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North Dakota Hard Red Winter Wheat

Variety Trial Results for 2020 and Selection Guide

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During the 2019-20 growing season, 40,000 acres of winter wheat were planted and 35,000 acres were harvested. The state's winter wheat yield was estimated at 40 bushels per acre (bu/a), which was down from last year's yield of 53 bu/a. Excessive fall rain made planting difficult, which is one of the reasons for the historically low winter wheat acreage. Snow cover was generally adequate, so winter survival rates were relatively good.

SY Wolf was the most popular variety in 2019-20, occupying 20% of the acres planted. Jerry and Willow Creek followed SY Wolf in popularity, with 15% and 6% of the acreage, respectively. Most growers (60%) surveyed did not identify the variety they used. Willow Creek is a forage winter wheat developed in Montana and is not included in any of the following tables because the focus of this publication is on varieties that are intended for grain production.

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. No fungicides were applied to the trials that were the source of these data.

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.

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. 2020 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
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
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
Oahe	SD	2016	2	6	6	4	6	-2	5	29	4
Peregrine	CDC	2008	1	3	1	6	6	1	5	34	2
SY Monument	Agripro	2014	3	3	1	6	5	-2	4	27	3
SY Sunrise	Agripro	2015	3	4	2	6	7	-2	4	23	6
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
WB4462	WB	2016	7	3	NA	8	6	-5	4	28	4
WB4595	WB	2019	4	4	NA	6	6	-1	3	28	6

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

²CDC = Crop Development Centre, University of Saskatchewan; MT = Montana State University; ND = North Dakota State University; SD = South Dakota State University; TCG = Twenty-first Century Genetics; WB = WestBred.

³Days to heading relative to Jerry.

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

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 three locations in western North Dakota in 2020, with three-year averages (2018-20).

Variety	<u>Dickinson</u>		<u>Minot</u>		<u>Williston</u>		<u>Avg. Western N.D.</u>	
	2020	3-Yr. Avg.	2020	3-Yr. Avg.	2020	3-Yr. Avg.	2020	3-Yr. Avg.
	------(bu/a)-----							
AAC Wildfire	51.8	--	82.9	--	46.9	--	60.5	--
AC Emerson	38.0	55.4	76.6	52.5	39.8	45.8	51.5	51.3
Ideal	45.5	61.9	83.1	58.8	38.4	49.9	55.7	56.9
Jerry	45.1	58.8	72.9	51.0	43.9	49.8	54.0	53.2
Keldin	38.2	63.7	88.1	58.6	38.8	49.0	55.0	57.1
ND Noreen	44.6	--	79.5	--	40.1	--	54.8	--
Northern	44.3	61.1	70.0	48.0	46.2	50.7	53.5	53.3
Oahe	41.2	56.8	72.8	56.8	50.4	50.3	54.8	54.7
Peregrine	46.5	62.8	81.3	59.1	39.5	51.3	55.8	57.7
SY Monument	41.0	57.4	77.6	57.9	45.3	49.8	54.6	55.0
SY Sunrise	37.5	50.3	68.3	44.1	40.2	--	48.7	--
SY Wolf	42.1	61.0	72.6	47.7	41.5	47.9	52.1	52.2
SY Wolverine	40.5	--	70.2	--	44.5	--	51.7	--
TCG-Boomlock	42.6	--	76.9	--	45.8	--	55.1	--
Thompson	44.2	60.6	81.7	57.5	40.7	48.3	55.5	55.5
WB4462	39.6	54.5	74.3	47.2	44.8	--	52.9	--
WB4595	43.3	--	74.9	--	40.5	51.1	52.9	--
Mean	42.9	58.7	74.8	53.3	44.9	49.4	54.2	53.8
CV (%)	8.1	--	10.2	--	8.9	--	7.8	5.1
LSD 0.05	4.9	--	12.6	--	6.6	--	7.0	4.7
LSD 0.10	4.1	--	10.5	--	5.5	--	5.8	3.8

Table 3. Yield of winter wheat varieties grown at three locations in eastern North Dakota in 2020, with three-year averages (2018-20).

Variety	<u>Carrington</u>		<u>Casselton</u>		<u>Langdon</u> ¹		<u>Avg. Eastern N.D.</u>	
	2020	3-Yr. Avg.	2020	3-Yr. Avg.	2020	3-Yr. Avg.	2020	3-Yr. Avg.
	------(bu/a)-----							
AAC Wildfire	54.1	--	59.2	--	45.4	--	52.9	--
AC Emerson	33.2	47.5	74.3	74.5	40.8	72.6	49.4	64.9
Ideal	46.3	50.6	70.0	75.4	43.3	48.4	53.2	58.1
Jerry	45.5	52.6	71.5	73.7	44.4	48.4	53.8	58.2
Keldin	44.2	53.4	68.4	72.6	36.3	69.8	49.6	65.3
ND Noreen	44.3	--	80.5	--	48.0	--	57.6	--
Northern	50.5	50.8	65.8	66.5	42.6	71.9	53.0	63.1
Oahe	44.1	53.2	69.2	73.0	39.3	75.9	50.9	67.4
Peregrine	47.0	55.4	77.4	78.7	43.8	71.1	56.1	68.4
SY Monument	46.5	49.7	67.7	67.0	35.8	67.3	50.0	61.3
SY Sunrise	41.5	46.4	71.9	69.3	23.9	64.0	45.8	59.9
SY Wolf	44.9	49.4	77.4	71.0	40.5	64.7	54.3	61.7
SY Wolverine	44.3	--	80.3	--	38.9	--	54.5	--
TCG-Boomlock	40.9	--	75.5	--	40.5	--	52.3	--
Thompson	46.5	50.2	77.8	75.5	39.6	--	54.6	--
WB4462	48.1	52.4	76.3	69.7	35.4	--	53.3	--
WB4595	39.5	--	73.7	--	20.5	--	44.6	--
Mean	45.2	51.0	73.1	72.0	38.7	65.4	52.3	62.8
CV (%)	12.5	--	7.8	--	12.4	--	11.2	9.5
LSD 0.05	8.0	--	8.1	--	6.8	--	9.8	10.1
LSD 0.10	6.7	--	6.7	--	5.7	--	8.2	8.4

¹Langdon three-year average (2017, 2019, 2020).

Table 4. Test weight of winter wheat varieties grown at six locations in North Dakota in 2020.

Variety	Dickinson	Minot	Williston	Carrington	Casselton	Langdon	Average ¹
	------(lb/bu)-----						
AAC Wildfire	60.1	62.6	55.7	59.1	53.6	58.7	58.3
AC Emerson	59.1	62.6	56.7	58.7	58.3	59.5	59.2
Ideal	59.5	62.9	57.4	58.2	56.6	59.2	59.0
Jerry	57.7	62.1	58.9	58.4	57.0	58.9	58.8
Keldin	60.1	62.9	58.1	59.4	55.2	58.5	59.0
ND Noreen	60.8	64.8	57.9	59.6	59.8	61.6	60.7
Northern	59.6	63.8	57.8	58.2	55.4	58.3	58.8
Oahe	59.4	63.5	57.6	59.5	57.8	59.3	59.5
Peregrine	59.9	63.1	55.9	59.4	57.8	60.2	59.4
SY Monument	58.0	59.6	56.6	58.1	54.8	56.3	57.2
SY Sunrise	58.9	62.4	58.0	58.9	56.1	57.9	58.7
SY Wolf	60.1	64.1	58.3	59.4	57.5	59.5	59.8
SY Wolverine	59.1	65.0	58.4	58.7	58.2	58.9	59.7
TCG-Boomlock	59.6	64.1	57.3	58.8	58.5	59.9	59.7
Thompson	59.1	62.9	57.0	59.1	57.2	58.6	59.0
WB4462	58.2	61.7	56.7	59.3	57.5	58.1	58.6
WB4595	62.4	66.1	59.9	61.0	59.3	59.4	61.3
Mean	59.5	62.8	57.5	59.0	56.9	58.9	59.1
CV (%)	0.6	1.4	0.7	1.5	2.6	1.1	1.5
LSD 0.05	0.5	1.4	0.7	1.2	2.1	1.0	1.0
LSD 0.10	0.4	1.2	0.6	1.0	1.8	0.8	0.8

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

Table 5. Grain protein content at 12% grain moisture content of winter wheat varieties grown at six locations in North Dakota in 2020.

Variety	Dickinson	Minot	Williston	Carrington	Casselton	Langdon	Average
------(%)-----							
AAC Wildfire	14.1	13.2	13.8	14.1	12.9	14.0	13.7
AC Emerson	15.4	13.9	15.1	15.9	13.9	14.7	14.8
Ideal	12.4	12.7	11.7	13.2	13.3	13.3	12.8
Jerry	13.3	13.4	13.7	14.6	13.2	14.3	13.7
Keldin	13.7	12.8	14.6	13.9	12.9	14.0	13.6
ND Noreen	13.8	13.8	13.8	15.2	12.5	14.1	13.9
Northern	14.3	13.1	13.4	14.3	13.6	14.3	13.8
Oahe	13.1	13.0	12.1	14.3	13.4	14.0	13.3
Peregrine	12.5	12.2	13.1	12.6	13.0	13.2	12.8
SY Monument	12.0	12.4	11.5	13.1	13.4	13.6	12.7
SY Sunrise	12.1	11.5	12.6	13.4	12.5	13.4	12.6
SY Wolf	13.5	12.6	13.3	14.0	13.3	14.3	13.5
SY Wolverine	12.5	13.0	12.5	13.0	13.3	14.4	13.1
TCG-Boomlock	13.4	13.6	13.4	14.7	13.7	14.2	13.8
Thompson	14.0	12.8	12.6	14.4	13.2	13.8	13.5
WB4462	12.2	12.3	12.6	12.9	13.3	13.8	12.8
WB4595	12.2	11.5	13.6	14.6	13.0	13.5	13.1
Mean	13.2	12.7	13.1	14.0	13.3	14.0	13.4
CV (%)	3.3	3.4	5.6	3.2	2.8	2.4	4.0
LSD 0.05	0.6	0.7	1.2	0.6	0.5	0.5	0.6
LSD 0.10	0.5	0.6	1.0	0.5	0.4	0.4	0.5

Table 6. Analytical milling and baking characteristics of selected varieties evaluated at Agronomy Seed Farm, Casselton, in 2019.

Variety	Kernel				Flour					Farinograph				Loaf		
	Test Weight	1,000 Kernel Weight	Whole Wheat Protein 12 MB	Falling Number	Flour Protein 14 MB	Flour Ash 14 MB	Milling Extraction	Wet Gluten	Gluten Index	Abs	Peak Time	Stability	Mixing Tolerance Index	Loaf Volume	Crumb Structure	Crumb Color
	(lb/bu)	(gram)	(%)	(seconds)	(%)	(%)	(%)	(%)		(%)	(min)	(min)	(BU)	(cc)	(1-10) ¹	(1-10) ¹
AC Emerson	58.7	24.2	13.5	391	12.7	0.56	73.6	30.4	100	54.4	7.2	13.6	19	1,145	8	7
Ideal	60.9	27.1	12.2	423	11.6	0.56	72.2	27.1	98	54.7	6.7	11.8	24	925	6	7
Jerry	57.9	28.7	13.5	403	12.8	0.54	72.1	34.4	92	58.1	6.3	7.5	39	970	7	6
Keldin	53.9	26.7	14.6	447	13.6	0.61	67.1	34.1	95	58.2	6.8	14.3	18	1,115	7	7
Loma	53.4	20.7	14.5	416	14.1	0.55	70.6	34.9	99	57.9	7.3	13.0	19	1,190	8	6
ND Noreen	60.6	31.2	12.5	374	12.0	0.57	74.8	30.4	98	57.5	5.7	5.6	51	970	7	7
Northern	54.2	21.1	14.6	476	14.0	0.62	68.5	35.6	89	61.4	7.2	8.0	35	1,125	8	7
Oahe	60.7	30.9	12.4	479	11.6	0.54	75.8	34.8	74	58.5	4.0	4.3	43	915	6	7
Peregrine	59.4	26.8	12.3	426	12.0	0.54	73.2	30.8	93	56.1	6.8	8.1	39	925	6	6
SY Monument	54.8	26.0	14.0	460	13.1	0.58	68.7	30.0	98	55.1	39.6	48.3	10	890	7	7
SY Sunrise	53.3	25.1	13.8	460	12.8	0.54	66.0	34.5	92	58.5	6.0	14.6	22	1,075	7	7
SY Wolf	59.0	29.1	13.5	424	12.7	0.55	70.3	31.3	90	57.1	7.8	11.8	20	950	7	6
TCG-Boomlock	60.8	26.6	13.3	496	12.4	0.59	67.2	33.1	84	57.3	6.4	7.5	40	1,020	7	7
Thompson	57.8	24.6	12.8	444	11.8	0.52	72.2	29.0	95	54.7	4.5	6.1	46	875	7	6
WB4462	58.2	31.6	13.8	472	12.9	0.55	72.1	34.8	86	56.3	5.4	4.7	50	930	6	7
WB4595	58.3	25.3	13.3	437	12.8	0.57	73.2	34.0	81	59.0	6.2	7.6	36	925	7	7
Mean	57.6	26.6	13.4	439	12.7	0.56	71.1	32.5	91	57.2	8.4	11.7	32	997	7	7

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

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