

North Dakota Durum Wheat Variety Trial Results for 2017 and Selection Guide

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Durum was harvested from 1.21 million acres in North Dakota in 2017, down 16 percent from last year. The average yield was 24 bushels per acre (bu/a), down from last year's record yield of 40.5 bu/a. Drought was the most serious constraint to durum yield in 2017. The most commonly grown varieties in 2017 and the percent of the acreage they occupied were Joppa (18), Divide (17), Carpio (15), Alkabo (11), Tioga (8) and Mountrail (5).

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 percent moisture, while protein content is reported at 12 percent 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 percent 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 percent 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 www.ag.ndsu.edu/varietytrials/durum. Use data from multiple locations and years when selecting a variety.

Table 1. Descriptions and agronomic traits of durum wheat varieties grown in North Dakota, 2017.

Variety	Agent or Origin ¹	Year Released	Height (inches)	Straw Strength ²	Days to Heading ³	Reaction to Disease ⁴				
						Stem Rust	Leaf Rust	Foliar Disease	Bact. Leaf Streak	Head Scab
AC Commander	Can.	2002	28	5	62	1	1	6	NA	NA
AC Navigator	Can.	1999	29	5	63	1	1	5	NA	NA
Alkabo	ND	2005	29	2	62	1	1	5	7	6
Alzada ⁵	WB	2004	26	6	60	1	1	8	NA	9
Ben	ND	1996	31	3	61	1	1	4	7	8 ⁶
Carpio	ND	2012	30	5	63	1	1	5	8	5
CDC Verona	Can.	2010	30	4	63	1	1	4	NA	8
Divide	ND	2005	31	5	63	1	1	5	8	5
Grenora	ND	2005	28	5	62	1	1	5	8	6
Joppa	ND	2013	30	5	62	1	1	5	7	5
Lebsock	ND	1999	29	3	61	1	1	5	7	6
Maier	ND	1998	31	5	62	1	1	5	NA	8 ⁶
Mountrail	ND	1998	29	5	62	1	1	5	7	8 ⁶
ND Grano ⁷	ND	2017	30	5	63	1	1	NA	NA	6
ND Riveland ⁷	ND	2017	32	4	62	1	1	NA	NA	5
Pierce	ND	2001	31	5	61	1	1	6	7	8
Rugby	ND	1973	32	5	62	1	1	4	NA	8 ⁶
Strongfield ⁷	Can.	2004	31	6	63	1	1	6	NA	8
Tioga	ND	2010	32	4	62	1	1	5	7	6
VT Peak	Viterra	2010	30	6	61	NA	NA	NA	NA	NA

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

² Straw 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.

³ Days to Heading = the number of days from planting to head emergence from the boot. Averaged from several locations in 2017.

⁴ Disease 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.

⁵ Alzada has a disease-resistance package that makes it more adapted to drier growing conditions (for example, western North Dakota).

⁶ Indicates yields and/or quality often have been higher than would be expected based on visual symptoms.

⁷ Low cadmium accumulating variety.



Table 2. Durum wheat variety quality descriptions, milling and processing data averaged for five years (2011-2016) from drill strips (32 locations/year).

Variety	Test Weight	Vitreous Kernels	Large Kernels	Falling Number	Wheat Protein ¹	Gluten Index ²	Pasta Color ³	Spaghetti Firmness	Overall Quality ⁴
	(lb/bu)	(%)	(%)	(sec)	(%)		(1-12)	(g-cm)	
AC Commander	60.2	92	55	507	13.7	90	9.0	4.5	Good
AC Navigator	60.7	93	54	500	13.8	69	8.9	4.5	Good
Alkabo	61.7	85	54	406	13.5	48	9.0	4.1	Good
Alzada ^{5,6}	59.7	90	65	486	13.9	89	8.6	4.4	Average
Carpio	61.5	80	60	456	13.5	92	9.0	4.3	Good
Divide	61.1	87	52	445	13.7	76	8.8	4.1	Good
Grenora	60.7	90	54	429	13.6	65	8.9	4.2	Good
Joppa ⁵	61.8	85	50	401	12.8	83	9.2	3.9	Good
Maier	61.1	91	51	408	14.2	53	8.8	4.5	Good
Mountrail	60.6	90	45	424	13.8	22	8.5	3.8	Average
Pierce	61.5	93	47	408	13.9	59	8.8	4.3	Good
Strongfield	60.6	88	54	433	14.3	66	8.7	4.4	Good
Tioga	61.0	86	57	408	13.5	78	8.8	4.3	Good
Average	60.9	89	54	439	13.7	69	8.8	4.3	

For all numbered footnotes, refer to bottom of Table 3.

Table 3. Durum wheat variety quality descriptions, milling and processing data for 2016 at all locations in the drill strips.

Variety	Test Weight	Vitreous Kernels	Large Kernels	Falling Number	Wheat Protein ¹	Gluten Index ²	Pasta Color ³	Spaghetti Firmness	Overall Quality ⁴
	(lb/bu)	(%)	(%)	(sec)	(%)		(1-12)	(g-cm)	
AC Commander	60.9	93	60	503	13.3	91	9.0	4.7	Good
AC Navigator	61.3	92	53	508	13.7	72	8.8	4.5	Good
Alkabo	61.8	86	50	422	13.2	47	9.0	4.0	Good
Alzada ⁶	60.5	90	61	515	13.5	94	8.9	4.5	Good
Carpio	61.7	84	58	457	13.3	94	9.0	4.3	Good
Divide	61.1	85	47	438	13.2	78	8.7	4.0	Good
Grenora ⁵	60.2	87	48	433	13.4	68	8.6	3.9	Average
Joppa	61.5	89	39	427	13.0	89	9.1	4.0	Good
Maier	60.9	91	53	423	14.0	57	8.6	4.4	Good
Mountrail	61.0	91	42	434	13.4	34	8.5	3.8	Average
ND Grano ⁷	61.9	90	43	455	13.5	76	9.2	4.4	Good
ND Riveland ⁷	61.8	90	60	449	13.5	84	8.9	4.2	Good
Strongfield	60.6	88	47	445	14.2	71	8.4	4.3	Good
Tioga	61.1	83	54	414	13.2	82	8.7	4.1	Good
Average	61.2	89	51	452	13.5	74	8.8	4.2	

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

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

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

⁴ Overall Quality is determined based on agronomic, milling and spaghetti processing performance.

⁵ Average of 27 drill strips instead of 32 for other varieties in Table 1. Grenora average of four locations instead of five for other varieties in Table 3.

⁶ Alzada has good quality when grown in environments where it is adapted. Low test weight can affect quality in some environments.

⁷ Low cadmium accumulating variety.

Table 4. Yield of durum wheat varieties at five Research Extension Centers in North Dakota, 2015-2017.

Variety	Carrington		Langdon		Dickinson		Hettinger		Williston		Average	
	2017	3 Yr.	2017	3 Yr.	2017	3 Yr.	2017	3 Yr.	2017	3 Yr.	2017	3 Yr.
	------(bu/a)-----											
AC Commander	52.3	53.3	70.0	58.0	31.1	47.4	38.0	44.2	26.7	29.6	43.6	46.5
AC Navigator	45.4	50.7	68.9	52.0	31.6	45.5	37.3	43.3	27.8	30.8	42.2	44.5
Alkabo	47.4	53.9	71.0	64.1	32.0	51.1	32.6	45.3	27.7	30.4	42.1	49.0
Alzada	46.9	51.5	46.7	48.2	35.0	44.8	34.0	36.7	27.6	30.1	38.0	42.3
Ben	52.8	54.0	65.8	60.7	33.0	48.3	35.1	42.4	26.7	28.5	42.7	46.8
Carpio	48.6	56.3	78.5	68.8	33.2	51.0	36.5	46.8	26.7	30.7	44.7	50.7
CDC Verona	52.9	56.4	71.6	59.2	29.8	45.5	36.0	45.4	22.9	26.4	42.6	46.6
Divide	56.9	56.8	77.7	63.4	33.2	53.7	33.5	49.8	27.0	29.7	45.7	50.7
Grenora	57.2	60.0	69.0	62.2	35.2	53.9	33.3	47.7	22.3	28.5	43.4	50.5
Joppa	56.8	58.0	74.8	66.6	34.0	53.2	35.7	51.9	27.6	30.6	45.8	52.1
Lebsock	59.8	59.6	78.1	67.6	31.8	50.9	37.8	44.7	27.0	27.4	46.9	50.0
Maier	61.4	57.3	77.4	62.8	32.4	49.8	33.5	41.1	26.1	--	46.2	--
Mountrail	51.5	57.7	81.1	66.4	35.9	51.5	38.9	49.1	23.8	28.8	46.2	50.7
ND Grano	62.5	62.3	77.7	66.0	32.9	51.8	35.7	48.4	26.0	--	47.0	--
ND Riveland	51.9	55.7	87.6	72.8	32.4	53.8	37.3	51.8	27.6	--	47.4	--
Pierce	55.1	55.6	75.5	63.3	32.5	50.7	34.7	41.7	26.4	28.1	44.8	47.9
Rugby	48.3	52.1	60.6	52.8	31.8	48.0	34.1	39.6	25.1	26.7	40.0	43.8
Strongfield	50.5	50.8	63.4	53.7	33.8	49.7	38.9	48.4	24.8	27.1	42.3	45.9
Tioga	60.4	59.2	70.3	61.0	32.8	53.0	33.8	49.9	28.5	32.7	45.2	51.2
VT Peak	57.4	57.2	84.5	71.7	30.0	--	37.2	50.5	26.8	30.2	47.2	--
Mean	53.8	55.9	73.6	62.0	31.9	50.6	36.1	46.8	26.2	29.2	44.4	48.1
CV %	13.3	--	7.0	--	9.9	--	9.7	--	9.1	--	10.5	--
LSD 0.05	10.4	--	7.2	--	4.4	--	4.9	--	3.9	--	4.8	--
LSD 0.10	8.7	--	6.0	--	3.7	--	4.1	--	3.2	--	3.8	--



Table 5. Test weight and protein of durum wheat varieties at five Research Extension Centers in North Dakota.

Variety	Carrington		Langdon	Dickinson		Hettinger		Williston		Average	
	Test Wt.	Protein	Test Wt.	Test Wt.	Protein	Test Wt.	Protein	Test Wt.	Protein	Test Wt.	Protein
	lb/bu	%	lb/bu	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%
AC Commander	58.8	16.0	57.8	58.3	17.0	58.4	14.4	50.5	18.8	56.8	16.6
AC Navigator	59.6	15.9	59.9	59.3	16.1	59.4	14.3	53.5	17.7	58.3	16.0
Alkabo	59.7	15.5	61.0	58.8	15.8	57.1	13.5	51.1	17.8	57.5	15.7
Alzada	59.4	15.9	55.3	58.3	15.7	56.3	13.6	51.0	18.0	56.1	15.8
Ben	59.4	16.2	60.3	58.0	16.7	58.1	14.7	51.9	18.3	57.5	16.5
Carpio	59.3	16.1	61.7	58.8	15.8	55.1	13.6	50.1	18.5	57.0	16.0
CDC Verona	59.9	15.6	60.8	56.8	18.1	56.7	14.8	49.5	20.4	56.7	17.2
Divide	59.7	15.7	60.7	57.8	16.4	57.2	13.9	50.6	18.7	57.2	16.2
Grenora	58.8	15.8	59.7	57.5	16.2	57.7	13.9	49.2	18.3	56.6	16.1
Joppa	59.6	15.1	60.5	56.8	16.5	56.3	12.9	50.3	18.4	56.7	15.7
Lebsock	59.9	16.0	61.3	57.5	17.0	58.4	13.0	51.5	17.3	57.7	15.8
Maier	60.1	14.8	60.5	58.0	17.1	56.7	14.8	50.6	19.8	57.2	16.6
Mountrail	59.3	15.9	60.0	58.0	16.7	57.7	13.2	50.3	18.3	57.1	16.0
ND Grano	60.4	15.7	61.0	58.3	16.5	57.4	14.0	50.4	19.2	57.5	16.4
ND Riveland	59.2	16.7	61.5	57.3	17.4	57.1	13.8	51.4	18.4	57.3	16.6
Pierce	60.3	15.1	61.5	58.3	16.4	56.3	13.7	51.0	17.9	57.5	15.8
Rugby	59.0	16.4	60.2	57.3	17.3	56.3	14.3	51.4	18.8	56.8	16.7
Strongfield	59.3	16.9	58.9	58.3	17.0	56.7	14.2	50.6	19.3	56.8	16.9
Tioga	58.9	16.2	60.3	58.3	16.9	57.9	14.4	50.9	18.8	57.3	16.6
VT Peak	60.7	15.9	62.4	59.3	16.6	58.4	13.5	52.5	17.7	58.7	15.9
Mean	59.5	15.8	60.7	58.3	16.8	57.3	14.0	50.9	18.5	57.3	16.6
CV %	0.8	4.1	1.1	1.4	4.2	2.5	3.4	1.1	3.4	1.6	3.0
LSD 0.05	0.7	0.9	0.9	1.6	1.4	2.0	0.7	0.9	1.0	1.1	0.6
LSD 0.10	0.6	0.8	0.8	1.4	1.2	1.7	0.6	0.8	0.9	0.8	0.4