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North Dakota Hard Red Winter Wheat

Variety Trial Results for 2019 and Selection Guide

Joel Ransom, Francois Marais, Senay Simsek and Andrew Friskop (NDSU Main Station); Eric Eriksmoen (North Central Research Extension Center, Minot); Bryan Hanson (Langdon Research Extension Center); John Rickertsen (Hettinger Research Extension Center); Glenn Martin (Dickinson Research Extension Center); Mike Ostlie (Carrington Research Extension Center); and Gautam Pradhan (Williston Research Extension Center)

During the 2018-19 growing season, 90,000 acres of winter wheat were planted and 75,000 acres were harvested. The state's winter wheat yield this season was estimated at 45 bushels per acre (bu/a), which was up from last year's yield of 40 bu/a. Adequate snow cover facilitated winter survival in most regions of the state.

SY Wolf was the most popular variety in 2018-19, occupying 24% of the acres planted. Jerry and Willow Creek followed SY Wolf in popularity, with 13% and 9% of the acreage, respectively. Most growers (54%) 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% moisture basis.

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, or about 80 to 100 pounds per acre. Higher seeding rates should be used for late seeding or 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 known to be 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. 2019 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				
Emerson	A.Can.	2011	1	6	1	3	5	1	2	32	3
Ideal	SD	2011	4	1	3	8	4	-1	4	28	5
Jerry	ND	2001	8	3	1	8	8	0	5	34	3
Keldin	WB	2011	2	3	3	5	3	0	3	29	3
Loma	MT	2016	1	NA	1	8	NA	3	4	26	3
Northern	MT	2015	1	8	1	8	6	2	4	29	6
Oahe	SD	2016	2	3	6	NA	NA	-2	5	29	3
Peregrine	CDC	2008	1	3	1	6	6	1	5	34	2
SY Monument	Agripro	2014	3	3	NA	6	NA	-2	3	27	4
SY Sunrise	Agripro	2015	3	NA	NA	6	NA	-2	3	23	5
SY Wolf	Agripro	2010	3	3	1	6	1	-2	3	27	6
SY Wolverine	Agripro	2019	NA	NA	NA	NA	NA	-5	3	25	NA
TCG-Boomlock	TCG	2019	NA	NA	NA	NA	NA	-1	5	29	NA
Thompson	SD	2017	5	3	3	3	NA	-1	3	30	NA
WB4462	WB	2016	7	3	NA	8	6	-5	4	28	3
WB4595	WB	2019	4	4	NA	6	6	-1	3	28	3

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

²A.Can. = Agriculture and Agri-Food Canada; CDC = 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 2018 only.

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 = very poor. These values are subject to change as additional information becomes available.

Bold varieties are those recently released, so data are limited and rating values may change.

Table 2. Analytical milling and baking characteristics of selected varieties evaluated at Agronomy Seed Farm, Casselton, in 2018.

Variety	Kernel			Flour					Farinograph			Loaf				
	Test Weight (lb/bu)	1,000 Kernel Weight (gram)	Whole Wheat Protein 12 MB (%)	Falling Number (seconds)	Flour Protein 14 MB (%)	Flour Ash 14 MB (%)	Milling Extraction (%)	Wet Gluten (%)	Gluten Index	Abs (%)	Peak Time (min)	Stability (min)	Mixing Tolerance Index (BU)	Loaf Volume (cc)	Crumb Structure (1-10) ¹	Crumb Color (1-10) ¹
AAC Gateway	58.7	28.2	13.6	426	12.6	0.52	67.6	33.9	98	54.9	7.3	13.4	26	1,030	7	7
AAC Goldrush	57.9	24.5	13.8	363	12.6	0.49	68.9	31.2	98	54.7	4.4	12.7	21	1,070	7	7
AAC Wildfire	55.7	23.1	14.0	429	12.9	0.54	65.3	33.5	98	57.5	7.0	11.9	24	1,035	7	6
Accipiter	58.8	25.2	13.0	449	11.7	0.51	78.5	28.8	100	54.5	6.5	15.5	23	1,040	7	7
Broadview	57.7	26.4	12.8	451	11.7	0.53	69.1	32.1	91	56.1	4.8	5.7	46	950	7	5
CDC Chase	60.2	29.1	13.3	465	12.2	0.47	71.5	31.5	98	55.3	7.5	15.7	24	1,025	7	7
Decade	56.7	25.9	13.8	447	11.8	0.99	68.3	27.9	100	53.2	5.0	20.7	18	975	6	0
Emerson	59.1	24.8	14.0	387	12.8	0.49	70.5	30.6	100	53.6	6.7	22.9	13	1,145	7	7
Ideal	58.4	27.7	13.2	456	12.0	0.53	70.1	28.2	100	54.4	4.5	38.3	13	995	7	6
Jerry	57.0	28.1	13.1	396	12.0	0.48	68.9	31.7	97	55.5	5.7	10.8	23	1,040	7	7
Keldin	58.2	29.2	13.7	432	12.6	0.54	67.9	29.5	99	56.8	5.7	14.7	21	1,070	7	8
Loma	51.9	18.5	15.3	372	13.9	0.55	64.9	35.1	98	57.9	8.4	19.7	18	1,070	8	7
Lyman	58.9	32.2	13.8	447	12.2	0.60	70.0	33.0	75	55.9	7.0	16.2	22	1,010	6	7
Moats	58.4	26.7	13.4	471	12.3	0.51	70.6	30.3	98	55.7	6.3	15.0	19	1,050	7	7
Northern	57.4	25.6	13.2	425	12.2	0.54	70.2	29.9	98	59.2	6.3	10.8	20	1,000	7	7
Oahe	58.6	29.7	13.1	484	12.0	0.50	71.0	34.5	75	58.8	4.2	4.3	53	910	7	7
Overland	59.2	36.1	13.7	408	12.2	0.49	69.8	41.2	70	56.4	5.2	5.7	47	1,015	7	7
Peregrine	58.7	27.0	12.8	442	11.8	0.50	71.5	30.3	96	55.6	5.2	9.9	29	865	6	7
Redfield	58.8	27.1	13.6	432	12.5	0.51	70.4	30.9	98	55.4	6.7	12.4	29	1,130	7	8
SY Monument	56.8	27.8	13.6	451	12.3	0.51	67.6	28.4	100	56.0	3.4	12.9	24	790	5	5
SY Sunrise	58.0	27.8	12.7	437	11.6	0.51	66.7	28.4	99	56.4	4.4	13.3	24	955	7	7
SY Wolf	57.3	24.4	15.1	415	13.1	0.51	66.8	35.3	83	57.1	8.0	11.7	23	975	7	6
Thompson	58.8	24.2	13.1	390	12.0	0.48	69.0	33.4	90	55.5	5.4	7.8	36	950	6	6
WB Matlock	59.2	27.6	14.3	438	13.0	0.53	69.9	36.7	91	57.8	5.5	10.4	28	1,015	7	8
WB4462	58.3	34.1	13.3	460	12.4	0.47	71.1	31.6	97	55.7	6.0	13.6	19	970	6	7
MEAN	57.9	27.2	13.6	431	12.3	0.53	69.4	31.9	94	56.0	5.9	13.8	26	1,003	7	7

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

Table 3. Yield of winter wheat varieties grown at four locations in western North Dakota in 2019, with three-year averages (2017-19).

Variety	<u>Dickinson</u>		<u>Hettinger</u>		<u>Minot</u>		<u>Williston</u>		<u>Avg. Western N.D.</u>	
	2019	3-Yr. Avg.	2019	3-Yr. Avg.	2019	3-Yr. Avg.	2019	3-Yr. Avg.	2019 ¹	3-Yr. Avg.
	------(bu/a)-----									
Emerson	45.2	60.2	60.9	54.0	56.0	45.0	55.6	45.5	54.4	51.2
Ideal	49.6	64.1	66.0	60.3	61.5	56.1	63.7	52.2	60.2	58.2
Jerry	46.7	63.2	64.8	56.9	54.3	46.0	57.2	49.5	55.8	53.9
Keldin	53.9	70.9	70.6	69.7	61.4	55.8	59.3	44.9	61.3	60.3
Loma	46.7	57.4	58.4	55.5	48.8	43.2	63.5	48.4	54.4	51.1
Northern	54.0	63.6	74.5	62.4	52.5	42.9	59.0	46.1	60.0	53.8
Oahe	54.6	61.3	69.5	60.3	66.1	58.3	57.3	39.3	61.9	54.8
Peregrine	51.3	66.8	66.0	61.7	60.6	61.9	63.4	54.8	60.3	61.3
SY Monument	54.9	64.4	71.6	66.3	65.6	60.0	57.6	48.1	62.4	59.7
SY Sunrise	49.3	57.9	64.5	56.8	45.3	39.7	--	--	52.8	--
SY Wolf	60.4	66.3	63.8	60.7	49.0	52.6	57.3	39.4	57.6	54.8
SY Wolverine	66.8	--	62.1	--	46.5	--	--	--	58.2	--
TCG-Boomlock	53.2	--	65.3	--	52.3	--	44.5	--	53.8	--
Thompson	53.2	--	64.9	--	57.7	--	56.9	--	58.2	--
WB4462	55.2	60.0	69.4	--	49.0	--	54.2	--	57.0	--
WB4595	60.0	--	71.2	--	65.1	--	61.6	--	64.5	--
Mean	53.0	63.0	66.5	60.4	54.6	51.0	57.5	46.8	58.3	55.9
CV (%)	8.5	--	6.0	--	9.1	--	8.7	--	8.8	--
LSD 0.05	6.4	--	5.6	--	8.1	--	8.3	--	7.3	--
LSD 0.10	5.3	--	4.7	--	6.8	--	6.9	--	6.1	--

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

Table 4. Yield of winter wheat varieties grown at three locations in eastern North Dakota in 2019, with two/three-year averages (2017-19).

Variety	<u>Carrington</u>		<u>Casselton</u>		<u>Langdon¹</u>		<u>Avg. Eastern N.D.</u>	
	2019	3-Yr. Avg.	2019 Fung.	2-Yr. Avg.	2019	3-Yr. Avg.	2019	2-Yr./3-Yr. Avg.
	-----(bu/a)-----							
Emerson	43.4	49.1	81.6	74.6	87.3	87.6	70.8	70.4
Ideal	40.6	45.5	88.7	78.1	85.7	58.7	71.7	60.8
Jerry	44.1	52.7	80.8	74.8	84.3	55.2	69.7	60.9
Keldin	45.4	58.8	81.1	74.7	89.2	--	71.9	--
Loma	29.7	39.5	79.6	66.1	78.4	75.2	62.6	60.3
Northern	38.4	49.8	73.3	66.9	90.1	88.5	67.3	68.4
Oahe	45.7	50.3	83.4	75.0	83.4	--	70.8	--
Peregrine	44.9	54.1	82.3	79.4	90.0	83.5	72.4	72.3
SY Monument	37.6	44.4	83.6	66.7	85.4	88.1	68.9	66.4
SY Sunrise	29.9	45.1	80.3	68.1	82.0	89.4	64.1	67.5
SY Wolf	39.1	51.2	81.7	67.8	86.6	81.8	69.1	66.9
SY Wolverine	41.2	--	80.9	--	85.2	--	69.1	--
TCG-Boomlock	36.4	--	75.3	--	79.2	--	63.6	--
Thompson	34.8	--	80.7	74.4	90.3	--	68.6	--
WB4462	37.8	--	82.1	66.4	80.1	--	66.7	--
WB4595	36.6	--	81.1	--	88.6	--	68.8	--
Mean	39.1	49.1	81.0	71.8	84.4	78.7	68.5	66.0
CV (%)	8.2	--	7.6	--	3.6	--	5.2	--
LSD 0.05	4.5	--	10.1	--	4.3	--	7.4	--
LSD 0.10	3.7	--	7.7	--	3.6	--	6.3	--

¹Langdon three-year average (2016, 2017, 2019).

Table 5. Test weight of winter wheat varieties grown at seven locations in North Dakota in 2019.

Variety	Dickinson	Hettinger	Minot	Williston	Carrington	Casselton	Langdon	Average ¹
	------(lb/bu)-----							
Emerson	58.5	61.4	62.1	56.3	59.8	62.0	60.4	60.1
Ideal	58.1	58.8	60.8	55.5	58.8	61.8	59.7	59.1
Jerry	57.5	59.9	60.3	54.9	59.0	59.9	59.1	58.7
Keldin	57.0	59.9	62.0	56.4	59.2	61.3	60.5	59.5
Loma	54.4	59.2	61.7	55.6	55.0	57.5	58.3	57.4
Northern	57.5	60.2	62.6	56.0	56.2	59.2	59.2	58.7
Oahe	57.5	61.2	62.0	56.0	59.6	61.2	59.7	59.6
Peregrine	57.0	61.0	62.4	55.8	59.2	60.7	60.3	59.5
SY Monument	54.5	58.3	60.0	55.5	57.3	59.1	58.3	57.6
SY Sunrise	54.9	60.4	61.3	--	55.7	59.7	59.4	58.0
SY Wolf	58.3	59.6	62.5	56.8	59.4	61.1	59.5	59.6
SY Wolverine	58.3	58.5	62.3	--	59.0	61.4	59.7	59.3
TCG-Boomlock	58.3	61.4	61.5	55.8	59.7	61.8	60.3	59.8
Thompson	58.5	58.6	60.8	55.2	57.5	61.9	59.9	58.9
WB4462	55.6	60.6	61.5	56.1	57.9	60.4	60.0	58.9
WB4595	60.6	63.1	64.4	57.7	59.3	62.8	61.8	61.4
Mean	57.2	60.1	61.6	55.8	58.2	60.7	59.7	59.0
CV (%)	1.0	2.0	0.9	1.0	1.4	0.7	0.6	1.5
LSD 0.05	0.8	1.7	0.9	0.9	1.1	0.7	0.5	0.9
LSD 0.10	0.7	1.4	0.7	0.7	0.9	0.5	0.4	0.8

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

Table 6. Grain protein content of winter wheat varieties grown at seven locations in North Dakota in 2019.

Variety	Dickinson	Hettinger	Minot	Williston	Carrington	Casselton	Langdon	Average ¹
	------(%)-----							
Emerson	14.8	12.4	14.1	16.5	14.2	13.4	11.5	13.8
Ideal	12.8	11.6	12.3	16.0	13.5	11.8	11.0	12.7
Jerry	13.8	12.3	12.6	16.6	13.6	12.7	11.2	13.3
Keldin	13.0	11.7	12.3	16.1	13.6	12.6	10.9	12.9
Loma	14.4	12.4	14.0	15.9	15.3	14.1	11.3	13.9
Northern	13.3	12.2	13.5	16.8	14.2	13.1	11.1	13.5
Oahe	13.0	12.1	12.3	17.3	13.1	12.9	11.5	13.2
Peregrine	12.7	11.0	11.7	16.0	12.7	12.4	10.4	12.4
SY Monument	12.8	11.4	11.8	16.8	13.4	12.5	11.0	12.8
SY Sunrise	13.2	12.0	11.9	--	13.9	12.0	11.4	13.0
SY Wolf	13.4	13.2	13.7	17.7	13.5	13.1	11.5	13.7
SY Wolverine	12.4	12.9	13.2	--	13.7	12.7	11.5	13.3
TCG-Boomlock	13.5	12.3	13.2	18.5	14.1	12.8	11.6	13.7
Thompson	13.3	12.1	13.0	17.7	13.6	12.3	10.9	13.3
WB4462	12.8	11.6	12.5	16.7	13.2	12.6	11.8	13.0
WB4595	12.1	11.9	11.2	16.7	13.1	11.8	10.3	12.4
Mean	13.2	12.2	12.8	17.0	13.7	12.7	11.3	13.2
CV (%)	3.0	5.2	2.5	6.7	2.5	2.8	1.9	3.7
LSD 0.05	0.7	0.9	0.5	1.9	0.5	0.6	0.3	0.5
LSD 0.10	0.5	0.7	0.4	1.6	0.4	0.5	0.3	0.4

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

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

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