire	60.0	34.4	12.9	422	12.2	0.6	74.4	32	60.0	5.5	7.4	46	840	7
AC Emerson	59.6	28.1	13.8	381	12.7	0.5	70.8	31	55.1	6.2	12.5	26	940	9
AP Bigfoot	61.3	30.7	11.5	397	10.4	0.5	71.5	24	54.5	1.8	8.9	37	775	7
Jerry	58.1	33.1	12.6	328	11.8	0.6	73.1	31	58.7	5.0	5.3	58	775	7
Keldin	62.7	41.2	12.1	373	11.3	0.6	72.4	28	59.1	4.2	8.0	35	835	8
MS Maverick	62.4	37.9	12.3	409	11.5	0.6	71.3	30	58.2	5.8	7.7	52	790	7
MS Sundown	60.7	33.1	11.8	450	10.6	0.5	72.2	26	55.5	2.4	8.0	30	805	8
ND Allison	62.7	31.4	11.8	421	11.0	0.6	72.4	26	57.4	4.3	6.6	56	810	8
ND Noreen	62.3	38.2	13.4	354	12.1	0.5	72.4	33	59.0	4.0	4.8	68	800	6
Northern	60.0	32.7	12.4	388	11.8	0.7	73.5	31	61.4	4.9	5.5	58	765	7
SD Andes	62.4	38.2	12.4	413	11.5	0.6	73.3	31	58.6	4.4	5.6	53	920	8
SD Midland	61.9	40.5	12.5	419	11.6	0.6	73.4	30	57.6	5.2	7.6	47	825	8
SD Pheasant	60.8	36.6	13.4	412	12.4	0.6	71.6	31	60.2	5.5	8.5	39	870	9
SY Monument	59.8	33.9	12.4	347	11.0	0.5	71.6	24	58.1	1.9	4.8	46	830	8
SY Wolverine	61.5	32.5	11.7	416	11.0	0.6	71.5	26	56.1	2.4	9.2	31	765	7
WB 4309	61.4	32.1	12.7	413	11.8	0.5	71.1	28	60.1	3.0	7.6	32	930	8
WB 4422	62.2	34.8	12.8	426	12.0	0.6	72.2	32	60.7	4.7	5.9	52	800	7
Winner	60.3	37.6	13.2	395	11.9	0.6	70.9	31	58.6	5.8	8.1	39	900	8
Mean	60.9	34.7	12.6	397	11.7	0.6	72.2	29	58.1	4.4	7.8	43	839	7

¹Test weight - Expressed in pounds (lbs) per bushel. A high test weight is desirable. A 58 lb test weight is required for a grade of U.S. No. 1.

²1,000 KWT - Estimate of weight of 1,000 seeds based on a clean 10g sample. Expressed in grams and used to approximate seed size.

³Wheat Protein - Measured by NIR at a 12% moisture basis. A high protein is desirable for baking quality.

⁴Falling Number - Expressed in seconds at a 14% moisture basis. It is used as an indicator of sprouting based on elevated enzyme activity.

A high falling number is desirable, preferably greater than 400 seconds.

⁵Flour Extraction - Percentage of milled flour recovered from cleaned and tempered wheat. A high flour extraction percentage is desirable.

⁶Farinograph Absorption - Measured by NIR at a 14% moisture basis. A measure of dough water absorption, expressed as percent. A high absorption is desirable.

⁷Farinograph Stability - A measure of dough strength. It is expressed in minutes above the 500 Brabender unit line during mixing. A high stability is desirable.

⁸Loaf Volume - The volume of the pup loaf of bread, expressed in cubic centimeters. A high volume is desirable.

⁹Scale 1-10, with 1 being low and 10 being superior.

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