

North Dakota Durum Wheat

Variety Trial Results for 2016 and Selection Guide

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Durum was planted on 1.46 million acres in North Dakota in 2016, up significantly from the 1.1 million acres planted in 2015. The average yield is estimated at 40.5 bushels per acre, up from last year. If this estimate is accurate, it will represent the highest average yield ever reported for durum in North Dakota. The most commonly grown varieties in 2016 and the percent of the acreage they occupied were Divide (21.5), Carpio (17), Alkabo (11.2), Joppa (10.3), Tioga (8), Lebsock (7.8), Mountrail (5.5) and Grenora (3.8).

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 reliable 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.

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Table 1. Descriptions and agronomic traits of durum wheat varieties grown in North Dakota, 2016.

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	32	5	68	R	R	MS	NA	NA
AC Napoleon	Can.	2001	40	5	68	R	R	S	NA	NA
AC Navigator	Can.	1999	32	5	66	R	R	M	NA	S
Alkabo	ND	2005	36	2	67	R	R	M	MS	MS
Alzada ⁵	WB	2004	30	6	63	R	R	S	NA	VS
Belzer	ND	1997	39	5	66	R	R	M	NA	M
Ben	ND	1996	39	3	67	R	R	MR	MS	S ⁶
Carpio	ND	2012	37	5	69	R	R	M	MS/S	M
CDC Verona	Can.	2010	38	4	69	R	R	MR	NA	S
DG Max	DGP	2008	38	5	66	R	MR	MR	NA	MS
DG Star	DGP	2007	37	4	64	R	R	M	NA	NA
Dilse	ND	2002	37	5	68	R	R	M	M	MS
Divide	ND	2005	38	5	68	R	R	M	MS/S	M
Grande D'Oro	WB/DGP	2005	37	4	68	R	R	M	NA	NA
Grenora	ND	2005	35	5	67	R	R	M	MS/S	MS
Joppa	ND	2013	39	5	68	R	R	M	MS	M
Kyle	Can.	1984	39	7	68	R	MR	M	NA	NA
Lebsock	ND	1999	37	3	67	R	R	M	MS	MS
Maier	ND	1998	37	5	67	R	R	M	NA	S ⁶
Mountrail	ND	1998	37	5	68	R	R	M	MS	S ⁶
MS-Dart	Meridian	2015	37	5	68	NA	NA	NA	NA	NA
Pierce	ND	2001	38	5	67	R	R	MS	MS	S
Plaza	ND	1999	29	7	68	R	R	M	NA	MS
Rugby	ND	1973	38	5	64	R	R	MR	NA	S ⁶
Silver	MT	2012	31	5	62	NA	NA	NA	NA	NA
Strongfield	Can.	2004	37	6	68	R	R	MS	NA	S
Tioga	ND	2010	39	4	68	R	R	M	MS	MS
VT Peak	Viterra	2010	37	6	68	NA	NA	NA	NA	NA
Wales	WB	2008	36	3	67	R	R	M	NA	S ⁶
WB-Belfield	WB	2011	30	2	62	R	R	S	NA	S
Westhope	WB	2009	36	3	67	R	R	MS	NA	S

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

²Straw 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.

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

⁴R = resistant; MR = moderately resistant; M = intermediate; MS = moderately susceptible; S = susceptible; VS = very susceptible; NA = Not adequately tested. Foliar Disease = reaction to tan spot and septoria leaf spot complex.

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

⁶Indicates yields and/or quality often have been higher than would be expected based on visual symptoms. NA = Not adequately tested.

Table 2. Durum wheat variety quality descriptions, milling and processing data averaged for five years (2010-2015) from drill strips (33 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	59.5	93	52	495	14.1	89	9.0	5.4	Average
AC Navigator	60.0	93	59	486	14.2	68	8.9	5.4	Good
Alkabo	61.2	86	51	399	13.8	47	9.0	4.8	Good
Alzada ^{5,6}	59.1	91	62	467	14.2	88	8.5	5.3	Average
Carpio	61.0	82	59	447	13.9	91	8.9	5.1	Good
Divide	60.7	88	51	442	14.1	76	8.9	4.9	Good
Grenora	60.3	92	52	424	13.9	63	8.8	5.0	Good
Joppa	60.7	87	44	405	13.5	83	9.2	4.8	Good
Maier	60.4	92	47	399	14.7	54	8.8	5.2	Good
Mountrail	59.8	91	42	417	14.4	22	8.4	4.4	Average
Pierce	60.8	94	44	406	14.3	60	8.8	5.0	Good
Strongfield	60.2	89	52	426	14.7	65	8.7	5.1	Good
Tioga	60.7	88	57	402	13.8	76	8.7	5.1	Good
Average	60.3	90	51	432	14.1	68	8.8	5.1	

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

Table 3. Durum wheat variety quality descriptions, milling and processing data for 2015 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 ⁵	58.9	90	38	596	14.2	91	9.3	4.2	Average
AC Navigator	59.6	89	39	576	14.0	75	9.2	4.1	Average
Alkabo	62.1	82	47	469	13.5	46	9.4	3.4	Good
Alzada ⁶	58.8	86	56	545	14.4	85	8.7	4.0	Average
Carpio	61.6	78	54	517	14.1	92	9.1	3.8	Good
Divide	61.4	86	48	501	14.2	75	9.1	3.8	Good
Grenora	60.9	87	51	505	13.8	58	9.2	3.8	Good
Joppa	61.5	85	40	479	13.4	83	9.4	3.6	Good
Lebsock ⁵	61.7	89	41	509	14.1	32	8.8	3.7	Good
Maier	61.4	87	44	483	14.3	55	9.1	4.0	Good
Mountrail	60.6	91	39	491	14.1	18	9.1	3.4	Average
Pierce	61.8	91	44	483	14.2	60	9.1	3.7	Good
Strongfield	60.6	89	48	516	14.8	65	8.9	3.9	Good
Tioga	61.4	87	55	468	13.8	77	9.2	3.8	Good
Average	60.9	87	46	510	14.1	65	9.1	3.8	

¹Wheat protein is reported on a 12 percent 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.

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

⁵Average of 31 drill strips instead of 33 for other varieties in Table 1. Lebsock average of five locations and AC Commander average of six locations instead of seven for other varieties in Table 3.

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

Table 4. Yield of durum wheat varieties at five Research Extension Centers in North Dakota, 2014-2016.

Variety	<u>Langdon</u>		<u>Dickinson</u>		<u>Hettinger</u>		<u>Minot</u>		<u>Williston</u>		<u>Average</u>	
	2016	3 Yr.	2016	3 Yr.	2016	3 Yr.	2016	3 Yr.	2016	3 Yr.	2016	3 Yr.
	------(bu/a)-----											
AC Commander	45.4	64.1	47.6	61.2	35.0	54.8	61.1	63.6	39.6	33.8	45.7	55.5
AC Navigator	35.2	57.2	43.7	57.8	36.3	52.5	55.7	54.1	37.3	34.0	41.6	51.1
Alkabo	51.2	68.8	53.1	65.2	33.3	62.0	72.3	76.4	36.4	33.3	49.3	61.1
Alzada	37.1	59.2	39.9	52.1	34.4	44.3	60.9	53.4	35.5	32.7	41.6	48.3
Ben	44.5	65.3	43.7	61.1	31.6	55.0	61.8	67.1	36.8	31.8	43.7	56.1
Carpio	43.0	69.0	47.7	59.1	32.2	61.4	72.5	71.8	35.3	33.6	46.1	59.0
CDC Verona	36.3	60.7	52.5	62.3	33.7	59.8	59.7	60.0	37.7	31.4	44.0	54.8
Divide	35.0	65.5	54.2	68.4	33.4	65.9	64.2	69.4	41.4	34.5	45.6	60.7
Grenora	40.9	67.7	51.5	68.2	33.4	59.3	69.1	69.6	39.4	34.2	46.9	59.8
Joppa	42.9	70.4	56.7	68.7	41.1	68.5	78.3	73.9	32.7	32.3	50.3	62.8
Lebsock	52.5	68.1	52.8	64.6	35.6	56.0	66.7	71.2	41.5	32.2	49.8	58.4
Maier	37.2	64.5	45.1	64.2	30.4	52.0	66.1	67.1	34.1	--	42.6	--
Mountrail	37.9	68.3	50.3	67.3	31.8	63.9	72.5	73.7	33.0	31.9	45.1	61.0
Pierce	41.3	65.5	48.2	64.6	35.1	51.6	61.3	68.0	35.0	31.0	44.2	56.1
Rugby	31.8	57.2	45.8	60.9	25.5	53.2	59.1	61.6	35.5	30.2	39.5	52.6
Strongfield	32.7	61.0	51.2	62.5	35.5	60.6	45.7	59.0	38.0	31.5	40.6	54.9
Tioga	37.1	65.4	51.5	68.2	34.3	65.2	51.7	63.8	43.0	37.5	43.5	60.0
VT Peak	55.2	70.4	51.7	--	35.1	64.9	77.4	73.5	38.9	34.2	51.7	--
Mean	41.0	64.9	49.3	63.3	33.8	58.4	64.2	66.5	37.3	32.9	45.1	57.2
CV %	11.1	--	9.6		17.2	--	6.7	--	9.4	--	10.9	6.1
LSD 0.05	6.3	--	6.8		8.4	--	7.7	--	5.6	--	6.2	4.0
LSD 0.10	5.3	--	5.7		7.1	--	6.4	--	4.7	--	5.2	3.4

Table 5. Test weight and protein of durum wheat varieties at five Research Extension Centers in North Dakota, 2016.

Variety	<u>Langdon</u>		<u>Dickinson</u>		<u>Hettinger</u>		<u>Minot</u>		<u>Williston</u>		<u>Average</u>	
	Test Wt.	Test Wt.	Protein	Test Wt.	Protein	Test Wt.	Protein	Test Wt.	Protein	Test Wt.	Protein ¹	
	lb/bu	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%	lb/bu	%	
AC Commander	52.5	59.0	13.8	58.9	13.4	56.3	14.6	57.6	18.7	56.9	13.9	
AC Navigator	52.9	60.4	14.3	60.7	12.8	55.7	14.4	57.6	18.7	57.5	13.8	
Alkabo	56.6	61.4	12.3	59.3	12.4	57.2	13.6	56.6	19.3	58.2	12.8	
Alzada	51.4	59.7	13.8	59.4	12.3	57.4	13.7	56.3	18.7	56.8	13.3	
Ben	55.3	60.9	13.5	59.3	12.3	57.9	15.1	57.2	19.4	58.1	13.6	
Carpio	55.6	61.5	14.1	56.1	12.6	57.9	14.0	57.2	19.0	57.7	13.6	
CDC Verona	55.5	60.5	12.9	58.8	12.7	56.3	15.4	56.8	21.0	57.6	13.7	
Divide	53.6	60.1	12.7	59.6	12.6	57.5	14.5	57.1	19.5	57.6	13.3	
Grenora	54.2	58.5	12.3	58.8	12.5	56.5	15.0	57.3	17.9	57.1	13.3	
Joppa	55.4	60.8	11.9	58.7	11.8	57.5	13.7	57.1	18.9	57.9	12.5	
Lebsock	57.2	61.9	12.3	60.4	11.6	58.5	14.4	57.6	18.0	59.1	12.8	
Maier	53.7	61.5	12.3	58.5	12.7	57.5	15.2	56.6	20.7	57.6	13.4	
Mountrail	54.4	59.0	12.1	58.9	12.1	57.2	14.1	55.3	19.7	57.0	12.8	
Pierce	56.7	61.8	13.1	60.4	12.2	58.3	14.2	57.5	18.9	58.9	13.2	
Rugby	54.3	60.3	13.4	59.1	12.7	57.6	14.1	57.9	18.2	57.8	13.4	
Strongfield	53.2	58.7	11.9	58.2	13.3	54.1	15.6	56.8	20.1	56.2	13.6	
Tioga	53.2	61.4	12.9	59.8	13.0	55.1	14.7	58.2	17.7	57.5	13.5	
VT Peak	58.6	61.9	13.4	61.1	12.1	59.0	14.4	58.9	19.4	59.9	13.3	
Mean	54.7	60.5	12.9	59.2	12.5	57.1	14.5	57.2	19.1	57.7	13.3	
CV %	1.5	1.4	4.8	2.2	8.6	1.1	1.8	1.1	5.2	1.7	4.4	
LSD 0.05	1.2	2.0	1.2	1.8	1.5	1.0	0.4	1.0	1.6	1.3	1.0	
LSD 0.10	1.0	1.6	1.0	1.5	1.3	0.8	0.3	0.8	1.3	1.1	0.8	

¹Williston protein not included in average.**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, ndsu.eoaa.ndsu.edu. This publication will be made available in alternative formats for people with disabilities upon request, 701-231-7881.