A574-24 (Revised December 2024)

North Dakota
Hard Red Spring Wheat

Variety Trial Results for 2024 and Selection Guide

Clair Keene, Andrew Green, Shahidul Islam, Andrew Friskop, Tim Friesen, Zhaohui Liu and Shaobin Zhong (NDSU Main Station); Yue Jin (USDA-ARS St. Paul, MN); John Rickertsen (Hettinger Research Extension Center); Leandro Bortolon, Austin Kraklau, and Jayden Hansen (North Central Research Extension Center, Minot); Bryan Hanson (Langdon Research Extension Center); Glenn Martin (Dickinson Research Extension Center); Justin Jacobs (Williston Research Extension Center); and Kristin Simons (Carrington Research Extension Center)

Hard red spring (HRS) wheat was planted on 5.4 million acres in 2024, down slightly from 5.6 million acres in 2023. The average yield of HRS wheat was 59 bushels/acre (bu/a) across the state, up substantially from 49 bu/a in 2023. If downward revisions are not made, 2024 will be a new record for highest average state-wide HRS wheat yield in North Dakota. The 2024 growing season was generally favorable for HRS wheat yields with a long, cool spring and abundant moisture compared to recent drought years, especially in western and central parts of the state. While most of the spring was ideal for HRS wheat vegetative growth, a few weeks of extremely high temperatures during early grain fill coupled with a dry July took the top off of what could have been even larger yields.

WB9590 was the most popular HRS wheat variety in 2024, reportedly occupying 13.8% of the planted acreage, followed by SY Valda (10.0%), AP Murdock (9.8%), MN Torgy (4.7%) and SY Ingmar (4.4%) as the top five varieties. WB9590 was released by WestBred/Monsanto. SY Valda, AP Murdock and SY Ingmar are Syngenta/AgriPro varieties. MN Torgy is a University of Minnesota release. NDSU varieties Faller and Glenn were reported on 3.0% and 1.7% of acres, respectively. Glenn is considered a very high-quality HRS wheat and is still contracted on some acres by the North Dakota Mill to ensure high-quality flour demanded by discerning buyers.

In regards to quality characteristics important to end users, the marketed 2024 HRS wheat crop was characterized by high grades, average protein levels and good functional characteristics across the northern HRS wheat growing region. Slightly more than 90% of samples tested by the NDSU Hard Red Spring Wheat Quality Laboratory were graded at U.S. class No.1, an exceptionally high proportion. Average test weight was 61.3 lbs/bu, similar to the five-year average. Protein was somewhat below normal in samples from eastern North Dakota, largely assumed to be a result of high yields, and slightly above average for western portions of the state. Crop damage ranging from mild to severe was experienced in central and eastern regions of North Dakota when two to six inches of rain fell in less than one week in mid-August on many fields of mature HRS wheat prior to harvest. This unfortunate situation contributed to low falling numbers, pre-harvest sprout damage and discounts and/or rejection of many HRS wheat loads for some producers in the central portion of the state.

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Successful HRS wheat production depends on numerous factors, including selecting the right variety for a particular field. The information included in this publication is meant to aid in selecting a 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, use data that summarize several years and locations. Choose the variety that, on average, performs the best at multiple locations near your farm over several years.

Selecting varieties with good milling and baking quality is important to maintain market recognition and avoid discounts. HRS wheat from the northern Great Plains is known around the world for its excellent end-use quality. It is recommended that producers balance their variety selection by taking into consideration not only yield, but also the quality rankings presented on Table 6 in this publication.

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). These data are presented in Tables 6 and 7.

Gluten strength and milling and baking quality ratings are provided for individual varieties based on the results from the NDSU field trials conducted across multiple locations in 2023 (Table 7). 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 trials 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 shown at the bottom of the table, it means that with 90% confidence (LSD probability 0.10), the higher-yielding variety has a significant and real 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. Ideally, aim to select varieties that are high-yielding, preferably across locations and years, for your region of the state, along with those varieties that appear in the top half of the Wheat Quality Index ratings (Tables 6 and 7).

NS is used to indicate no significant difference for that trait among any of the varieties tested at the 90% level of confidence. CV stands for coefficient of variation and is expressed as a percentage. The CV is a measure of variability in the trial. Large CVs (CV > 10%) indicate a large amount of variation could not be attributed to differences among the varieties. Yield is reported on a 13.5% moisture basis, while protein content is reported at 12% moisture content, per industry standards.

Presentation of data for the entries tested does not imply approval or endorsement by the authors or agencies conducting the test. NDSU approves the reproduction of any table in the publication only if no portion is deleted or altered, appropriate footnotes are given and the order of the data is not rearranged. Additional data from county sites are available from each NDSU Research Extension Center and at *https://www.ag.ndsu.edu/varietytrials/variety-trial-results*.

Due to the high rainfall and cool early-season growing conditions, fungal pathogens of HRS wheat were much more prevalent in 2024 than the previous five years. Below is a list of disease issues of concern at the trial locations in which they were observed. The reader is cautioned to keep the disease susceptibility ratings presented in Table 1 in mind when evaluating characteristics of susceptible varieties in Tables 2-5.

Location	2024 Disease Observations
Carrington	Fusarium head blight (FHB), or head scab, pressure high and assumed to have reduced yields and test weight in susceptible varieties.
Casselton	Stripe rust pressure was high and disease was present on the flag leaf at head emergence. Moderate tan spot and bacterial leaf streak pressure, with heavy stem rust and significant damage from FHB. Leaf rust was also present on susceptible varieties which still had leaves in later stages of grain fill.
Forman	Very high levels of FHB damage from high disease pressure throughout the season.
Prosper	Low to moderate levels of leaf and stem rust present and moderate FHB pressure.
Hettinger	Severe stripe rust pressure early in the season but as the weather turned hot and dry, the infestation subsided. Stripe rust-susceptible varieties are assumed to have lost yield.
Dickinson	Similar to Hettinger, early stripe rust pressure was high; however, the season turned hot and dry and the disease subsided. Susceptible varieties may have lost some yield.

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Table 1. North Dakota hard red spring wheat variety descriptions, agronomic traits, 2024.

Variety	Agent or Origin[1]	Year Released	Height (inches)[2]	Straw Strength[3]	Days to Head[4]	Reaction to Disease[5]					
						Stem Rust[6]	Leaf Rust	Tan Spot	Bact. Leaf Streak	Head Scab	Stripe Rust
Ambush	Dyna-Gro	2016	33	5	57	2	6	NA	6	5	NA
AP Elevate	**Syngenta/AgriPro**	**2024**	**32**	**4**	**60**	**2**	**4**	**NA**	**7**	**5**	**3**
AP Gunsmoke CL2	Syngenta/AgriPro	2021	33	6	58	2	4	5	8	5	**4**
AP Murdock	Syngenta/AgriPro	2019	33	4	58	2	5	3	6	5	3
AP Smith	Syngenta/AgriPro	2021	32	3	60	1	3	5	5	6	**4**
Ascend-SD	SD	2022	38	4	60	2	4	6	4	4	**3**
Ballistic	Dyna-Gro	2018	35	5	59	1	9	NA	7	4	NA
Bolles	MN	2015	34	4	61	2	1	4	6	5	4
Brawn-SD	SD	2022	36	4	59	2	2	4	5	7	6
CAG-Ceres	**Champions Alliance Grp**	**2024**	**33**	**3**	**64**	**2**	**9**	**NA**	**7**	**7**	**6**
CAG-Justify	Champions Alliance Grp	2021	33	6	58	2	2	4	6	6	4
CAG-Reckless	Champions Alliance Grp	2021	36	4	60	2	2	7	6	4	4
CAG Recoil	Champions Alliance Grp	2022	36	2	59	2	2	NA	5	7	3
Commander	Dyna-Gro	2019	34	4	57	2	2	NA	8	5	NA
CP3055[7]	**Croplan**	**2023**	**35**	**3**	**67**	**6**	**8**	**NA**	**6**	**7**	**3**
CP3099A	Croplan	2020	38	4	64	7	5	6	5	7	1
CP3119A[7]	Croplan	2021	37	2	67	2	8	NA	5	7	1
CP3188	Croplan	2020	35	8	59	7	2	6	6	7	9
CP3322[7]	**Croplan**	**2023**	**34**	**3**	**65**	**3**	**8**	**NA**	**6**	**8**	**3**
CP3360AX	**Croplan**	**2024**	**33**	**4**	**57**	**2**	**6**	**NA**	**6**	**5**	**8**
CP3915	Croplan	2019	33	4	59	2	1	NA	6	5	6
Driver	SD	2019	35	4	61	2	1	6	8	4	2
Faller	ND	2007	36	7	60	2	8	NA	6	5	8
Glenn	ND	2005	38	4	57	2	7	6	6	4	3
Lanning	MT	2016	34	4	59	2	6	4	6	7	4
LCS Ascent	Limagrain	2022	33	6	56	2	6	8	7	4	2
LCS Boom	**Limagrain**	**2023**	**33**	**4**	**56**	**1**	**5**	**8**	**6**	**6**	**2**
LCS Buster	Limagrain	2020	36	4	64	1	3	4	4	4	4
LCS Cannon	Limagrain	2018	32	3	56	1	5	6	7	5	4
LCS Dual	Limagrain	2020	34	3	58	2	4	6	7	6	6

[1]Refers to agent or developer: MN = Univ of Minnesota; MT = Montana State Univ; ND = North Dakota State Univ; SD = South Dakota State Univ

Varieties in bold text are a recent release or first year entry in NDSU trials with limited data available and the potential for future ratings to change.

[2]Height data averaged from 9 locations in 2024.

[3]Straw 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.

[4]Days to Head = the number of days from planting to head emergence from the boot, averaged based on data from 7 locations in 2024.

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

[6]Stem rust scores determined from field severity ratings and*Puccinia graminis* f. sp. *tritici* race QFCQ

[7]Solid stem or semi-solid stem for increased resistance to wheat stem sawfly.

Table 1. North Dakota hard red spring wheat variety descriptions, agronomic traits, 2024. (Continued)

Variety	Agent or Origin[1]	Year Released	Height (inches)[2]	Straw Strength[3]	Days to Head[4]	Reaction to Disease[5]					
						Stem Rust[6]	Leaf Rust	Tan Spot	Bact. Leaf Streak	Head Scab	Stripe Rust
LCS Hammer AX	Limagrain	2022	33	2	58	2	7	8	7	8	2
LCS Trigger	Limagrain	2016	36	5	65	2	1	3	4	3	6
MN- Rothsay	MN	2022	31	3	61	2	6	3	6	6	6
MN-Torgy	MN	2020	34	4	59	2	3	4	6	4	3
MS Charger	Meridian Seeds	2022	33	8	58	2	3	6	7	5	8
MS Cobra	Meridian Seeds	2022	33	5	59	1	2	8	7	6	3
MS Nova	**Meridian Seeds**	**2024**	**33**	**4**	**57**	**NA**	**4**	**NA**	**8**	**5**	**3**
MS Ranchero	Meridian Seeds	2020	38	7	62	2	6	6	6	5	4
MT Carlson	**MT**	**2023**	**33**	**5**	**58**	**1**	**8**	**NA**	**7**	**8**	**4**
MT Dutton	**MT**	**2023**	**34**	**4**	**59**	**2**	**4**	**NA**	**8**	**6**	**6**
MT Ubet	**MT**	**2024**	**34**	**5**	**59**	**2**	**8**	**NA**	**6**	**8**	**8**
ND Frohberg	ND	2020	37	3	60	2	4	8	5	5	3
ND Heron	ND	2021	34	6	56	1	6	4	7	4	6
ND Stampede	**ND**	**2024**	**34**	**4**	**58**	**1**	**6**	**NA**	**7**	**5**	**9**
ND Thresher	**ND**	**2023**	**33**	**5**	**60**	**2**	**5**	**4**	**4**	**4**	**6**
ND VitPro	ND	2016	34	4	58	2	4	6	6	4	4
PFS Buns	Peterson Farm Seeds	2021	33	7	68	1	3	4	4	6	9
PFS Rolls	**Peterson Farm Seeds**	**2023**	**35**	**4**	**61**	**3**	**4**	**NA**	**5**	**8**	**6**
Rocker	**Dyna-Gro**	**2019**	**34**	**4**	**61**	**2**	**6**	**NA**	**7**	**8**	**NA**
Shelly	MN	2016	33	5	61	2	6	4	7	5	4
SY 611CL2	Syngenta/AgriPro	2019	31	4	58	2	6	5	6	4	4
SY Ingmar	Syngenta/AgriPro	2014	33	4	60	2	3	5	6	5	4
SY Longmire[7]	Syngenta/AgriPro	2019	32	4	59	2	5	5	6	7	3
SY Valda	Syngenta/AgriPro	2015	33	5	59	2	3	5	7	5	8
TCG-Badlands	**21st Century Genetics**	**2024**	**33**	**3**	**59**	**1**	**6**	**NA**	**6**	**7**	**3**
TCG-Teddy	**21st Century Genetics**	**2023**	**30**	**2**	**60**	**2**	**4**	**6**	**6**	**7**	**2**
TCG-Wildcat	21st Century Genetics	2020	34	3	60	2	4	7	7	7	6
WB9590	WestBred	2017	30	3	58	2	3	7	8	8	8
WB9719	WestBred	2018	32	4	61	2	5	3	5	7	4

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[6]Stem rust scores determined from field severity ratings and*Puccinia graminis* f. sp. *tritici* race QFCQ

[7]Solid stem or semi-solid stem for increased resistance to wheat stem sawfly.

Table 2. Yield of hard red spring wheat varieties at 5 locations in eastern North Dakota 2022-2024.

	Carrington[1]		Casselton[2]		Forman[3]		Langdon		Prosper[4]		Average	
Variety	**2024**	**3 Yr.**	**2024**	**3 Yr.**	**2024**	**2 Yr.**	**2024**	**3 Yr.**	**2024**	**2 Yr.**	**2024**	**3 Yr.**
	---------- (bu/a) ----------											
Ambush	71.7	--	85.8	--	61.5	--	82.8	80.5	86.9	--	77.7	--
AP Elevate	**76.0**	**--**	**90.3**	--	**65.4**	--	**89.0**	**--**	**90.7**	**--**	**82.3**	**--**
AP Gunsmoke CL2	56.8	62.2	80.6	79.3	62.2	67.0	77.3	78.2	84.2	85.9	72.2	73.2
AP Murdock	78.2	66.1	88.9	84.7	69.4	68.9	85.5	83.7	91.2	89.8	82.6	78.1
AP Smith	77.1	65.0	88.8	80.3	64.9	66.2	86.2	80.4	85.5	85.1	80.5	75.2
Ascend-SD	75.9	73.2	90.7	83.0	59.0	64.0	80.2	83.8	91.5	96.4	79.4	80.0
Ballistic	75.1	--	97.9	--	67.8	--	90.2	86.9	96.8	--	85.5	86.9
Bolles	68.2	60.9	84.7	78.4	56.0	60.5	76.7	73.7	84.9	86.5	74.1	71.0
Brawn-SD	70.5	66.0	89.5	84.2	57.7	66.1	84.6	82.8	94.1	101.5	79.3	77.7
CAG-Ceres	**72.5**	**--**	**84.3**	--	**59.4**	--	**79.8**	**--**	**83.5**	**--**	**75.9**	--
CAG-Justify	68.6	66.4	90.9	85.8	58.0	64.5	83.5	85.6	88.1	92.4	77.8	79.3
CAG-Reckless	64.5	63.1	90.6	84.9	61.1	65.6	84.5	83.8	87.8	93.6	77.7	77.2
CAG Recoil	66.2	--	86.4	--	62.0	--	90.4	--	83.4	--	77.7	--
Commander	76.0	--	91.1	--	66.8	--	81.7	77.6	87.2	--	80.5	77.6
CP3055	**58.3**	**--**	**77.1**	--	**42.3**	--	**91.5**	**--**	**77.7**	**--**	**69.4**	--
CP3099A	66.4	63.0	58.7	72.9	39.3	55.8	78.9	79.3	95.5	99.0	67.8	71.7
CP3119A	53.9	--	74.8	--	39.6	--	85.8	--	74.7	--	65.7	--
CP3188	66.5	62.0	86.8	81.5	59.7	64.1	78.5	76.6	78.4	84.6	74.0	73.4
CP3322	**51.3**	**--**	**71.8**	--	**40.8**	**52.2**	**79.0**	**--**	**79.2**	**85.0**	**64.4**	--
CP3360AX	**--**	**--**	**87.4**	--	**60.4**	--	**83.3**	**--**	**85.1**	**--**	**79.1**	**--**
CP3915	70.6	--	92.6	--	57.5	63.1	81.9	80.5	84.5	89.1	77.4	80.5
Driver	72.6	68.2	94.0	82.9	61.6	64.5	82.2	82.7	90.4	90.9	80.1	77.9
Faller	76.1	--	87.7	--	59.8	--	89.2	85.2	96.7	--	81.9	85.2
Glenn	67.2	59.6	79.8	71.2	52.7	60.7	69.0	68.4	81.2	82.4	70.0	66.4
Lanning	55.7	58.3	76.7	75.4	50.8	59.2	78.5	71.4	83.6	87.4	69.0	68.4
LCS Ascent	78.8	63.1	94.1	87.7	65.4	65.9	83.7	84.2	89.3	89.6	82.3	78.4
LCS Boom	**81.8**	**--**	**90.4**	--	**71.5**	**64.6**	**86.2**	**--**	**84.5**	**86.8**	**82.9**	--
LCS Buster	66.1	65.0	92.0	85.6	61.9	66.7	93.5	86.7	98.0	101.6	82.3	79.1
LCS Cannon	81.2	64.8	87.0	81.3	65.8	66.3	80.1	81.1	82.8	82.5	79.4	75.7
LCS Dual	66.2	64.1	84.9	82.7	38.9	54.3	80.8	77.9	76.8	85.7	69.5	74.9

[1]Carrington REC dryland trial was impacted by Fusarium Head Blight, aka head scab. Disease severity was high and reduced yield of susceptible varieties.

[2]Casselton had very high stripe rust and stem rust pressure, moderate tan spot and bacterial leaf streak pressure, and FHB damage was significant.

[3]Forman had very high levels of FHB damage from high disease pressure throughout the season.

[4]Prosper had low levels of stripe and leaf rust present; however FHB pressure was high and susceptible varieties exhibited reduced yield.

Table 2. Yield of hard red spring wheat varieties at 5 locations in eastern North Dakota 2022-2024. (Continued)

	Carrington[1]		Casselton[2]		Forman[3]		Langdon		Prosper[4]		Average	
Variety	**2024**	**3 Yr.**	**2024**	**3 Yr.**	**2024**	**2 Yr.**	**2024**	**3 Yr.**	**2024**	**2 Yr.**	**2024**	**3 Yr.**
	(bu/a)											
LCS Hammer AX	77.2	68.1	70.4	76.9	48.7	55.1	83.3	80.7	81.7	87.6	72.2	75.3
LCS Trigger	72.3	67.8	99.4	89.8	67.7	69.2	88.3	87.2	92.2	98.1	84.0	81.6
MN- Rothsay	70.2	64.7	85.7	79.8	61.0	64.5	87.6	81.6	90.2	89.5	78.9	75.3
MN-Torgy	72.5	64.4	96.9	80.9	65.2	68.0	81.5	79.6	88.2	93.4	80.9	75.0
MS Charger	86.9	70.6	90.1	90.2	72.6	69.3	87.2	87.3	89.7	93.0	85.3	82.7
MS Cobra	74.0	65.7	91.3	82.9	64.6	65.2	82.9	76.3	88.9	89.0	80.3	74.9
MS Nova	**69.6**	**--**	**86.5**	**--**	**60.6**	**--**	**73.3**	**--**	**79.9**	**--**	**74.0**	--
MS Ranchero	38.9	58.6	87.7	66.0	60.5	56.3	88.3	80.9	82.3	81.8	71.5	68.5
MT Carlson	**69.3**	**--**	**74.0**	**--**	**51.5**	**--**	**83.5**	**--**	**82.1**	**--**	**72.1**	--
MT Dutton	**60.9**	--	**79.4**	**--**	**53.7**	**--**	**81.3**	**--**	**78.7**	**--**	**70.8**	--
MT Ubet	**65.7**	**--**	**82.1**	**--**	**49.6**	**--**	**80.9**	**--**	**85.0**	**--**	**72.7**	--
ND Frohberg	68.1	65.6	85.9	81.5	51.4	58.8	75.4	76.1	84.8	87.1	73.1	74.4
ND Heron	67.4	59.9	80.6	76.3	62.2	62.0	74.1	74.3	87.9	86.0	74.4	70.2
ND Stampede	**84.5**	**70.2**	**80.8**	**84.4**	**73.4**	**71.1**	**89.8**	**85.6**	**98.6**	**94.6**	**85.4**	80.1
ND Thresher	**68.1**	**62.2**	**82.2**	**74.1**	**62.5**	**60.5**	**75.4**	**75.0**	**84.8**	**92.2**	**74.6**	70.5
ND VitPro	65.9	57.3	82.6	73.3	52.9	58.7	74.1	71.7	82.9	85.0	71.7	67.4
PFS Buns	63.9	62.5	80.1	78.8	55.1	58.6	94.2	--	88.7	96.3	76.4	70.7
PFS Rolls	**63.3**	**--**	**81.7**	**--**	**57.2**	**--**	**90.2**	**--**	**95.3**	**--**	**77.5**	--
Rocker	**59.4**	**--**	**72.7**	**--**	**40.5**	**--**	**77.9**	**--**	**83.8**	**--**	**66.9**	--
Shelly	69.2	66.6	88.1	82.4	64.5	68.6	91.0	84.2	93.5	92.8	81.3	77.7
SY 611CL2	73.3	67.8	93.9	80.2	69.5	66.4	82.2	83.4	87.7	92.7	81.3	77.1
SY Ingmar	75.4	62.2	84.4	78.5	60.3	62.5	74.0	73.5	84.6	86.7	75.8	71.4
SY Longmire	67.6	62.5	73.4	71.3	45.1	57.3	76.4	72.7	81.9	89.7	68.9	68.8
SY Valda	77.3	68.3	96.5	84.2	74.9	72.0	86.6	84.0	93.9	96.3	85.8	78.8
TCG-Badlands	**72.9**	**--**	**84.4**	**--**	**57.5**	**--**	**77.9**	**--**	**86.1**	**--**	**75.8**	--
TCG-Teddy	**70.6**	**--**	**80.1**	**--**	**57.9**	**62.7**	**81.2**	**--**	**83.4**	**86.1**	**74.6**	--
TCG-Wildcat	82.3	69.6	89.6	85.4	56.8	59.3	82.6	80.6	96.1	95.5	81.5	78.5
WB9590	67.6	64.4	75.9	82.5	57.6	61.1	83.6	79.0	88.9	92.2	74.7	75.3
WB9719	65.7	--	76.5	--	47.2	57.1	81.0	--	88.9	99.0	71.9	--
Mean	69.8	64.6	85.3	80.6	59.1	63.0	82.8	80.1	87.3	90.5	76.5	75.7
CV%	7.2	--	4.9	--	4.2	--	4.3	--	4.6	--	7.3	--
LSD 0.10	5.9	--	6.3	--	3.6	--	4.1	--	3.6	--	5.8	--

[1]Carrington REC dryland trial was impacted by Fusarium Head Blight, aka head scab. Disease severity was high and reduced yield of susceptible varieties.

[2]Casselton had very high stripe rust and stem rust pressure, moderate tan spot and bacterial leaf streak pressure, and FHB damage was significant.

[3]Forman had very high levels of FHB damage from high disease pressure throughout the season.

[4]Prosper had low levels of stripe and leaf rust present; however FHB pressure was high and susceptible varieties exhibited reduced yield.

Table 3. Yield of hard red spring wheat varieties grown at 5 locations in western North Dakota 2022-2024.

	Dickinson[1]		Hettinger[2]		Mandan		Minot		Williston		Average	
Variety	**2024**	**2 Yr.**	**2024**	**3 Yr.**	**2024**	**3 Yr.**	**2024**	**3 Yr.**	**2024**	**2 Yr.**	**2024**	**3 Yr.**
	---------- (bu/a) ----------											
Ambush	68.5	--	56.9	--	58.6	--	62.7	--	69.4	--	63.2	--
AP Elevate	**67.4**	**--**	**60.4**	**--**	**70.0**	**--**	**65.3**	**--**	**77.1**	**--**	**68.0**	**--**
AP Gunsmoke CL2	67.0	60.0	61.3	75.0	62.2	59.3	50.6	58.9	74.5	56.0	63.1	64.4
AP Murdock	69.3	55.5	56.7	68.5	68.7	62.2	67.3	63.1	76.3	54.8	67.7	64.6
AP Smith	57.7	55.4	54.6	70.6	61.3	56.2	51.9	59.4	70.4	45.0	59.2	62.1
Ascend-SD	66.4	57.5	60.2	72.6	74.4	65.5	55.7	--	75.9	48.6	66.5	69.1
Ballistic	62.5	--	59.2	--	71.5	--	64.6	--	77.8	--	67.1	--
Bolles	58.5	52.1	60.8	69.0	60.6	56.1	66.9	66.3	63.2	40.5	62.0	63.8
Brawn-SD	66.8	58.5	64.0	79.0	67.5	62.9	66.6	--	74.6	47.3	67.9	71.0
CAG-Ceres	**61.7**	**--**	**55.4**	**--**	**62.3**	**--**	**62.6**	**--**	**65.5**	**--**	**61.5**	--
CAG-Justify	64.4	62.8	65.0	80.3	69.5	62.3	75.1	68.3	76.9	--	70.2	70.3
CAG-Reckless	69.8	57.6	60.6	73.2	67.3	59.2	69.2	65.4	79.2	--	69.2	65.9
CAG Recoil	69.1	--	57.5	--	71.5	--	51.2	--	72.5	--	64.4	--
Commander	70.0	--	61.1	--	66.8	--	61.3	--	76.4	--	67.1	--
CP3055	**65.0**	**--**	**57.8**	**--**	**65.5**	**--**	**52.8**	**--**	**69.2**	**48.4**	**62.1**	**--**
CP3099A	65.9	60.3	60.0	76.2	60.3	59.2	63.0	64.9	75.2	54.8	64.9	66.8
CP3119A	62.0	--	60.2	73.7	67.3	--	69.5	69.3	75.4	54.8	66.9	71.5
CP3188	51.8	53.1	51.7	69.9	47.3	54.2	56.7	59.4	71.0	53.1	55.7	61.2
CP3322	**64.5**	**63.5**	**54.9**	**--**	**56.5**	**--**	**35.8**	**--**	**57.1**	**50.3**	**53.8**	--
CP3360AX	**62.8**	**--**	**57.1**	**--**	**60.9**	**--**	**38.2**	**--**	**69.8**	**--**	**57.8**	**--**
CP3915	62.3	--	54.4	--	61.5	--	39.4	--	62.5	--	56.0	--
Driver	67.8	57.2	61.8	75.2	67.5	60.5	49.9	56.8	70.4	54.7	63.5	64.2
Faller	51.7	--	54.5	--	63.8	--	52.2	--	58.4	44.8	56.1	--
Glenn	67.6	56.6	51.5	65.3	59.7	53.4	47.4	55.3	55.8	42.5	56.4	58.0
Lanning	70.7	59.0	59.3	71.7	60.9	56.4	48.0	57.9	81.1	57.6	64.0	62.0
LCS Ascent	72.9	63.6	58.0	73.0	69.1	56.5	65.4	66.2	85.7	58.6	70.2	65.2
LCS Boom	**76.8**	**61.6**	**59.3**	**--**	**62.8**	**--**	**54.3**	**--**	**74.1**	**52.5**	**65.5**	--
LCS Buster	58.2	58.9	58.8	76.9	70.2	66.2	58.4	65.7	68.9	47.3	62.9	69.6
LCS Cannon	70.5	62.4	56.9	70.9	66.4	56.0	48.9	57.9	68.1	49.0	62.2	61.6
LCS Dual	59.7	54.3	55.4	73.6	61.7	54.0	66.7	66.6	68.2	46.3	62.3	64.7

[1]Dickinson observed stripe rust early in the season; however, weather turned hot and dry and reduced disease pressure. Only the most susceptible varieties affected.

[2]Hettinger had severe stripe rust. Very susceptible to susceptible varieties were impacted while resistant and moderately resistant varieties did not lose yield.

Table 3. Yield of hard red spring wheat varieties grown at 5 locations in western North Dakota 2022-2024. (Continued)

	Dickinson[1]		Hettinger[2]		Mandan		Minot		Williston		Average	
Variety	**2024**	**2 Yr.**	**2024**	**3 Yr.**	**2024**	**3 Yr.**	**2024**	**3 Yr.**	**2024**	**2 Yr.**	**2024**	**3 Yr.**
	---------- (bu/a) ----------											
LCS Hammer AX	72.7	61.2	61.4	70.8	61.5	58.7	54.1	--	76.8	--	65.3	64.8
LCS Trigger	59.2	56.6	57.1	75.8	73.0	67.9	58.0	65.1	70.7	48.3	63.6	69.6
MN- Rothsay	63.2	57.3	55.5	71.6	64.5	61.6	64.8	66.4	69.2	--	63.4	66.5
MN-Torgy	66.3	59.9	60.1	74.2	71.6	66.0	67.8	65.5	72.8	--	67.7	68.6
MS Charger	59.1	55.9	59.3	78.2	64.0	57.5	52.5	57.2	73.7	55.3	61.7	64.3
MS Cobra	71.2	58.5	60.1	71.5	69.2	60.6	66.5	61.1	76.1	49.0	68.6	64.4
MS Nova	**70.4**	**--**	**60.8**	**--**	**64.1**	**--**	**53.6**	**--**	**71.8**	**--**	**64.1**	--
MS Ranchero	64.9	62.1	55.5	75.0	68.8	66.6	63.9	56.5	67.4	49.2	64.1	66.0
MT Carlson	**73.2**	**--**	**58.7**	**--**	**64.3**	**--**	**44.5**	**--**	**78.8**	**--**	**63.9**	--
MT Dutton	**69.5**	**--**	**57.5**	**--**	**65.5**	**--**	**59.8**	**--**	**77.1**	**--**	**65.9**	--
MT Ubet	**66.4**	**--**	**60.8**	**--**	**64.7**	**--**	**57.7**	**--**	**80.4**	**--**	**66.0**	**--**
ND Frohberg	71.1	57.7	56.4	69.5	60.3	55.3	48.3	57.4	70.9	47.0	61.4	60.7
ND Heron	65.1	55.2	54.4	68.1	62.8	53.7	52.7	55.0	69.9	51.5	61.0	60.9
ND Stampede	**60.9**	**55.3**	**53.6**	**75.9**	**67.5**	**57.2**	**65.2**	**63.9**	**76.0**	**59.1**	**64.6**	65.7
ND Thresher	**57.9**	**52.1**	**58.1**	**71.2**	**58.8**	**55.4**	**46.4**	**55.4**	**63.3**	**40.3**	**56.9**	63.3
ND VitPro	63.5	53.2	53.7	66.5	58.7	52.4	34.8	49.0	64.0	42.3	54.9	56.0
PFS Buns	42.5	49.9	52.5	--	63.8	--	50.9	60.8	64.8	--	54.9	60.8
PFS Rolls	**63.0**	**--**	**55.7**	**--**	**67.3**	**--**	**66.4**	**--**	**73.6**	**--**	**65.2**	--
Rocker	**67.3**	**--**	**60.3**	**--**	**62.3**	**--**	**48.2**	**--**	**73.4**	**--**	**62.3**	**--**
Shelly	66.5	59.1	58.4	74.6	68.1	60.1	64.7	64.2	67.1	46.7	65.0	66.3
SY 611CL2	69.6	59.5	56.6	73.6	69.6	62.6	48.6	57.4	66.7	53.8	62.2	64.5
SY Ingmar	65.1	57.4	53.9	63.3	63.6	55.9	51.5	54.7	68.4	44.8	60.5	58.0
SY Longmire	66.1	55.6	59.5	68.9	58.8	55.5	42.7	54.2	71.8	53.1	59.8	59.5
SY Valda	63.1	59.3	56.1	72.5	66.1	62.4	52.9	57.2	72.3	48.5	62.1	64.0
TCG-Badlands	**73.2**	**--**	**62.2**	**--**	**65.8**	**--**	**64.5**	**--**	**76.7**	**--**	**68.5**	--
TCG-Teddy	**75.2**	**62.9**	**62.0**	**--**	**65.8**	**--**	**52.5**	**55.7**	**74.5**	**--**	**66.0**	55.7
TCG-Wildcat	69.1	59.8	57.4	70.5	65.3	61.6	61.2	65.7	75.4	--	65.7	65.9
WB9590	70.5	57.3	56.8	71.2	64.4	55.8	59.2	61.7	73.0	51.8	64.8	62.9
WB9719	71.0	61.9	57.2	--	56.0	--	49.2	--	73.1	53.0	61.3	--
Mean	65.6	58.0	57.7	72.4	64.9	59.1	56.1	60.9	71.8	49.6	63.2	64.2
CV%	6.3	--	5.3	--	7.1	--	6.5	--	6.7	--	8.1	--
LSD 0.10	3.8	--	2.5	--	4.2	--	5.0	--	6.5	--	5.3	--

[1]Dickinson observed stripe rust early in the season; however, weather turned hot and dry and reduced disease pressure. Only the most susceptible varieties affected.

[2]Hettinger had severe stripe rust. Very susceptible to susceptible varieties were impacted while resistant and moderately resistant varieties did not lose yield.

Table 4. Protein at 12% moisture of hard red spring wheat varieties across 9 locations in North Dakota, 2024.

Variety	Carrington	Casselton	Forman	Langdon	Prosper	Dickinson	Hettinger	Mandan	Minot	State Avg.
						(%)				
Ambush	15.9	14.5	14.7	14.4	15.0	15.2	11.4	13.9	14.2	14.3
AP Elevate	**15.4**	**14.0**	**14.4**	**13.8**	**14.4**	**15.0**	**12.1**	**13.8**	**14.1**	**14.1**
AP Gunsmoke CL2	18.0	15.4	15.8	13.3	15.1	15.1	11.4	13.9	13.5	14.6
AP Murdock	15.4	13.4	13.8	12.9	14.3	14.7	11.5	13.6	13.6	13.7
AP Smith	15.0	13.9	14.4	14.1	14.3	14.2	12.0	13.9	14.3	14.0
Ascend-SD	16.7	14.7	15.3	13.9	15.9	15.0	11.6	13.4	14.0	14.5
Ballistic	15.3	13.1	14.1	13.0	14.3	14.1	11.8	13.2	13.5	13.6
Bolles	17.4	15.8	16.6	14.4	16.0	16.6	12.6	14.2	16.4	15.6
Brawn-SD	15.8	13.8	13.7	12.6	14.3	14.2	11.8	12.3	13.1	13.5
CAG-Ceres	**14.6**	**13.5**	**13.9**	**13.7**	**14.6**	**13.8**	**12.5**	**14.2**	**14.8**	**14.0**
CAG-Justify	15.3	13.1	13.5	12.6	13.5	14.7	12.0	12.0	12.9	13.3
CAG-Reckless	15.5	13.9	14.8	13.8	14.5	14.1	11.9	14.1	13.9	14.0
CAG Recoil	15.3	14.4	14.8	13.2	14.6	15.2	12.2	13.4	13.3	14.0
Commander	15.1	13.9	14.2	13.6	14.0	14.2	11.8	13.9	14.2	13.9
CP3055	**14.4**	**12.6**	**13.4**	**12.1**	**13.8**	**14.5**	**12.3**	**11.9**	**12.7**	**13.1**
CP3099A	13.2	10.2	10.5	10.5	12.6	13.3	11.0	10.0	11.0	11.4
CP3119A	14.2	12.2	12.6	12.2	13.7	14.2	11.8	11.5	12.1	12.7
CP3188	14.7	12.5	13.1	12.1	14.0	13.9	11.5	12.0	12.8	13.0
CP3322	**15.4**	**13.1**	**13.7**	**11.8**	**13.8**	**13.7**	**11.5**	**12.7**	**13.3**	**13.2**
CP3360AX	**--**	**13.0**	**13.5**	**12.7**	**13.9**	**13.6**	**11.2**	**12.2**	**12.9**	**12.9**
CP3915	15.2	14.0	14.8	13.8	14.3	14.7	11.7	13.7	14.5	14.1
Driver	15.4	14.1	14.5	13.6	14.0	14.7	12.0	13.7	13.7	14.0
Faller	15.3	13.2	14.1	12.8	14.1	14.4	12.2	12.9	13.4	13.6
Glenn	16.1	15.0	15.4	14.5	15.6	15.4	12.0	14.6	14.7	14.8
Lanning	17.0	14.9	15.4	14.3	15.1	15.4	12.1	14.2	14.3	14.7
LCS Ascent	14.4	13.1	13.7	12.9	13.2	13.7	11.8	12.9	13.3	13.2
LCS Boom	**15.3**	**14.5**	**14.5**	**13.3**	**14.5**	**14.7**	**12.2**	**13.3**	**13.9**	**14.0**
LCS Buster	14.2	12.5	12.8	11.1	12.1	13.1	11.6	12.3	11.5	12.4
LCS Cannon	15.4	14.2	14.4	13.5	14.3	14.4	12.6	12.8	13.8	13.9
LCS Dual	15.7	13.5	14.4	13.0	14.9	14.0	11.9	13.2	13.9	13.8

Table 4. Protein at 12% moisture of hard red spring wheat varieties across 9 locations in North Dakota, 2024. (Continued)

Variety	Carrington	Casselton	Forman	Langdon	Prosper	Dickinson	Hettinger	Mandan	Minot	State Avg.
						(%)				
LCS Hammer AX	14.7	13.4	14.4	13.4	14.3	14.2	11.8	13.5	13.8	13.7
LCS Trigger	13.3	11.7	12.7	11.1	12.7	13.9	11.4	11.4	12.2	12.3
MN- Rothsay	15.2	14.0	14.5	13.3	14.3	14.4	11.9	13.9	13.6	13.9
MN-Torgy	16.1	14.4	14.9	14.3	15.1	14.9	12.0	14.4	14.5	14.5
MS Charger	14.1	12.3	12.9	12.0	13.5	13.3	11.1	11.9	12.2	12.6
MS Cobra	15.4	13.9	14.3	13.8	15.1	14.9	12.2	13.9	14.0	14.2
MS Nova	**15.7**	**14.1**	**14.9**	**14.1**	**15.1**	**14.3**	**11.9**	**14.0**	**14.3**	**14.3**
MS Ranchero	17.0	13.1	14.0	13.1	14.4	14.4	11.9	12.8	13.7	13.8
MT Carlson	**15.3**	**14.1**	**14.1**	**13.3**	**13.8**	**14.0**	**11.6**	**13.2**	**13.8**	**13.7**
MT Dutton	**16.9**	**14.7**	**15.8**	**13.6**	**15.5**	**14.3**	**11.7**	**13.9**	**14.1**	**14.5**
MT Ubet	**16.3**	**14.2**	**14.6**	**13.7**	**14.3**	**14.4**	**11.1**	**13.7**	**13.9**	**14.0**
ND Frohberg	15.8	14.1	15.1	13.5	15.2	15.0	11.8	14.2	13.9	14.3
ND Heron	15.9	14.9	15.1	14.1	15.3	15.1	12.0	13.9	15.2	14.6
ND Stampede	**15.5**	**13.6**	**14.6**	**13.6**	**15.0**	**14.3**	**11.5**	**13.4**	**14.3**	**14.0**
ND Thresher	**16.0**	**14.6**	**15.3**	**14.0**	**15.1**	**14.9**	**12.3**	**13.7**	**14.2**	**14.4**
ND VitPro	16.1	15.3	15.5	14.7	15.6	15.6	12.3	15.2	14.8	15.0
PFS Buns	14.1	12.8	13.5	11.7	12.9	14.8	11.7	12.0	12.1	12.8
PFS Rolls	**15.5**	**13.9**	**14.3**	**13.1**	**14.9**	**14.5**	**11.4**	**13.5**	**13.7**	**13.8**
Rocker	**16.1**	**14.1**	**15.0**	**14.0**	**14.6**	**14.8**	**11.7**	**13.1**	**15.1**	**14.3**
Shelly	15.3	13.4	14.3	13.0	14.3	14.3	12.2	13.0	13.3	13.7
SY 611CL2	15.7	14.1	14.8	13.9	14.6	15.0	11.4	13.8	14.9	14.2
SY Ingmar	15.4	14.1	15.1	14.2	14.9	14.8	11.6	14.8	15.0	14.4
SY Longmire	15.6	14.2	14.8	13.8	14.6	14.7	10.7	14.2	14.6	14.1
SY Valda	14.9	13.5	14.0	13.2	14.2	14.8	11.5	13.7	14.1	13.8
TCG-Badlands	**15.1**	**13.5**	**14.0**	**13.4**	**14.6**	**14.6**	**12.4**	**14.3**	**13.5**	**13.9**
TCG-Teddy	**15.2**	**14.7**	**15.0**	**13.8**	**14.6**	**14.8**	**12.4**	**13.7**	**14.2**	**14.3**
TCG-Wildcat	15.6	14.0	14.9	14.4	15.1	14.4	12.2	13.6	14.5	14.3
WB9590	15.9	14.0	14.6	13.8	14.8	14.8	11.3	13.6	14.1	14.1
WB9719	14.8	14.1	14.3	13.6	14.7	14.2	11.7	13.2	14.0	13.8
Mean	15.5	13.8	14.4	13.4	14.5	14.5	11.8	13.4	13.8	13.9
CV%	2.8	--	1.4	2.7	2.3	2.7	8.3	4.8	3.3	3.3
LSD 0.10	0.5	--	0.28	0.42	0.3	0.4	0.9	0.6	0.6	0.4

Table 5. Test weight of hard red spring wheat varieties grown at 9 locations in North Dakota, 2024.

Variety	Carrington	Casselton	Forman	Langdon	Prosper	Dickinson	Hettinger	Mandan	Minot	State Avg.
	---------- (lb/bu) ----------									
Ambush	57.9	58.0	59.7	61.7	57.1	59.9	58.4	61.3	63.1	59.7
AP Elevate	**58.4**	**57.8**	**59.4**	**60.3**	**57.7**	**58.4**	**58.3**	**60.8**	**60.4**	**59.1**
AP Gunsmoke CL2	56.4	56.7	58.6	60.5	56.9	57.1	57.5	60.5	61.2	58.4
AP Murdock	59.3	57.4	58.1	60.1	57.8	57.8	55.5	60.2	61.1	58.6
AP Smith	58.3	57.4	58.3	60.4	57.5	56.8	59.0	59.9	60.8	58.7
Ascend-SD	59.2	56.8	59.6	61.7	57.6	58.9	59.6	61.3	60.7	59.5
Ballistic	57.0	55.9	57.6	61.0	56.4	56.1	56.3	60.6	61.1	58.0
Bolles	57.2	56.8	57.5	61.1	56.7	56.4	57.8	59.3	61.5	58.2
Brawn-SD	59.5	57.4	59.2	62.1	60.0	59.8	60.1	61.8	63.7	60.4
CAG-Ceres	**57.7**	**57.0**	**58.8**	**61.0**	**56.4**	**56.8**	**57.6**	**60.6**	**62.1**	**58.7**
CAG-Justify	56.1	55.0	56.9	59.4	55.8	52.8	55.6	59.5	60.6	56.9
CAG-Reckless	57.3	57.3	59.1	61.7	58.3	58.8	59.0	60.6	62.7	59.4
CAG Recoil	58.1	55.4	57.4	60.8	57.7	57.4	57.3	59.4	59.6	58.1
Commander	58.4	58.0	58.4	60.7	56.7	58.5	58.6	60.7	61.8	59.1
CP3055	**53.7**	**52.4**	**54.5**	**59.0**	**53.1**	**56.4**	**56.3**	**57.0**	**58.3**	**55.6**
CP3099A	55.1	47.5	51.3	56.6	56.6	55.5	55.4	55.3	57.3	54.5
CP3119A	51.4	51.8	53.7	57.8	50.3	55.3	53.8	56.8	58.9	54.4
CP3188	55.4	54.6	55.9	59.3	54.7	54.6	55.3	58.9	59.4	56.5
CP3322	**56.3**	**55.0**	**57.3**	**59.4**	**55.7**	**56.8**	**58.2**	**57.8**	**57.7**	**57.1**
CP3360AX	**--**	**57.6**	**59.4**	**62.2**	**58.9**	**59.7**	**58.0**	**62.1**	**62.4**	**60.0**
CP3915	58.8	58.9	59.9	61.7	58.6	58.9	58.4	61.4	62.2	59.8
Driver	59.6	57.1	59.4	61.9	57.7	59.0	59.4	61.7	62.6	59.8
Faller	58.4	56.9	58.7	61.7	58.4	55.6	57.6	61.0	61.1	58.8
Glenn	61.5	60.5	61.1	62.7	59.8	61.7	59.5	62.5	64.2	61.5
Lanning	54.6	55.0	56.8	60.6	56.0	57.2	57.8	59.6	59.2	57.4
LCS Ascent	57.7	57.5	58.6	61.8	55.9	59.7	58.2	61.5	62.9	59.3
LCS Boom	**58.9**	**59.1**	**60.4**	**61.8**	**56.9**	**61.1**	**59.0**	**62.2**	**62.9**	**60.3**
LCS Buster	56.2	54.6	56.6	60.1	54.8	55.2	57.0	58.7	59.7	57.0
LCS Cannon	58.8	58.7	59.8	61.9	57.6	60.4	58.3	61.9	62.7	60.0
LCS Dual	56.7	57.8	57.8	61.6	57.0	56.9	57.7	60.2	62.6	58.7

Table 5. Test weight of hard red spring wheat varieties grown at 9 locations in North Dakota, 2024. (Continued)

Variety	Carrington	Casselton	Forman	Langdon	Prosper	Dickinson	Hettinger	Mandan	Minot	State Avg.
	---------- (lb/bu) ----------									
LCS Hammer AX	56.8	54.5	56.6	61.1	56.2	58.9	57.7	60.9	61.5	58.2
LCS Trigger	58.3	58.3	59.6	61.8	58.4	56.2	57.8	61.0	60.4	59.1
MN- Rothsay	57.9	56.7	58.9	61.1	58.5	57.6	58.0	60.0	62.6	59.0
MN-Torgy	57.9	58.2	59.1	61.7	59.0	59.8	58.7	60.9	63.2	59.8
MS Charger	56.6	56.6	58.3	60.5	55.9	55.8	57.6	60.3	61.8	58.2
MS Cobra	57.7	57.1	58.8	61.2	57.6	59.2	58.9	60.2	62.2	59.2
MS Nova	**57.7**	**57.3**	**58.2**	**60.3**	**56.2**	**58.9**	**58.8**	**60.3**	**62.4**	**58.9**
MS Ranchero	51.3	56.0	58.2	60.8	56.7	58.2	57.0	60.3	60.7	57.7
MT Carlson	**56.5**	**53.3**	**54.8**	**61.0**	**56.4**	**57.5**	**57.2**	**60.7**	**60.7**	**57.6**
MT Dutton	**53.4**	**55.1**	**56.6**	**60.0**	**55.1**	**56.8**	**56.7**	**59.5**	**60.7**	**57.1**
MT Ubet	**56.1**	**54.4**	**56.4**	**60.8**	**55.4**	**56.4**	**57.2**	**60.0**	**60.5**	**57.5**
ND Frohberg	58.9	57.2	58.6	61.6	58.8	60.0	58.0	60.9	60.6	59.4
ND Heron	58.9	58.1	59.5	62.4	58.3	59.5	59.5	62.2	63.1	60.2
ND Stampede	**58.2**	**55.9**	**58.0**	**61.2**	**56.3**	**56.6**	**55.8**	**59.8**	**60.7**	**58.0**
ND Thresher	**57.8**	**56.6**	**58.9**	**60.4**	**58.1**	**54.8**	**56.2**	**58.7**	**59.4**	**57.9**
ND VitPro	60.1	59.1	60.4	62.8	59.8	59.7	58.6	61.9	62.8	60.6
PFS Buns	54.7	53.0	55.2	59.4	53.7	51.9	55.7	58.3	58.6	55.6
PFS Rolls	**56.7**	**54.6**	**58.0**	**61.4**	**58.3**	**58.1**	**58.1**	**59.5**	**62.1**	**58.5**
Rocker	**57.4**	**54.6**	**56.0**	**60.3**	**56.0**	**59.3**	**57.8**	**61.0**	**61.7**	**58.2**
Shelly	57.5	56.6	58.2	61.3	59.1	58.9	58.1	60.7	62.4	59.2
SY 611CL2	58.9	57.9	58.9	61.6	57.1	59.3	59.3	60.7	62.1	59.5
SY Ingmar	59.1	57.9	59.6	61.2	58.8	59.1	58.8	60.6	60.5	59.5
SY Longmire	58.2	55.6	58.1	60.8	58.0	59.6	59.4	61.0	61.7	59.2
SY Valda	58.8	56.9	58.9	60.7	57.3	57.7	58.4	60.5	61.2	58.9
TCG-Badlands	**58.9**	**56.3**	**58.0**	**60.5**	**56.7**	**58.6**	**58.4**	**60.2**	**61.6**	**58.8**
TCG-Teddy	**56.4**	**56.0**	**57.1**	**60.3**	**56.9**	**59.1**	**58.8**	**60.1**	**60.4**	**58.3**
TCG-Wildcat	59.1	56.8	57.9	61.5	58.7	58.9	58.2	60.4	61.8	59.3
WB9590	55.7	55.8	57.4	60.7	56.8	57.7	57.9	60.3	61.3	58.2
WB9719	59.9	57.2	59.6	63.2	58.6	61.4	58.4	62.6	63.1	60.4
Mean	57.5	56.4	58.1	61.0	57.1	57.9	57.8	60.4	61.3	58.6
CV%	1.8	--	0.6	0.7	1.3	1.3	1.3	0.8	1.0	1.6
LSD 0.10	1.2	--	0.5	0.5	0.7	0.7	0.7	0.5	0.8	0.7

Table 6. Quality data from 2021-2023. The Wheat Quality Index (WQI) is a weighted average developed to summarize the relative milling and baking quality of lines in the trial. Data from across years are from 2021-2023 for all varieties which were tested in a minimum of two years (and 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	
MS Cobra	61.4	85.3	15.0	65.9	68.2	12.6	1053.2	1
Glenn	63.4	85.6	15.2	65.0	66.4	17.0	971.1	2
TCG Heartland	62.2	74.6	15.5	64.2	67.8	17.5	956.1	3
CP3915	61.8	79.1	15.1	63.7	69.3	16.4	969.8	4
ND Stampede	61.2	77.9	14.7	66.5	65.6	15.3	977.3	5
Bolles	60.6	79.8	16.3	65.0	65.2	21.7	935.5	6
CP3530	60.7	75.1	14.8	64.6	68.8	13.3	995.9	7
ND Frohberg	61.9	74.1	14.7	66.5	66.4	16.4	937.9	8
SY Longmire	61.3	73.4	14.8	64.4	67.6	15.3	988.1	9
ND VitPro	62.6	86.4	15.4	65.2	67.4	11.7	967.2	10
CAG Recoil	60.1	79.8	14.4	63.4	68.2	24.1	942.7	11
CAG Reckless	61.5	76.7	14.8	65.0	66.0	15.9	966.1	12
TCG Teddy	60.5	71.2	15.0	64.0	66.7	25.9	929.4	13
Boost	60.6	69.4	14.9	65.5	67.4	11.5	966.8	14
LCS Cannon	62.7	59.6	14.6	63.2	69.1	15.6	952.4	15
Lanning	60.2	81.5	15.2	63.4	67.6	13.5	984.3	16
SY Ingmar	61.7	81.0	15.0	63.1	67.8	15.4	961.6	17
TCG Spitfire	60.5	71.7	14.1	64.7	66.5	14.8	980.2	18
SY611CL2	62.0	77.9	14.7	68.6	65.7	10.6	949.5	19
WB 9590	61.5	77.6	15.1	64.0	66.9	15.7	934.5	20
AP Smith	60.8	73.9	14.8	62.9	66.9	16.5	969.4	21
ND Thresher	59.6	77.9	15.2	65.1	67.4	11.7	942.0	22
MS Ranchero	60.0	81.1	14.2	66.3	65.9	13.9	932.1	23
ND Heron	62.7	77.5	15.4	72.4	64.6	9.2	937.0	24
Ascend-SD	61.3	87.9	14.7	64.1	66.5	12.0	969.0	25
LCS Boom	62.3	57.5	14.8	63.4	68.4	12.8	950.4	26

[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 US No. 1.

[2]Vitreous kernels - Percentage seeds having a vitreous-colored endosperm, a high percentage is desirable. US No. 1 DNS requires > 75% vitreous kernels.

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

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

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

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

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

[8]Standardized means were used to calculate the Wheat Quality Index (WQI). The WQI is a weighted index calculated as: Test Weight (5%); Vitreous kernel (5%); Wheat Protein (10%); Flour Extraction (10%); Farinograph Absorption (23.3%); Farinograph Stability (23.3%) and Loaf Volume (23.3%). Adjusted means across locations were calculated for each trait using a mixed model. These means were standardized (mean=0 and standard deviation=1) to remove the effect of scale, which varies between traits.

Table 6. Quality data from 2021-2023. The Wheat Quality Index (WQI) is a weighted average developed to summarize the relative milling and baking quality of lines in the trial. Data from across years are from 2021-2023 for all varieties which were tested in a minimum of two years (and four locations per year) across North Dakota. (Continued)

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	
AP Murdock	60.3	65.7	14.5	63.9	67.2	15.1	951.6	27
LCS Ascent	62.1	48.7	14.1	63.5	67.7	16.3	939.5	28
WB 9719	63.7	63.5	14.0	63.3	67.0	15.1	947.9	29
TCG Wildcat	61.9	77.2	14.8	64.1	67.6	10.4	936.2	30
MN Rothsay	61.3	66.0	14.6	61.9	68.2	15.9	948.2	31
LCS Dual	61.9	81.1	14.0	64.2	67.9	12.0	919.0	32
Faller	60.7	70.5	14.2	64.6	68.8	11.8	904.3	33
MN Torgy	61.7	74.3	14.8	62.3	67.1	15.0	919.6	34
MS Charger	61.4	61.0	13.4	64.6	67.1	12.5	928.4	35
Brawn-SD	62.5	67.0	13.9	61.7	67.7	17.9	913.5	36
LCS HammerAX	61.1	65.9	14.4	62.8	67.5	13.5	929.0	37
Shelly	61.6	66.4	14.1	61.4	69.1	16.8	906.6	38
CP3322	60.1	83.9	13.5	62.9	67.7	11.4	950.4	39
AP Gunsmoke CL2	60.6	72.7	15.2	61.5	66.5	14.3	916.7	40
SY Valda	61.4	79.8	14.4	63.4	66.8	9.2	898.8	41
Driver	62.0	69.7	14.3	60.8	68.1	12.3	907.2	42
CP3188	59.5	62.9	13.4	60.4	68.5	17.9	898.9	43
LCS Trigger	60.8	75.6	13.0	64.4	68.1	11.3	837.9	44
CAG Justify	58.8	73.7	13.8	62.8	68.4	10.1	879.4	45
PFS Buns	58.2	67.5	14.0	60.8	65.5	16.4	912.7	46
CP3099A	58.5	80.7	12.6	61.7	66.3	15.6	896.8	47
LCS Buster	59.0	56.5	12.8	57.9	69.0	18.4	849.1	48

[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 US No. 1.

[2]Vitreous kernels - Percentage seeds having a vitreous-colored endosperm, a high percentage is desirable. US No. 1 DNS requires > 75% vitreous kernels.

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

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

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

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

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

[8]Standardized means were used to calculate the Wheat Quality Index (WQI). The WQI is a weighted index calculated as: Test Weight (5%); Vitreous kernel (5%); Wheat Protein (10%); Flour Extraction (10%); Farinograph Absorption (23.3%); Farinograph Stability (23.3%) and Loaf Volume (23.3%). Adjusted means across locations were calculated for each trait using a mixed model. These means were standardized (mean=0 and standard deviation=1) to remove the effect of scale, which varies between traits.

Table 7. Quality Data from 2023 from 4 locations across North Dakota. The Wheat Quality Index (WQI) is a weighted average developed to summarize relative milling and baking quality of the varieties tested. Data below are from all varieties tested in 2023 at Hettinger, Williston, Forman, and Casselton, ND. These data are always presented from the previous year due to the amount of time it takes to process and test samples.

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	
ND Frohberg	60.9	61.0	14.2	66.5	67.9	18.9	1004.1	1
Glenn	62.7	77.5	14.5	65.1	67.7	19.0	998.2	2
ND VitPro	61.6	80.2	14.7	64.7	69.5	13.7	1002.5	3
ND Heron	61.3	64.8	14.8	72.5	66.8	11.8	1015.8	4
MS Cobra	60.3	76.2	14.8	65.9	67.9	11.8	1032.9	5
Bolles	59.9	71.4	15.3	65.5	66.5	21.3	949.7	6
Boost	60.0	61.0	14.6	65.7	68.1	11.2	1004.1	7
ND Thresher	59.1	66.6	14.7	64.0	70.4	12.9	997.7	8
TCG Spitfire	60.0	60.7	13.6	64.7	67.1	18.9	986.5	9
ND Stampede	59.9	71.2	14.1	66.3	65.6	14.7	980.7	10
SY611CL2	61.4	62.8	14.2	68.7	66.6	11.1	957.7	11
AP Murdock	59.2	57.4	14.5	64.8	67.6	15.1	972.9	12
TCG Teddy	59.7	57.4	14.5	64.1	67.4	28.2	919.4	13
Ascend-SD	60.8	80.4	14.4	64.9	67.4	11.4	973.7	14
SY Longmire	60.7	58.0	14.5	64.2	67.7	14.0	968.9	15
WB 9590	60.4	67.3	14.5	64.2	67.6	15.8	947.5	16
LCS Cannon	61.9	41.9	14.4	64.2	69.7	12.1	935.3	17
SY Ingmar	61.0	64.6	14.4	63.7	68.5	14.1	943.3	18
CP3530	59.9	64.1	14.1	64.1	68.6	11.0	976.9	19
LCS Boom	61.4	42.0	14.3	63.5	69.2	12.7	946.5	20
LCS Dual	60.9	68.2	13.7	65.0	68.4	13.2	925.8	21
MS Ranchero	59.2	68.5	13.7	66.6	66.8	13.8	909.8	22

[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 US No. 1.

[2]Vitreous kernels - Percentage of seeds having a vitreous-colored endosperm, a high percentage is desirable. US No. 1 DNS requires > 75% vitreous kernels.

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

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

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

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

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

[8]Standardized means were used to calculate the Wheat Quality Index (WQI). The WQI is a weighted index calculated as: Test Weight (5%); Vitreous kernel (5%); Wheat Protein (10%); Flour Extraction (10%); Farinograph Absorption (23.3%); Farinograph Stability (23.3%) and Loaf Volume (23.3%). Adjusted means across locations were calculated for each trait using a mixed model. These means were standardized (mean=0 and standard deviation=1) to remove the effect of scale, which varies between traits.

Table 7. Quality Data from 2023 from 4 locations across North Dakota. The Wheat Quality Index (WQI) is a weighted average developed to summarize relative milling and baking quality of the varieties tested. Data below are from all varieties tested in 2023 at Hettinger, Williston, Forman, and Casselton, ND. These data are always presented from the previous year due to the amount of time it takes to process and test samples. (Continued)

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	
CP3915	60.9	65.1	14.6	63.7	69.4	14.0	887.4	23
WB 9719	62.9	48.8	13.6	63.5	67.7	15.4	943.3	24
Lanning	59.7	68.0	14.5	62.8	67.4	12.3	962.5	25
TCG Wildcat	61.2	66.6	14.5	64.2	67.8	11.3	908.2	26
CAG Reckless	60.3	60.7	14.1	64.0	67.2	13.5	927.4	27
Brawn-SD	61.8	54.6	13.6	61.9	67.8	22.1	884.2	28
Shelly	60.6	43.5	13.5	61.3	69.7	19.9	909.8	29
SY Valda	60.5	61.2	13.7	63.3	68.5	12.2	933.9	30
MN Rothsay	60.1	43.5	14.2	61.8	68.8	18.0	908.2	31
LCS Ascent	61.1	29.0	13.7	63.7	68.5	15.2	898.6	32
LCS Trigger	60.3	58.0	12.8	65.0	69.6	11.0	890.6	33
CP3322	59.3	71.8	13.0	63.0	68.5	11.0	946.5	34
MS Charger	60.5	44.9	13.1	64.4	67.9	11.5	914.6	35
LCS HammerAX	59.9	47.6	14.0	62.9	68.1	12.6	906.6	36
AP Smith	59.9	59.8	14.3	62.7	67.7	12.7	900.2	37
CAG Justify	58.1	58.0	13.3	63.1	70.1	10.8	908.2	38
AP Gunsmoke CL2	59.9	60.1	14.6	61.6	66.6	13.0	895.4	39
MN Torgy	60.5	60.5	14.3	62.0	67.3	12.4	877.8	40
PFS Buns	57.6	48.7	13.5	61.2	66.3	19.7	908.2	41
Driver	61.1	53.7	13.9	61.1	68.9	11.4	866.6	42
CP3188	58.2	50.1	13.1	60.9	68.9	13.9	884.2	43
CP3099A	57.6	72.8	12.0	62.3	66.4	16.3	890.6	44
LCS Buster	58.7	41.7	12.6	58.5	69.4	24.2	841.0	45

[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 US No. 1.

[2]Vitreous kernels - Percentage of seeds having a vitreous-colored endosperm, a high percentage is desirable. US No. 1 DNS requires > 75% vitreous kernels.

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

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

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

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

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

[8]Standardized means were used to calculate the Wheat Quality Index (WQI). The WQI is a weighted index calculated as: Test Weight (5%); Vitreous kernel (5%); Wheat Protein (10%); Flour Extraction (10%); Farinograph Absorption (23.3%); Farinograph Stability (23.3%) and Loaf Volume (23.3%). Adjusted means across locations were calculated for each trait using a mixed model. These means were standardized (mean=0 and standard deviation=1) to remove the effect of scale, which varies between traits.

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

2.5M-12-24