A1196-21

North Dakota
Hard Red Winter Wheat

Variety Trial Results for 2021 and Selection Guide

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During the 2020-21 growing season, 85,000 acres of winter wheat were planted and 55,000 acres were harvested. The state's winter wheat yield was estimated at 35 bushels per acre (bu/a), which was down from last year's yield of 49 bu/a. The dry fall in 2020 reduced plantings and impacted stand establishment in parts of the state. The very dry conditions during the spring and summer months of 2021 resulted in reduced yields and in some cases the abandonment of the crop.

SY Wolf was the most popular variety in 2020-21, occupying 27% of the acres planted. Jerry followed SY Wolf in popularity with 12% of the acreage. Most growers (61%) surveyed did not identify the variety they used.

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 viable 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.

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Fargo, North Dakota
September 2021

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, 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. 2021 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 Wildfire	FP Genetics	2015	1	5	8	NA	NA	1	3	29	3
AC Emerson	Meridian	2011	1	6	1	3	5	1	2	32	4
Draper	**SD**	**2019**	**4**	**7**	**4**	**4**	**5**	**-2**	**NA**	**28**	**NA**
Ideal	SD	2011	4	1	3	8	4	-1	4	28	4
Jerry	ND	2001	8	3	1	8	8	0	5	34	3
Keldin	WB	2011	2	3	3	5	3	0	3	29	5
MS Iceman	**Meridian**	**2021**	**7**	**8**	**5**	**6**	**8**	**0**	**NA**	**26**	**NA**
ND Noreen	ND	2020	3	3	1	3	5	0	4	29	3
Northern	MT	2015	1	8	1	8	6	2	4	29	5
Ray[7]	**MT**	**2018**	**1**	**8**	**NA**	**NA**	**NA**	**4**	**NA**	**33**	**NA**
SD Andes	**SD**	**2020**	**2**	**6**	**NA**	**5**	**6**	**0**	**NA**	**29**	**NA**
SY Monument	Agripro	2014	3	3	1	6	5	-2	4	27	3
SY Wolf	Agripro	2010	3	3	1	6	1	-2	3	27	6
SY Wolverine	Agripro	2019	4	3	1	4	5	-5	4	25	4
TCG-Boomlock	TCG	2019	NA	NA	NA	NA	NA	-1	4	29	6
Thompson	SD	2017	5	3	3	3	6	-1	3	30	5
WB 4309	**WB**	**2019**	**4**	**6**	**4**	**7**	**7**	**-2**	**NA**	**29**	**NA**
WB4462	WB	2016	7	3	NA	8	6	-5	4	31	4
Winner	SD	2019	NA	NA	NA	NA	NA	-2	NA	29	NA

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

[2]MT = Montana State University; ND = North Dakota State University; SD = South Dakota State University; TCG = Twenty-first Century Genetics; WB = WestBred.

[3]Days to heading relative to Jerry.

[4]Straw strength: 1 = strongest, 9 = weakest. Based on field observations in limited sites in 2020.

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

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

[7]Developed primarily for use as a forage winter wheat.

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 four locations in North Dakota in 2021, with three-year averages (2019-21).

	Casselton		Dickinson		Hettinger		Minot		Avg. N.D.	
Variety	2021	3-Yr. Avg.	2021	3-Yr. Avg.	2021	3-Yr. Avg.	2021	3-Yr. Avg.	2021	3-Yr. Avg.
	(bu/a)									
AAC Wildfire	122.8	--	21.9	--	26.6	--	21.8	--	48.3	--
AC Emerson	97.3	84.4	17.4	33.5	27.1	39.5	14.1	48.9	39.0	51.6
Draper	122.7	--	19.8	--	29.4	--	16.7	--	47.2	--
Ideal	116.6	91.8	18.8	37.9	25.5	39.4	18.7	54.4	44.9	55.9
Jerry	115.9	89.4	21.2	37.7	28.0	40.8	26.5	51.2	47.9	54.8
Keldin	121.8	90.4	22.1	38.0	30.0	45.9	29.1	59.5	50.8	58.5
MS Iceman	99.6	--	13.9	--	28.7	--	16.8	--	39.8	--
ND Noreen	119.4	--	22.6	38.7	27.5	--	21.1	54.1	47.7	--
Northern	126.7	88.6	25.5	41.3	31.6	46.6	21.4	48.0	51.3	56.1
Ray	115.6	--	22.3	--	30.1	--	22.6	--	47.7	--
SD Andes	122.9	--	26.4	--	30.3	--	21.5	--	50.3	--
SY Monument	115.1	88.8	20.8	38.9	30.4	43.2	17.3	53.5	45.9	56.1
SY Wolf	107.8	89.0	12.9	38.5	25.9	38.0	19.3	47.0	41.5	53.1
SY Wolverine	116.6	92.6	12.6	--	28.2	--	11.7	42.8	42.3	--
TCG-Boomlock	121.4	90.7	19.6	38.5	30.8	--	21.7	50.3	48.4	44.9
WB4309	119.1	--	16.0	--	32.7	--	16.0	--	46.0	--
WB4462	110.3	89.6	18.5	37.7	30.5	40.0	17.4	46.9	44.2	53.6
Winner	120.3	--	23.2	--	30.8	--	18.3	--	48.2	--
Mean	115.9	89.5	19.3	38.1	29.1	41.8	19.4	50.6	46.2	53.8
CV (%)	4.4	--	18.1	--	7.5	--	17.7	--	8.7	5.2
LSD 0.05	5.9	--	5.7	--	2.6	--	5.6	--	5.7	4.2
LSD 0.10	4.9	--	4.8	--	2.0	--	4.7	--	4.8	3.5

Table 3. Test weight of winter wheat varieties grown at four locations in North Dakota in 2021.

Variety	Casselton	Dickinson	Hettinger	Minot	Average[1]
	----------(lb/bu)----------				
AAC Wildfire	62.8	55.9	52.0	55.7	56.6
AC Emerson	61.9	57.4	54.1	55.4	57.2
Draper	62.1	56.4	53.6	59.0	57.8
Ideal	62.7	56.7	53.6	58.4	57.9
Jerry	61.3	56.6	53.6	58.1	57.4
Keldin	62.4	57.0	52.5	58.3	57.6
MS Iceman	63.6	60.2	54.8	60.3	59.7
ND Noreen	63.6	59.8	56.1	59.9	59.9
Northern	62.3	58.0	54.2	57.4	58.0
Ray	61.1	57.0	51.5	56.3	56.5
SD Andes	63.6	57.8	53.7	59.0	58.5
SY Monument	61.6	53.9	52.1	57.1	56.2
SY Wolf	62.7	58.1	53.2	58.9	58.2
SY Wolverine	62.4	57.2	53.7	57.6	57.7
TCG-Boomlock	62.7	57.3	54.8	59.6	58.6
WB4309	62.2	56.6	52.1	56.7	56.9
WB4462	61.8	54.5	53.4	56.5	56.6
Winner	62.3	56.9	53.8	58.8	58.0
Mean	62.3	57.0	53.7	58.0	57.7
CV (%)	0.6	1.5	2.1	1.4	1.4
LSD 0.05	0.4	1.4	1.6	1.4	1.2
LSD 0.10	0.3	1.2	1.3	1.1	1.0

[1]Mean values have been estimated using statistical techniques if there were missing values.

Table 4. Grain protein content at 12% grain moisture content of winter wheat varieties grown at four locations in North Dakota in 2021.

Variety	Casselton	Dickinson	Hettinger	Minot	Average
	----------(%)----------				
AAC Wildfire	12.6	16.4	17.3	14.3	15.2
AC Emerson	13.9	16.2	16.3	15.5	15.5
Draper	12.7	14.8	15.7	13.5	14.2
Ideal	12.3	15.3	16.7	13.8	14.5
Jerry	13.0	15.6	16.9	13.8	14.8
Keldin	12.4	15.4	16.5	13.3	14.4
MS Iceman	14.4	15.3	16.3	15.4	15.4
ND Noreen	13.0	15.5	16.9	14.1	14.9
Northern	12.7	15.4	16.8	13.7	14.7
Ray	13.2	15.8	17.1	13.4	14.9
SD Andes	12.3	15.2	16.5	13.6	14.4
SY Monument	12.5	14.3	15.6	13.5	14.0
SY Wolf	13.0	15.3	16.2	14.3	14.7
SY Wolverine	13.0	14.8	15.6	15.1	14.6
TCG-Boomlock	12.8	15.3	16.4	14.2	14.7
WB4309	13.0	15.0	16.3	14.6	14.7
WB4462	12.7	14.9	15.4	14.1	14.3
Winner	12.7	14.5	15.2	14.5	14.2
Mean	12.9	15.2	16.2	14.1	14.7
CV (%)	2.5	2.5	3.2	3.3	3.4
LSD 0.05	0.4	0.6	0.7	0.8	0.7
LSD 0.10	0.3	0.5	0.6	0.6	0.6

Table 5. Analytical milling and baking characteristics of selected varieties evaluated at two locations (Casselton and Dickinson), in 2020.

	Kernel				Flour					Farinograph				Loaf	
Variety	Test Weight[1]	1,000 Kernel Weight[2]	Whole Wheat Protein 12 MB[3]	Falling Number[4]	Flour Protein 14 MB	Flour Ash 14 MB	Milling Extraction[5]	Wet Gluten	Gluten Index	Abs[6]	Peak Time	Stability[7]	Mixing Tolerance Index	Loaf Volume[8]	Crumb Color
	(lb/bu)	(gram)	(%)	(seconds)	(%)	(%)	(%)	(%)		(%)	(min)	(min)	(BU)	(cc)	(1-10)[9]
AAC-Wildfire	59.8	29.7	13.7	384	13.2	0.6	73.7	33.7	88.6	58.3	6.3	9.0	32.5	1025	8.0
AC Emerson	60.2	25.7	15.0	337	14.0	0.6	73.2	33.3	98.0	56.5	7.3	14.8	26.5	1038	7.5
Ideal	60.1	30.8	12.4	357	11.7	0.6	74.8	26.0	99.0	55.9	5.4	11.0	25.5	925	7.0
Jerry	58.6	31.6	14.0	354	13.0	0.5	73.1	29.6	92.5	57.9	5.5	5.0	51.0	945	7.0
Keldin	60.3	36.0	13.4	360	12.6	0.6	74.9	31.0	92.6	58.2	4.6	8.5	33.5	970	7.0
ND Noreen	61.0	33.5	13.9	377	12.9	0.6	73.1	34.5	77.4	57.8	5.5	5.4	47.5	995	8.0
Northern	57.8	27.9	14.7	386	14.0	0.6	72.2	36.2	84.7	62.4	5.9	6.0	39.5	1048	8.5
Oahe	60.2	34.5	13.0	382	12.0	0.6	75.2	31.8	80.1	59.3	4.0	4.0	50.0	870	6.0
Peregrine	60.0	28.7	12.7	313	12.0	0.5	76.3	29.2	94.5	56.5	5.2	6.3	47.0	920	6.5
SY Monument	58.0	29.7	12.9	387	12.2	0.5	70.3	27.0	99.3	56.9	4.4	15.4	15.0	838	6.0
SY Sunrise	58.6	30.0	12.4	382	11.5	0.5	71.7	28.1	97.5	56.4	5.0	6.3	45.5	935	7.0
SY Wolf	59.8	30.1	13.6	298	12.8	0.5	70.8	31.0	87.2	57.7	6.9	7.9	35.0	930	7.0
SY Wolverine	59.6	32.0	12.6	362	11.8	0.5	71.7	29.1	88.8	56.1	7.1	10.8	29.0	910	6.0
TCG-Boomlock	60.2	28.6	13.8	391	13.0	0.6	73.3	32.5	87.5	58.8	6.0	6.3	38.5	955	7.5
Thompson	60.2	28.5	13.7	371	12.8	0.5	73.1	33.8	66.6	56.4	5.2	5.2	48.5	885	6.5
WB4462	58.8	35.2	12.6	335	12.2	0.6	74.2	29.5	88.1	55.6	4.9	5.4	46.5	903	6.5
WB4595	61.3	29.7	13.0	303	12.3	0.6	73.0	31.6	71.0	59.8	4.3	4.6	45.0	903	7.0
Mean	59.7	30.7	13.4	357.4	12.6	0.6	73.2	31.0	87.9	57.6	5.5	7.7	38.6	941	7.0

[1]Test 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.

[2]1,000 KWT - Estimate of weight of 1,000 seeds based on a clean 10g sample. Expressed in grams and used to approximate seed size.

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

[4]Falling 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.

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

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

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

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

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

For more information on this and other topics, see www.ag.ndsu.edu

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