

A1067-23 (November 2023)

North Dakota Durum Wheat

Variety Trial Results for 2023 and Selection Guide

Clair Keene, Elias Elias, Andrew Friskop, Tim Friesen, Zhaohui Liu, Shaobin Zhong, Upinder Gill and Frank Manthey (NDSU Main Station); Kristin Simons (Carrington Research Extension Center); Glenn Martin (Dickinson Research Extension Center); Bryan Hanson (Langdon Research Extension Center); John Rickertsen (Hettinger Research Extension Center); Leandro Bortolon, Austin Kraklau and Jayden Hansen (North Central Research Extension Center, Minot); Justin Jacobs (Williston Research Extension Center)

Durum was planted on 905,000 acres in North Dakota in 2023, up 14% from 2022. The average yield was 37 bushels per acre (bu/a), down slightly from 40 bu/a last year. The 2023 growing season saw highly variable precipitation across the state. Deep snowpack resulted in good spring moisture across most of North Dakota. However, portions of the North Central and Northeast regions then experienced extreme drought conditions mid-summer while most of the Southwest had its highest growing season rainfall total in four years. The most commonly grown varieties in 2023 and the percent of the acreage they occupied were ND Riveland (52.7%), Joppa (12.5%), Divide (7.4%), AAC Cabri (5.1%), VT Peak (2.9%), TCG Webster (2.2%), and Carpio (2.1%).

Durum varieties are tested each year at multiple sites throughout North Dakota. The relative performance of these varieties is presented in table form. Variety performance data are used to provide recommendations to producers. Some varieties may not be included in the tables due to insufficient testing or lack of seed availability, or they offer no yield or disease advantage over similar varieties. Yield is reported at 13.5% moisture, while protein content is reported at 12% moisture.

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 significant or if they might be due to error inherent in the experimental process.

The LSD (least significant difference) numbers beneath the columns in tables are derived from these statistical analyses and only apply 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 occurs between those two varieties under those growing conditions.

The abbreviation NS indicates no significant difference for that trait among any of the varieties at the 95% or 90% level of confidence. The CV (coefficient of variation) is a measure of variability in the trial and is expressed as a percentage. Large CVs mean a large amount of variation that could not be attributed to differences in the varieties.

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, the order of the data is not rearranged and NDSU is given credit for conducting the trial. Additional data from county sites are available from each Research Extension Center at <https://vt.ag.ndsu.edu/>. Use data from multiple locations and years when selecting a variety.

List of Tables

Table 1. Descriptions and agronomic traits of durum wheat varieties grown in North Dakota, 2023.

Table 2. Yield of durum wheat varieties at six Research Extension Centers in North Dakota, 2021-2023.

Table 3. Test weight and protein of durum wheat varieties at six Research Extension Centers in North Dakota, 2023.

Table 4. Durum wheat variety quality descriptions, milling and processing data averaged for five years (2018-2022) from drill strips (32 locations/years).

Table 5. Durum wheat variety quality descriptions, milling and processing data for 2022 at all locations from drill strips.

Table 1. Descriptions and agronomic traits of durum wheat varieties grown in North Dakota, 2023.

	Agent or Origin ¹	Year Released	Height (inches) ²	Straw Strength ³	Days to Heading ⁴	Reaction to Disease ⁵				
						Stem Rust	Leaf Rust	Foliar Disease	Bact. Leaf Streak	Head Scab
AAC Stronghold ⁷	Can.	2016	28	3	54	NA	NA	NA	NA	NA
Alkabo	ND	2005	31	2	54	1	1	5	7	6
Carpio	ND	2012	30	6	56	1	1	5	6	5
CDC Defy	Can.	2019	31	3	54	NA	NA	NA	NA	NA
CDC Vantta	Can.	2021	27	3	60	NA	NA	NA	NA	NA
Divide	ND	2005	32	4	56	1	1	5	7	5
Joppa	ND	2013	30	5	55	1	1	5	7	5
Maier	ND	1998	29	4	55	1	1	5	NA	8
Mountrail	ND	1998	31	5	55	1	1	5	7	8
MT Blackbeard⁶	MT	2022	32	4	58	1	1	5	NA	5
MT Raska	MT	2022	24	2	54	1	1	5	NA	5
ND Grano ⁶	ND	2017	31	5	56	1	1	8	7	6
ND Riveland ⁶	ND	2017	32	4	56	1	1	5	6	5
ND Stanley ⁶	ND	2021	78	3	56	1	1	5	6	5
Strongfield ⁶	Can.	2004	30	5	55	1	1	6	NA	8
Tioga	ND	2010	34	5	57	1	1	5	7	6

¹Refers to agent or developer: Can. = Agriculture Canada, ND = North Dakota State University. MT = Montana State University.

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

²Plant height was obtained from the average of four locations in 2023.

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

⁴Days to Heading = the number of days from planting to head emergence from the boot. Averaged from three locations in 2023.

⁵Disease reaction scores from 1-9, with 1 = resistant and 9 = very susceptible. NA = Not adequately tested. Foliar Disease = reaction to tan spot and septoria leaf spot complex.

⁶Low cadmium accumulating variety.

⁷Solid stem variety to reduce wheat stem sawfly damage.

Table 2. Yield of durum wheat varieties at six Research Extension Centers in North Dakota, 2021-2023

Variety	<u>Carrington</u>		<u>Langdon</u>		<u>Dickinson</u>		<u>Hettinger</u>		<u>Minot</u>		<u>Williston¹</u>		<u>Average</u>	
	2023	3 Yr.	2023	3 Yr.	2023	3 Yr.	2023	3 Yr.	2023	3 Yr.	2023	3 Yr.	2023	3 Yr.
	------(bu/a)-----													
AAC Stronghold	50.3	50.3	--	--	--	--	76.9	56.4	32.0	--	34.4	--	48.4	--
Alkabo	49.0	47.9	63.4	63.3	56.9	36.7	76.9	58.3	43.1	43.5	32.8	27.0	53.7	46.1
Carpio	48.2	50.9	66.5	65.9	57.1	35.5	77.6	57.6	35.5	43.6	27.4	27.7	52.0	46.9
CDC Defy	56.9	54.9	--	--	--	--	83.6	63.0	35.0	57.0	33.0	--	52.1	--
CDC Vantta	42.5	--	--	--	--	--	82.2	--	29.3	39.9	26.6	--	45.1	--
Divide	53.9	49.7	63.1	62.9	51.8	34.1	75.2	55.8	25.8	35.7	23.5	22.4	48.9	43.4
Joppa	45.5	50.2	67.6	65.8	49.2	34.0	80.1	60.4	29.0	38.9	26.9	24.1	49.7	45.6
Maier	44.2	46.4	62.3	56.8	48.1	32.2	67.8	56.5	24.9	32.6	24.9	23.0	45.4	41.2
Mountrail	48.0	53.4	73.5	69.5	58.2	36.8	77.4	58.9	35.2	41.4	27.9	26.5	53.4	47.8
MT Blackbeard	--	--	--	--	45.4	--	81.0	--	31.7	--	29.1	--	46.8	--
MT Raska	--	--	--	--	50.5	--	68.9	--	25.6	--	25.1	--	42.5	--
ND Grano	51.7	50.6	66.6	66.8	57.6	35.8	76.1	57.5	30.7	42.4	28.1	25.9	51.8	46.5
ND Riveland	54.6	50.9	64.2	63.4	48.2	33.9	75.2	58.2	37.7	43.8	26.7	26.6	51.1	46.1
ND Stanley	50.2	50.0	67.9	67.8	54.3	36.0	74.3	59.4	40.6	45.1	28.6	24.0	52.7	47.0
Strongfield	50.2	53.5	64.4	60.4	47.4	31.2	74.5	56.4	32.3	40.1	31.4	25.8	50.0	44.6
Tioga	55.2	51.7	63.7	64.0	51.5	34.8	75.4	55.6	38.7	44.5	--	--	56.9	50.1
Mean	52.8	50.8	65.8	64.2	52.9	34.6	78.3	59.0	32.9	42.2	28.8	27.4	50.0	45.9
CV %	8.7	--	5.4	--	11.1	--	4.7	--	19.1	--	9.8	--	7.2	--
LSD 0.05	4.1	--	6.3	--	6.9	--	4.4	--	10.4	--	5.8	--	4.2	--
LSD 0.10	3.4	--	--	--	5.3	--	3.4	--	8.6	--	3.9	--	3.5	--

¹Williston location was damaged by hail. Loss was estimated at 40% across the entire trial.

Table 3. Test weight and protein of durum wheat varieties at six Research Extension Centers in North Dakota, 2023.

Variety	<u>Carrington</u>		<u>Langdon</u>		<u>Dickinson</u>		<u>Hettinger</u>		<u>Minot</u>		<u>Williston</u>		<u>Average</u>	
	Test		Test		Test		Test		Test		Test		Test	
	Wt.	Protein	Wt.	Protein	Wt.	Protein	Wt.	Protein	Wt.	Protein	Wt.	Protein	Wt.	Protein
	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%
AAC Stronghold	60.2	14.4	--	--	--	--	58.7	14.1	58.6	15.8	62.0	17.2	--	--
Alkabo	60.6	13.6	62.0	13.1	60.3	12.3	58.2	12.8	59.1	13.8	61.8	16.3	60.3	13.7
Carpio	60.2	13.7	61.9	12.7	60.4	12.2	59.4	12.5	59.0	14.3	61.7	16.6	60.4	13.7
CDC Defy	61.6	12.9	--	--	--	--	59.5	13.3	59.9	14.6	61.5	16.9	--	--
CDC Vantta	58.6	14.3	--	--	--	--	58.3	12.8	57.1	15.3	61.7	16.5	--	--
Divide	60.3	13.3	61.3	12.6	60.3	12.3	58.9	12.9	57.7	15.5	60.6	16.5	59.8	13.8
Joppa	61.0	12.5	62.5	12.3	60.5	12.7	59.3	12.8	59.2	14.4	62.3	16.3	60.8	13.5
Maier	60.5	13.8	61.8	13.1	60.2	13.5	58.3	14.0	58.2	16.2	62.2	17.6	60.2	14.7
Mountrail	60.2	13.1	61.8	12.7	60.4	12.2	58.5	13.0	58.6	14.4	60.9	16.8	60.1	13.7
MT Blackbeard	--	--	--	--	60.3	12.9	59.1	13.1	56.2	14.5	61.7	16.8	--	--
MT Raska	--	--	--	--	60.8	13.6	58.9	13.7	58.0	15.9	62.1	17.0	--	--
ND Grano	60.9	13.2	62.1	13.1	61.0	12.2	59.5	12.8	58.9	14.3	61.8	16.8	60.7	13.7
ND Riveland	60.7	13.2	61.1	13.0	59.8	13.1	59.2	12.8	60.0	14.1	61.2	17.1	60.3	13.9
ND Stanley	61.2	13.4	62.7	13.2	60.9	13.1	58.9	13.3	60.6	15.2	62.3	16.8	61.1	14.2
Strongfield	60.1	14.1	61.3	13.9	60.1	14.0	58.5	14.2	58.5	15.2	61.1	17.3	59.9	14.8
Tioga	61.2	12.7	61.1	13.1	59.7	12.5	57.4	13.2	58.8	13.9	--	--	--	--
Mean	60.6	13.7	61.9	13.1	60.5	12.8	58.9	13.1	58.7	14.8	61.6	16.8	60.4	14.0
CV %	1.0	5.9	0.7	4.0	0.6	4.9	0.6	4.3	4.2	2.6	1.1	2.5	--	--
LSD 0.05	0.9	1.1	0.6	0.7	0.4	0.7	0.4	0.7	4.0	0.6	1.1	0.7	--	--
LSD 0.10	0.7	0.9	0.5	0.6	0.3	0.6	0.3	0.5	3.3	0.5	0.9	0.6	--	--

Table 4. Durum wheat variety quality descriptions, milling and processing data averaged for five years (2018-2022) from drill strips (32 locations/years).

Variety	Test Weight	Vitreous Kernels	Large Kernels	Falling Number	Wheat Protein ¹	Gluten Index ²	Pasta Color ³	Spaghetti Firmness ⁴	Overall Quality ⁵
	(lb/bu)	(%)	(%)	(sec)	(%)		(1-12)	(g-cm)	
Alkabo	61.5	85	58	441	14.2	48	8.0	3.8	good
Carpio	61.8	81	68	521	14.3	91	8.0	4.0	good
Divide	61.2	87	58	516	14.4	74	7.6	3.9	good
Joppa	61.7	89	53	504	14.2	82	8.4	3.8	good
Maier	61.0	91	54	477	15.4	52	7.8	4.0	good
Mountrail	60.7	91	49	485	14.7	25	7.3	3.6	fair
ND Grano	62.0	89	59	509	14.7	65	8.2	4.0	good
ND Riveland	61.5	92	63	529	14.5	81	7.9	3.9	good
ND Stanley	62.3	86	65	524	14.8	72	8.0	3.8	good
Strongfield	61.0	91	62	522	15.4	67	7.6	4.1	good
Tioga	61.2	88	68	441	14.7	72	7.3	4.1	good
Average	61.4	88	60	497	14.7	66	7.8	3.9	

For all numbered footnotes, refer to bottom of Table 5.

Table 5. Durum wheat variety quality descriptions, milling and processing data for 2022 at all locations from drill strips.

Variety	Test Weight	Vitreous Kernels	Large Kernels	Falling Number	Wheat Protein ¹	Gluten Index ²	Pasta Color ³	Spaghetti Firmness ⁴	Overall Quality ⁵
	(lb/bu)	(%)	(%)	(sec)	(%)		(1-12)	(g-cm)	
Alkabo	61.6	87	49	506	14.0	58	8.4	3.9	good
Carpio	62.5	84	64	521	14.3	87	8.3	4.1	good
Divide	61.3	89	49	527	14.2	83	7.8	4.2	good
Joppa	62.1	91	45	521	13.7	93	8.5	3.7	good
Maier	61.3	93	47	510	15.0	59	8.2	4.1	good
Mountrail	61.1	94	44	538	14.1	39	7.8	3.7	fair
ND Grano	62.6	94	51	557	14.1	75	8.3	4.3	good
ND Riveland	61.9	93	56	567	13.8	91	8.2	4.1	good
ND Stanley	62.7	88	60	567	14.1	82	8.3	4.1	good
Strongfield	61.8	94	53	565	14.2	77	8.3	4.1	good
Tioga	61.5	92	62	447	14.3	80	7.7	4.2	good
Average	61.9	91	53	530	14.2	75	8.2	4.0	

¹Wheat protein is reported on a 12% moisture basis.

²Gluten index is unitless. Numbers less than 15 = very weak and greater than 80 = very strong gluten proteins.

³Pasta Color Score: Higher number indicates better color, with 8.5+ typically considered good.

⁴Work required to cut through a strand of spaghetti.

⁵Overall Quality is determined based on agronomic, milling and spaghetti processing performance.

NDSU does not endorse commercial products or companies even though reference may be made to tradenames, trademarks or service names.

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

NDSU encourages you to use and share this content, but please do so under the conditions of our Creative Commons license. You may copy, distribute, transmit and adapt this work as long as you give full attribution, don't use the work for commercial purposes and share your resulting work similarly. For more information, visit www.ag.ndsu.edu/agcomm/creative-commons.

County commissions, North Dakota State University and U.S. Department of Agriculture cooperating. NDSU does not discriminate in its programs and activities on the basis of age, color, gender expression/identity, genetic information, marital status, national origin, participation in lawful off-campus activity, physical or mental disability, pregnancy, public assistance status, race, religion, sex, sexual orientation, spousal relationship to current employee, or veteran status, as applicable. Direct inquiries to Vice Provost for Title IX/ADA Coordinator, Old Main 201, NDSU Main Campus, 701-231-7708, ndsuoaa.ndsu.edu. This publication will be made available in alternative formats for people with disabilities upon request, 701-231-7881.