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North Dakota Hard Red Spring Wheat

Variety Trial Results for 2021 and Selection Guide

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Hard red spring (HRS) wheat was planted on 5.5 million acres in 2021, down from 5.7 million in 2020. The average yield of HRS wheat was 34 bushels/acre (bu/a), down approximately 31% from 49 bu/a in 2020. Lower yields were common across the state due to a wide-spread and severe drought. A greater-than-average number of HRS wheat acres were hayed or abandoned due to the drought.

SY Ingmar was the most popular HRS wheat variety in 2021, occupying 13.2% of the planted acreage, followed by SY Valda (9.5%), WB9590 (7.5%), AP Murdock (4.7%), Glenn (4.4%) and Faller (4.2%). SY Ingmar, SY Valda, and AP Murdock were released by Syngenta/AgriPro. WB9590 was released by Westbred/Monsanto. Glenn and Faller are NDSU releases.

Successful wheat production depends on numerous factors, including selecting the right variety for a particular area. The information included in this publication is meant to aid in selecting that variety or group of varieties. Characteristics to consider in selecting a variety may include yield potential, protein content when grown with proper fertility, straw strength, plant height, response to problematic pests (diseases, insects, etc.) and maturity. Every growing season differs; therefore, when selecting a variety, we recommend using data that summarize several years and locations. Choose the variety that, on average, performs the best at multiple locations near your farm during several years.

Selecting varieties with good milling and baking quality also is important to maintain market recognition and avoid discounts. Hard red spring wheat from the northern Great Plains is known around the world for its excellent end-use quality.

Millers and bakers consider many factors in determining the quality and value of wheat they purchase. Several key parameters are: high test weight (for optimum milling yield and flour color), high falling number (greater than 300 seconds indicates minimal sprout damage), high protein content (the majority of HRS wheat export markets want at least 14% protein) and excellent protein quality (for superior bread-making quality as indicated by traditional strong gluten proteins, high baking absorption and large bread loaf volume).

Gluten strength, and milling and baking quality ratings are provided for individual varieties based on the results from the NDSU field plot variety trials in multiple locations in 2020. The wheat protein data often are higher than obtained in actual production fields but can be used to compare relative differences among varieties.

The agronomic data presented in this publication are from replicated research plots using experimental designs that enable the use of statistical analysis. These analyses enable the reader to determine, at a predetermined level of confidence, if the differences observed among varieties are reliable or if they might be due to error inherent in the experimental process.

The LSD (least significant difference) values beneath the columns in the tables are derived from these statistical analyses and apply only to the numbers in the column in which they appear. If the difference between two varieties exceeds the LSD value, it means that with 95% or 90% confidence (LSD probability 0.05 or 0.10), the higher-yielding variety has a significant yield advantage. When the difference between two varieties is less than the LSD value, no significant difference was found between those two varieties under those growing conditions.

NS is used to indicate no significant difference for that trait among any of the varieties at the 95% or 90% level of confidence. The CV stands for coefficient of variation and is expressed as a percentage. The CV is a measure of variability in the trial. Large CVs mean a large amount of variation could not be attributed to differences in the varieties. Yield is reported at 13.5% moisture, while protein content is reported at 12% moisture content.

Presentation of data for the entries tested does not imply approval or endorsement by the authors or agencies conducting the test. North Dakota State University approves the reproduction of any table in the publication only if no portion is deleted, appropriate footnotes are given and the order of the data is not rearranged. Additional data from county sites are available from each Research Extension Center at <https://vt.ag.ndsu.edu/>.

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Table 1. North Dakota hard red spring wheat variety descriptions, agronomic traits, 2021.

Variety	Agent or Origin ¹	Year Released	Height (inches) ²	Straw Strength ³	Days to Head ⁴	Reaction to Disease ^{5,6}			
						Leaf Rust	Tan Spot	Bact. Leaf Streak	Head Scab
Ambush	Dyna-Gro	2016	24	5	60	4	4	6	5
AP Gunsmoke CL2	Syngenta/AgriPro	2021	23	6	60	NA	4	8	3
AP Murdock	Syngenta/AgriPro	2019	22	4	60	NA	4	6	6
AP Smith	Syngenta/AgriPro	2021	21	3	61	NA	3	4	4
Ballistic	Dyna-Gro	2018	25	3	61	5	6	5	3
Bolles	MN	2015	26	4	62	3	4	6	5
CAG-Justify	Champions Alliance Grp	2021	25	6	62	NA	8	6	3
CAG-Reckless	Champions Alliance Grp	2021	25	4	60	NA	6	6	4
Commander	Dyna-Gro	2019	23	3	59	4	3	5	5
CP3099A	Croplan	2020	25	5	64	NA	4	6	4
CP3119A	Croplan	2021	24	3	64	NA	6	5	3
CP3188	Croplan	2020	25	6	61	NA	6	5	4
CP3530	Croplan	2015	27	5	62	2	6	5	5
CP3915	Croplan	2019	23	3	61	1	7	4	5
Dagmar ⁷	MT	2019	24	6	59	7	4	7	7
Driver	SD	2019	26	4	61	1	7	7	3
Faller	ND	2007	27	5	62	7	7	5	4
Glenn	ND	2005	25	4	59	6	6	4	4
Lang-MN	MN	2017	24	5	61	2	4	3	3
Lanning	MT	2017	23	4	60	7	4	8	6
LCS Buster	Limagrain	2020	24	4	63	NA	4	4	5
LCS Cannon	Limagrain	2018	23	4	58	7	5	7	6
LCS Rebel	Limagrain	2017	26	6	59	7	3	4	5
LCS Trigger	Limagrain	2016	24	5	64	1	6	3	3
MN-Torgy	MN	2020	23	3	61	4	3	3	3
MN-Washburn	MN	2019	22	3	61	1	6	5	5
MS Barracuda	Meridian Seeds	2018	22	4	58	2	7	7	6
MS Cobra	Meridian Seeds	2022	23	3	60	NA	4	8	5
MS Ranchero	Meridian Seeds	2020	24	5	61	4	5	6	6
ND Frohberg	ND	2020	25	4	61	5	8	4	5
ND VitPro	ND	2016	24	3	59	4	6	5	4
PFS Buns	Peterson Farms Seed	2021	23	3	65	NA	6	4	5
SY 611CL2	Syngenta/AgriPro	2019	22	5	60	6	4	6	5
SY Ingmar	Syngenta/AgriPro	2014	NA	3	NA	3	6	4	5
SY Longmire ⁷	Syngenta/AgriPro	2019	23	4	61	7	2	6	7
SY McCloud	Syngenta/AgriPro	2019	24	4	60	5	7	8	5
SY Soren	Syngenta/AgriPro	2011	22	3	60	2	2	7	7
SY Valda	Syngenta/AgriPro	2015	22	4	61	2	6	6	5
TCG-Heartland	21st Century Genetics	2019	22	3	59	2	5	7	6
TCG-Spitfire	21st Century Genetics	2015	24	3	63	5	6	4	6
TCG-Wildcat	21st Century Genetics	2020	21	3	61	5	6	7	NA
WB9479	WestBred	2017	21	2	59	1	4	8	6
WB9590	WestBred	2017	20	3	59	3	8	8	6

¹Refers to agent or developer: MN = University of Minnesota; MT = Montana State University; ND = North Dakota State University; SD = South Dakota State University. Bold varieties are those recently released, so data are limited and rating values may change.

²Height data averaged from multiple locations in 2021; note, state-wide drought conditions generally resulted in shorter wheat.

³Straw Strength = 1 to 9 scale, with 1 the strongest and 9 the weakest. These values are based on recent data and may change as more data become available.

⁴Days to Head = the number of days from planting to head emergence from the boot, averaged based on data from several locations in 2021.

⁵Disease reaction scores from 1 to 9, with 1 = resistant and 9 = very susceptible, NA = not available.

⁶All wheat varieties are resistant to moderately resistant to stem rust when screened using *Puccinia graminis* f. sp. *tritici* races TPMK, TMLK, RTQQ, QFCQ and QTHJ.

⁷Solid stemmed or semisolid stem, imparting resistance to sawfly.

Table 2. Yield of hard red spring wheat varieties grown at six locations in eastern North Dakota, 2019-2021.

Variety	<u>Carrington</u>		<u>Casselton</u>		<u>Grand Forks</u>		<u>Forman</u>	<u>Langdon</u>		<u>Prosper</u>	<u>Average</u>	
	2021	3 Yr.	2021	3 Yr.	2021	3 Yr.	2021	2021	3 Yr.	2021	2021	3 Yr.
	------(bu/a)-----											
Ambush	60.1	--	93.5	74.7	81.7	65.1	39.2	16.7	53.7	90.3	63.6	--
AP Gunsmoke CL2	57.7	--	103.1	--	84.8	--	46.1	23.5	--	96.2	68.6	--
AP Murdock	53.9	49.0	100.3	--	80.4	--	31.2	20.8	63.2	84.2	61.8	--
AP Smith	55.0	--	92.9	--	77.7	--	39.6	24.4	--	86.6	62.7	--
Ballistic	54.9	52.1	105.8	--	95.3	--	38.8	24.4	62.6	93.1	68.7	--
Bolles	57.7	48.3	89.2	71.0	75.3	55.7	36.7	14.6	51.7	81.4	59.1	56.7
CAG-Justify	60.5	--	111.4	--	84.3	--	40.4	23.1	--	91.5	68.5	--
CAG-Reckless	54.3	--	107.0	--	83.2	--	40.0	24.3	--	92.0	66.8	--
Commander	58.1	46.2	96.0	82.2	85.4	72.2	36.2	17.4	57.1	95.3	64.7	64.4
CP3099A	57.4	--	106.7	--	--	--	39.8	31.4	--	98.4	66.7	--
CP3119A	50.4	--	85.2	--	91.2	--	33.0	30.7	--	75.2	60.9	--
CP3188	57.8	--	102.9	--	90.1	--	47.3	27.4	--	90.5	69.3	--
CP3530	59.6	52.5	97.3	84.8	88.8	69.6	44.8	31.6	64.3	76.7	66.5	67.8
CP3915	54.1	50.0	95.7	80.0	81.8	69.9	36.2	28.7	62.1	87.6	64.0	65.5
Dagmar	59.3	--	99.2	--	80.0	--	35.4	24.0	--	81.9	63.3	--
Driver	62.2	--	102.7	--	88.5	--	45.9	28.8	--	95.6	70.6	--
Faller	57.0	54.0	95.1	81.8	86.4	72.9	45.3	28.4	64.2	91.0	67.2	68.2
Glenn	54.6	44.6	82.7	69.5	73.9	63.5	36.1	27.2	58.5	81.3	59.3	59.0
Lang-MN	57.8	52.1	94.2	80.0	80.2	65.2	44.7	26.1	58.5	84.7	64.6	64.0
Lanning	56.7	--	102.2	--	77.5	--	42.8	27.9	--	82.0	64.8	--
LCS Buster	48.7	--	111.4	--	90.9	--	43.6	22.2	--	87.1	67.3	--
LCS Cannon	52.3	42.6	109.6	88.3	85.6	67.8	35.9	23.4	59.2	--	61.4	64.5
LCS Rebel	58.0	47.9	98.2	78.0	86.6	73.6	40.5	21.8	59.5	89.1	65.7	64.8
LCS Trigger	58.8	52.6	108.4	87.8	88.7	82.5	39.2	23.0	63.6	93.6	68.6	71.6
MN-Torgy	63.2	--	96.0	--	81.8	--	31.9	28.0	60.8	86.1	64.5	--
MN-Washburn	54.4	45.5	95.4	79.1	79.2	64.2	36.2	21.6	58.4	86.4	62.2	61.8
MS Barracuda	56.6	44.1	92.4	80.1	78.5	63.6	31.9	14.8	54.6	78.6	58.8	60.6
MS Cobra	56.6	--	97.4	--	83.0	--	35.3	20.4	--	85.7	63.1	--
MS Ranchero	60.0	--	102.8	--	85.2	--	41.3	32.7	--	74.2	66.0	--
ND Frohberg	62.6	53.3	100.8	79.4	76.9	64.7	37.2	13.6	56.0	85.5	62.8	63.3
ND VitPro	52.5	43.3	86.7	73.4	74.3	62.4	30.5	21.1	56.7	78.0	57.2	58.9
PFS-Buns	59.8	--	105.6	--	90.2	--	40.0	32.8	--	95.3	70.6	--
SY 611CL2	59.5	46.3	95.8	81.8	81.7	64.7	42.9	23.4	61.5	94.0	66.2	63.6
SY Ingmar	54.2	45.2	93.8	78.5	75.8	66.5	44.8	21.3	59.8	84.9	62.5	62.5
SY Longmire	62.3	--	101.2	81.6	79.4	63.6	36.7	26.2	61.0	87.1	65.5	--
SY McCloud	62.7	47.1	90.5	77.9	82.4	62.8	36.4	22.5	58.9	88.0	63.7	61.7
SY Soren	49.8	45.6	90.0	77.4	76.5	56.5	27.1	18.3	55.6	83.1	57.5	58.8
SY Valda	57.7	53.5	102.1	84.9	84.1	69.8	35.3	27.6	62.2	91.7	66.4	67.6
TCG-Heartland	50.6	45.2	87.7	75.2	77.8	62.2	20.6	23.1	54.8	81.3	56.8	59.3
TCG-Spitfire	59.6	52.5	98.5	81.5	88.5	76.2	43.5	25.2	61.2	99.4	69.1	67.9
TCG-Wildcat	50.9	--	96.5	--	83.8	--	38.9	22.5	--	89.6	63.7	--
WB9479	60.6	--	85.9	--	76.2	--	25.1	18.1	--	77.1	57.2	--
WB9590	56.3	--	91.6	--	82.2	--	16.5	22.2	--	86.7	59.3	--
Mean	56.4	48.4	97.7	79.5	82.7	66.7	37.5	24.1	59.2	86.8	64.1	63.5
CV%	12.7	--	2.9	--	5.3	--	8.4	9.3	--	8.4	7.3	--
LSD 0.05	NS	--	6.8	--	4.9	--	7.9	2.0	--	8.3	5.4	--
LSD 0.10	8.3	--	5.7	--	4.1	--	6.6	1.7	--	7.0	4.5	--

Table 3. Yield of hard red spring wheat varieties grown at five locations in western North Dakota, 2019-2021.

Variety	<u>Dickinson</u>		<u>Hettinger</u>		<u>Mandan</u>		<u>Minot</u>		<u>Williston</u>		<u>Average</u>	
	2021	3 Yr.	2021	3 Yr.	2021	3 Yr.	2021	2 Yr. ¹	2021	3 Yr.	2021 ²	3 Yr. ²
	------(bu/a)-----											
Ambush	17.6	34.9	43.1	42.6	16.6	31.9	13.5	64.1	16.6	37.5	23.5	36.7
AP Gunsmoke CL2	22.7	--	48.4	--	19.8	--	8.3	--	16.2	--	26.8	--
AP Murdock	15.9	--	39.5	44.1	16.7	34.0	8.1	--	14.3	--	21.6	--
AP Smith	19.5	--	38.0	--	23.7	--	10.9	--	14.4	--	23.9	--
Ballistic	17.6	--	45.7	44.3	21.3	35.3	11.8	--	16.7	--	25.3	--
Bolles	14.3	30.4	42.7	41.3	18.4	31.6	14.3	62.2	13.3	34.3	22.2	34.4
CAG-Justify	16.1	--	48.0	--	20.8	--	9.5	--	14.9	--	24.9	--
CAG-Reckless	19.0	--	49.9	--	19.0	--	19.1	--	20.7	--	27.1	--
Commander	18.8	35.6	48.4	45.7	19.1	32.9	17.0	--	16.7	37.9	25.7	38.0
CP3099A	12.6	--	41.9	--	15.1	--	10.5	--	19.8	--	22.4	--
CP3119A	17.4	--	42.8	--	26.2	--	21.5	--	20.4	--	26.7	--
CP3188	24.4	--	43.7	--	24.3	--	17.8	--	18.5	--	27.7	--
CP3530	19.8	38.7	40.3	45.0	19.1	34.6	12.0	69.0	15.8	35.9	23.7	38.6
CP3915	21.7	39.2	43.4	46.4	19.4	34.5	11.4	--	17.7	37.4	25.5	39.4
Dagmar	22.3	--	48.4	--	18.8	--	6.8	--	21.5	--	27.8	--
Driver	21.0	--	45.9	--	23.3	--	15.3	--	19.0	--	27.3	--
Faller	18.1	38.7	45.1	48.3	23.4	37.9	17.9	74.5	17.7	39.6	26.1	41.1
Glenn	19.6	33.9	41.6	40.7	19.1	32.0	7.4	59.1	20.2	36.4	25.1	35.7
Lang-MN	18.3	37.4	49.4	47.1	21.8	36.9	13.0	62.1	19.3	37.3	27.2	39.7
Lanning	19.4	37.6	48.6	44.7	22.4	35.5	8.0	66.2	21.6	38.1	28.0	39.0
LCS Buster	12.2	--	43.5	--	22.2	--	10.2	--	15.7	--	23.4	--
LCS Cannon	21.0	37.5	48.5	45.3	18.1	32.2	7.0	61.3	17.1	34.9	26.2	37.5
LCS Rebel	23.2	38.8	49.4	46.2	17.1	33.6	9.5	61.0	16.1	39.5	26.4	39.5
LCS Trigger	14.7	37.8	43.1	48.0	22.2	38.0	20.7	75.1	16.9	39.8	24.2	40.9
MN-Torgy	17.3	--	45.2	46.1	21.4	36.8	18.8	--	16.3	--	25.1	--
MN-Washburn	19.5	36.1	39.8	43.7	20.8	32.2	15.2	60.8	16.0	34.4	24.0	36.6
MS Barracuda	23.0	32.1	45.0	44.0	12.1	30.1	11.9	68.7	19.7	36.3	25.0	35.6
MS Cobra	20.3	--	42.3	--	17.1	--	15.0	--	14.0	--	23.4	--
MS Ranchoero	19.3	--	49.3	--	27.0	--	7.5	--	16.0	--	27.9	--
ND Frohberg	16.8	35.4	46.0	43.7	18.8	32.0	11.0	60.5	16.4	35.8	24.5	36.7
ND VitPro	19.2	34.2	39.4	40.7	16.8	33.3	10.8	56.2	17.3	35.3	23.2	35.9
PFS-Buns	5.0	--	39.9	--	22.2	--	21.5	--	15.2	--	20.6	--
SY 611CL2	20.8	38.3	44.6	47.8	20.0	35.0	15.6	68.9	15.6	--	25.2	--
SY Ingmar	16.2	35.4	42.6	41.2	21.5	31.5	17.2	58.4	19.0	36.3	24.8	36.1
SY Longmire	15.0	35.9	40.2	45.1	19.6	32.4	13.6	63.8	17.5	38.7	23.1	38.0
SY McCloud	16.9	34.3	46.5	43.2	17.5	30.5	6.9	61.7	17.8	37.3	24.7	36.3
SY Soren	12.6	33.9	44.2	43.1	18.3	29.4	8.4	65.0	19.2	36.3	23.6	35.7
SY Valda	15.5	36.3	43.3	46.1	21.4	38.1	12.8	61.8	14.4	38.2	23.6	39.7
TCG-Heartland	15.6	33.5	45.7	44.0	15.4	29.5	8.2	--	16.9	37.6	23.4	36.1
TCG-Spitfire	13.0	37.8	42.6	47.4	25.5	37.6	11.9	68.1	18.8	40.3	25.0	40.8
TCG-Wildcat	19.0	--	44.9	--	21.6	--	19.5	--	16.4	--	25.5	--
WB9479	13.4	--	45.9	--	15.4	--	5.8	--	16.4	--	22.8	--
WB9590	19.8	--	43.2	--	17.5	--	8.3	--	18.1	--	24.6	--
Mean	17.9	36.0	44.2	44.7	20.3	33.7	13.1	64.2	17.4	37.2	24.9	37.7
CV%	20.9	--	7.4	--	7.2	--	45.7	--	17.9	--	11.6	--
LSD 0.05	5.2	--	3.8	--	3	--	9.7	--	5	--	4	--
LSD 0.10	4.4	--	3.0	--	2.5	--	8.1	--	4.2	--	3.4	--

¹Two-year average includes 2019 and 2020.²Averaged across four locations, Minot data excluded due to low yields and high variability caused by drought conditions.

Table 4. Quality data from 2017-2020. The Wheat Quality Index (WQI) is a weighted average developed to summarize the relative milling and baking quality of lines in the trial. Data below are from 2017-2020 for all varieties which were tested in a minimum of two years (four locations per year) across North Dakota.

Variety	Test Weight ¹	Vitreous Kernels ²	Wheat Protein ³	Farinograph Absorption ⁴	Flour Extraction ⁵	Farinograph Stability ⁶	Loaf Volume ⁷	WQI RANK ⁸
	lb/bu	%	12% m.b.	%	%	min	cm ³	
Bolles	60.6	76.6	16.8	64.9	64.8	23.7	1031.7	1
ND Frohberg	62.0	71.3	15.5	66.8	66.2	12.1	996.5	2
Glenn	63.3	83.0	15.6	64.9	65.9	15.1	1008.9	3
CP3915	62.2	74.5	15.2	64.2	69.5	12.4	991.0	4
MS Barracuda	61.3	67.9	15.6	64.8	67.0	11.5	999.7	5
ND VitPro	62.9	81.7	15.6	65.2	67.4	9.2	978.9	6
WB9479	62.1	67.5	15.8	62.8	66.4	20.9	952.4	7
SY McCloud	62.2	63.4	15.3	65.9	66.3	10.6	981.2	8
LCS Rebel	62.5	68.7	15.1	64.5	68.6	11.9	982.2	9
Lang-MN	61.9	84.0	15.4	64.9	66.8	12.0	949.6	10
SY 611CL2	62.3	69.7	15.2	67.9	65.6	8.5	916.4	11
TCG-Heartland	62.3	66.7	15.5	63.8	67.7	14.3	941.8	12
SY Longmire	61.6	67.4	15.4	64.7	66.8	10.2	985.4	13
Ballistic	60.7	73.0	14.9	64.5	67.7	12.2	979.1	14
SY Soren	61.7	60.6	15.6	63.8	66.4	9.7	1007.4	15
SY Ingmar	61.8	69.8	15.3	63.2	67.7	10.8	996.0	16
AP Murdock	61.0	51.9	14.9	64.9	67.3	13.4	949.7	17
Ambush	62.1	70.6	15.3	62.7	66.1	13.7	996.3	18
Lanning	60.6	76.6	15.6	63.9	65.0	10.0	1008.1	19
LCS Cannon	62.3	62.8	14.8	63.2	68.7	12.1	964.4	20
Faller	60.6	63.6	14.6	63.9	68.1	10.2	985.9	21
CP3530	61.0	59.9	14.7	64.7	67.0	9.3	984.5	22
MN-Washburn	61.0	81.7	14.6	61.1	69.4	14.9	973.6	23
TCG-Spitfire	61.0	63.8	14.3	64.4	65.1	13.5	966.4	24
Commander	61.3	65.0	15.3	63.5	66.9	9.1	948.3	25
WB9590	61.6	64.7	15.4	63.4	66.3	13.4	900.2	26
MN-Torgy	61.5	58.0	15.2	62.5	65.4	14.6	927.9	27
SY Valda	61.3	78.5	14.5	62.8	66.5	8.1	929.5	28
LCS Trigger	60.8	74.0	13.4	64.6	67.5	8.6	814.4	29
Mean	61.6	69.5	15.2	64.2	66.9	12.3	967.2	

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.

²Vitreous kernels - Expressed as a percentage of seeds having a vitreous-colored endosperm. A high percentage is desirable. US No. 1 DNS requires greater than 75% vitreous kernels.

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

⁴Farinograph Absorption - Measured by NIR at a 14% moisture basis. A measure of dough water absorption, expressed as percent. A high absorption is desirable.

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

⁶Farinograph Stability - A measure of dough strength expressed in minutes above the 500 Brabender unit line during mixing. A high stability is desirable.

⁷Loaf Volume - The volume of the pup loaf of bread, expressed in cubic centimeters. A high volume is desirable.

⁸Adjusted means across locations were calculated for each trait. These means were standardized (mean=0 and standard deviation=1) to remove effect of scale, which varies between traits. The standardized means were used to calculate the Wheat Quality Index (WQI). The WQI is a weighted index using 7 key traits with the following weights: Test Weight (5%); Vitreous kernel (5%); Wheat Protein (15%); Flour Extraction (10%); Farinograph Absorption (21.66%); Farinograph Stability (21.66%); Loaf Volume (21.66%).

Table 5. Quality data from 2020. The Wheat Quality Index is a weighted average developed to summarize the relative milling and baking quality of lines in the trial. Data below are from 2020 for all varieties which were tested in the 2021 trial. Data were collected from Gwinner, Langdon, Minot and Williston.

Variety	Test Weight ¹	Vitreous Kernels ²	Wheat Protein ³	Farinograph Absorption ⁴	Flour Extraction ⁵	Farinograph Stability ⁶	Loaf Volume ⁷	WQI RANK ⁸
	lb/bu	%	12% m.b.	%	%	min	cm ³	
Bolles	59.8	75.3	17.1	63.6	62.6	22.6	953.8	1
Glenn	62.4	72.9	15.6	63.8	64.2	12.8	930.5	2
ND Frohberg	61.4	56.0	15.0	65.2	65.3	11.2	932.3	3
ND VitPro	62.2	66.3	15.4	64.4	66.4	9.2	928.6	4
Sy Ingmar	61.6	58.6	15.6	63.0	66.0	10.8	920.2	5
Lang-MN	61.0	74.5	15.8	63.7	65.0	10.3	903.5	6
SY McCloud	61.5	59.4	15.3	64.9	64.6	9.2	927.7	7
CP3915	61.7	53.5	15.1	63.9	66.8	9.9	921.2	8
Lanning	59.8	64.4	16.1	63.0	62.8	8.7	972.4	9
LCS Rebel	61.9	54.8	15.3	64.1	66.4	10.2	904.4	10
MS Barracuda	60.4	56.3	15.5	63.9	64.9	10.0	927.7	11
MN-Washburn	61.0	68.1	14.8	60.4	67.8	13.2	937.0	12
Dagmar	60.7	75.7	15.8	63.6	64.3	9.8	900.7	13
TCG-Heartland	61.7	60.2	15.6	62.9	65.8	11.0	885.8	14
Ballistic	60.2	63.8	14.9	63.7	65.9	10.4	916.5	15
SY Soren	61.0	50.6	15.8	63.2	63.8	9.4	913.7	16
Faller	60.2	50.7	14.8	63.2	67.0	8.9	930.5	17
MS Ranchero	58.9	60.4	15.1	64.4	62.7	11.8	896.0	18
AP Murdock	60.6	45.9	14.8	64.1	66.4	11.1	876.4	19
SY Longmire	61.0	62.8	15.5	63.9	64.8	7.8	900.7	20
SY 611CL2	61.5	56.9	15.2	66.7	64.3	7.2	865.3	21
Ambush	61.4	68.0	15.4	62.1	64.4	9.9	906.3	22
CP3530	61.1	52.1	14.7	64.1	65.7	7.8	916.5	23
Commander	60.9	61.9	15.6	62.9	65.0	8.8	889.5	24
TCG-Wildfire	61.5	59.6	15.3	63.4	64.8	8.8	888.5	25
LCS Cannon	61.5	52.7	14.6	61.9	66.5	10.6	881.1	26
TCG-Spitfire	60.7	54.3	14.7	63.6	62.2	10.8	892.3	27
MN-Torgy	61.0	46.7	15.3	61.2	63.1	11.3	894.1	28
Driver	61.2	62.8	15.2	61.0	64.4	9.2	849.4	29
SY Valda	61.1	68.7	14.7	62.4	63.8	7.2	865.3	30
LCS Trigger	61.5	68.3	13.5	65.1	65.8	6.9	815.9	31
LCS Buster	58.8	54.5	13.7	58.7	66.6	12.9	839.2	32
Mean	61.0	60.5	15.2	63.3	65.0	10.3	902.6	

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.

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