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North Dakota Durum Wheat

Variety Trial Results for 2021 and Selection Guide

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Durum was planted on 880,000 acres in North Dakota in 2021, down 3.4% from 2020. The average yield was 24 bushels per acre (bu/a), down from 39 last year. Lower yields were the result of the widespread and severe drought that persisted throughout the growing season across most of the state. The most commonly grown varieties in 2021 and the percent of the acreage they occupied were Joppa (27%), ND Riveland (23%), Divide (10%), Alkabo (6%), VT Peak (5%), Carpio (5%) and ND Grano (4%).

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 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 is a measure of variability in the trial. The CV stands for coefficient of variation 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 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>. Use data from multiple locations and years when selecting a variety.

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Table 1. Descriptions and agronomic traits of durum wheat varieties grown in North Dakota, 2021.

	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
AC Commander	Can.	2002	19	5	62	1	1	6	NA	NA
Alkabo	ND	2005	21	2	63	1	1	5	7	6
Alzada	WB	2004	20	6	62	1	1	8	NA	9
Ben	ND	1996	22	4	63	1	1	4	7	8
Carpio	ND	2012	22	5	64	1	1	5	6	5
CDC Verona	Can.	2010	22	5	64	1	1	4	NA	8
Divide	ND	2005	22	5	65	1	1	5	7	5
Grenora	ND	2005	22	5	64	1	1	5	7	6
Joppa	ND	2013	22	5	64	1	1	5	7	5
Lebsock	ND	1999	21	3	63	1	1	5	7	6
Maier	ND	1998	20	5	63	1	1	5	NA	8
Mountrail	ND	1998	20	5	63	1	1	5	7	8
ND Grano ⁶	ND	2017	20	5	64	1	1	8	7	6
ND Riveland ⁶	ND	2017	23	4	63	1	1	4	7	5
ND Stanley⁶	ND	2021	21	4	64	1	1	5	NA	5
Pierce	ND	2001	21	5	63	1	1	6	7	8
Rugby	ND	1973	22	5	63	1	1	4	NA	8
Strongfield ⁶	Can.	2004	23	6	64	1	1	6	NA	8
Tioga	ND	2010	23	4	63	1	1	5	7	6
VT Peak	Viterra	2010	22	6	64	1	NA	NA	NA	NA

¹Refers to agent or developer: Can. = Agriculture Canada, WB = Westbred, ND = North Dakota 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 six locations in 2021.

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 six locations in 2021.

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.

Table 2. Yield of durum wheat varieties at six Research Extension Centers in North Dakota, 2019-2021.

Variety	<u>Carrington</u>		<u>Langdon</u>		<u>Dickinson</u>		<u>Hettinger</u>		<u>Minot</u>		<u>Williston</u>		<u>Average</u>	
	2021	3 Yr.	2021	3 Yr.	2021	3 Yr.	2021	3 Yr.	2021	2 Yr. ¹	2021	3 Yr.	2021 ²	3 Yr. ³
	------(bu/a)-----													
AC Commander	49.3	39.1	42.3	55.2	12.0	34.9	28.4	36.4	9.3	56.6	18.8	37.2	30.2	43.2
Alkabo	47.0	38.7	48.6	64.9	13.9	33.4	25.7	40.5	15.1	58.3	15.5	35.6	30.1	45.2
Alzada	50.4	34.9	39.4	48.8	13.4	33.0	29.5	31.5	12.8	46.1	16.0	31.8	29.8	37.7
Ben	51.1	38.8	45.5	62.5	11.1	33.3	25.5	35.4	12.5	59.3	14.0	34.6	29.4	44.0
Carpio	46.8	45.4	50.0	65.6	12.9	32.1	23.3	35.8	13.6	65.1	18.5	35.9	30.3	46.6
CDC Verona	50.6	44.1	51.7	60.1	8.0	33.1	22.9	38.8	19.4	55.2	15.1	37.2	29.7	44.7
Divide	47.1	41.0	50.7	65.7	12.4	33.4	24.0	38.1	12.2	62.3	13.4	36.2	29.5	46.1
Grenora	52.0	42.1	49.3	67.6	14.8	35.3	27.5	39.4	18.1	59.9	17.7	38.7	32.3	47.2
Joppa	53.3	42.4	43.5	64.8	11.5	34.7	25.8	37.9	14.7	66.8	15.7	34.8	30.0	46.9
Lebsock	45.4	38.7	45.1	63.3	16.6	36.2	29.2	38.1	16.1	62.9	13.8	34.0	30.0	45.5
Maier	43.9	36.1	40.0	56.8	13.5	32.1	30.4	37.1	9.5	58.9	13.6	34.1	28.3	42.5
Mountrail	56.0	41.9	48.7	62.3	11.4	34.8	26.6	39.1	10.5	68.0	15.9	36.5	31.7	47.1
ND Grano	47.6	41.8	49.8	65.0	11.3	34.6	25.2	39.3	13.3	68.1	15.3	35.2	29.8	47.3
ND Riveland	50.6	48.5	45.2	65.3	15.3	33.1	30.3	41.9	15.9	61.6	15.5	37.8	31.4	48.0
ND Stanley	53.9	43.8	50.0	65.8	13.8	35.5	30.1	41.2	10.8	68.8	13.6	--	32.3	49.1
Pierce	42.6	39.0	44.9	63.3	13.3	32.8	28.6	39.9	10.6	60.7	13.0	33.6	28.5	44.9
Rugby	53.4	43.9	40.7	55.3	12.7	31.4	25.5	36.1	11.2	56.7	13.1	35.0	29.1	43.1
Strongfield	55.0	43.3	45.7	57.0	9.9	32.0	25.7	37.9	12.3	59.2	15.4	34.8	30.3	44.0
Tioga	50.1	41.7	47.6	64.6	15.3	35.0	27.9	37.6	16.2	63.5	15.9	35.4	31.4	46.3
VT Peak	53.8	41.9	48.7	67.0	11.6	33.3	26.7	41.1	16.6	64.8	16.1	35.9	31.4	47.3
Mean	51.3	41.4	48.1	62.0	12.7	33.7	27.6	38.7	13.7	61.1	15.2	35.5	30.3	45.3
CV %	13.7	--	7.1	--	19.0	--	13.3	--	50.4	--	19.7	--	9.6	5.9
LSD 0.05	NS	--	3.1	--	3.4	--	4.3	--	NS	--	4.8	--	3.7	3.1
LSD 0.10	NS	--	2.6	--	2.8	--	3.3	--	NS	--	4.1	--	3.1	2.6

¹Two-year data includes 2019 and 2020.; 2021 data not included due to low yields and high variability caused by drought conditions.

²2021 state-wide average does not include Minot data.

³Averages calculated with three-year averages from all sites except Minot, for which two-year averages were used.

Table 3. Test weight and protein of durum wheat varieties at six Research Extension Centers in North Dakota, 2021.

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 ¹
	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%
AC Commander	63.8	16.4	58.7	15.2	58.6	18.8	57.7	16.6	58.9	17.2	61.4	19.8	59.9	16.4
Alkabo	64.6	15.6	59.5	14.7	59.3	17.1	58.1	16.1	59.9	14.8	61.2	19.0	60.4	15.3
Alzada	64.0	16.6	57.3	15.2	58.9	16.5	56.3	15.0	58.8	15.6	61.4	18.6	59.5	15.6
Ben	64.3	16.9	59.8	15.8	58.7	18.7	57.4	16.8	59.5	16.5	60.9	20.0	60.1	16.5
Carpio	63.4	16.5	59.8	14.4	57.1	18.4	55.1	16.5	57.9	15.8	60.0	18.5	58.9	15.8
CDC Verona	64.3	16.3	59.4	15.7	58.1	20.0	54.8	17.4	59.8	16.0	60.2	20.4	59.4	16.4
Divide	63.6	16.6	59.7	15.2	58.5	18.4	56.2	16.9	59.8	15.7	59.9	19.7	59.6	16.1
Grenora	63.9	15.8	59.1	14.9	59.1	17.8	56.8	15.8	59.5	14.7	60.9	18.9	59.9	15.3
Joppa	64.6	15.7	60.2	14.3	59.3	17.3	57.1	15.9	59.0	15.6	61.2	18.8	60.2	15.4
Lebsock	64.7	16.3	60.0	15.3	59.3	16.9	56.8	15.6	60.1	15.5	61.0	19.2	60.3	15.7
Maier	64.5	17.8	59.4	16.0	58.6	19.4	57.1	16.6	58.3	17.4	61.0	20.1	59.8	17.0
Mountrail	63.0	15.9	59.3	14.6	58.1	18.2	56.8	16.2	58.6	16.0	60.2	19.4	59.3	15.7
ND Grano	64.5	16.6	61.0	14.9	58.6	18.5	58.0	16.5	60.5	15.9	60.0	19.8	60.4	16.0
ND Riveland	64.1	16.4	59.5	14.8	59.2	17.1	57.4	15.5	59.3	15.8	60.1	19.1	59.9	15.6
ND Stanley	63.6	16.3	60.4	15.2	60.0	18.2	57.1	16.3	60.1	16.4	61.3	19.4	60.4	16.1
Pierce	64.6	16.4	59.7	14.8	59.1	17.7	58.0	15.9	58.9	16.0	60.6	19.1	60.1	15.8
Rugby	64.3	16.2	59.8	15.6	59.1	17.6	57.4	16.3	59.2	16.3	60.3	20.0	60.0	16.1
Strongfield	63.3	17.0	58.8	16.3	58.1	20.6	54.4	17.2	58.8	17.1	60.5	20.4	59.0	16.9
Tioga	64.5	16.8	59.3	14.7	59.4	18.3	57.5	16.9	59.9	15.8	61.3	18.7	60.3	16.0
VT Peak	65.0	16.1	60.8	15.4	59.8	18.1	57.7	15.8	61.2	16.0	61.7	19.5	61.0	15.8
Mean	64.1	16.4	59.8	15.0	59.0	18.1	57.2	16.3	59.2	16.1	60.7	19.4	59.9	16.0
CV %	0.8	1.8	0.5	1.5	0.8	2.5	1.8	3.7	1.9	5.2	0.8	1.9	1.0	2.5
LSD 0.05	0.7	0.4	0.2	0.2	0.7	0.6	1.2	0.7	1.8	1.4	0.7	0.6	0.7	0.6
LSD 0.10	0.6	0.3	0.2	0.2	0.5	0.5	0.9	0.4	1.5	1.1	0.6	0.5	0.6	0.5

¹Average protein does not include data from Dickinson and Williston due to abnormally high values caused by drought conditions.

Table 4. Durum wheat variety quality descriptions, milling and processing data averaged for five years (2016-2020) 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	61.3	83	59	397	13.9	48	8.3	3.9	good
Alzada	60.1	86	68	499	14.5	85	8.1	4.4	good
Carpio	61.6	80	67	471	14.0	92	8.4	4.1	good
Divide	61.0	86	59	460	14.3	76	8.0	3.9	good
Joppa	61.4	87	51	445	13.7	84	8.6	4.0	good
Maier	60.7	89	55	425	15.0	57	8.1	4.2	good
Mountrail	60.7	90	50	446	14.2	27	7.6	3.8	fair
ND Grano	61.5	85	55	458	14.3	68	8.4	4.1	good
ND Riveland	61.1	88	63	453	14.4	82	8.2	4.1	good
ND Stanley	62.1	83	62	470	14.5	74	8.3	4.0	good
Strongfield	60.6	88	58	455	14.9	68	7.9	4.2	good
Tioga	61.0	84	66	398	14.2	75	7.8	4.1	good
Average	61.1	86	59	448	14.3	70	8.1	4.1	

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

Table 5. Durum wheat variety quality descriptions, milling and processing data for 2020 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	61.0	88	58	386	14.0	53	8.1	3.9	good
Carpio	61.7	85	66	481	14.1	94	8.4	4.1	good
Divide	60.3	90	59	466	15.0	84	7.3	3.9	good
Joppa	61.3	93	52	414	13.9	88	8.6	3.9	good
Maier	60.4	94	57	402	15.6	64	7.7	4.2	good
Mountrail	60.4	94	49	421	14.3	25	7.6	3.7	fair
ND Grano	61.7	92	62	439	14.8	68	8.1	4.1	good
ND Riveland	61.2	94	62	433	14.4	88	7.9	4.0	good
ND Stanley	62.3	91	68	475	14.9	77	8.1	3.8	good
Strongfield	60.6	94	59	472	15.7	71	7.9	4.4	good
Tioga	60.8	90	74	359	14.6	77	7.3	4.3	good
Average	61.0	91	61	432	14.6	72	7.9	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.

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