



MONTANA
STATE UNIVERSITY

College of
**AGRICULTURE &
MONTANA AGRICULTURAL
EXPERIMENT STATION**

PROJECT TITLE:

2024 INTRASTATE DURUM ADVANCED YIELD TRIALS

PRINCIPAL INVESTIGATORS:

Dr. Michael Giroux, MSU-Bozeman, MT

Email: mgiroux@montana.edu

Phone: (406) 994-7877

Mr. Andy Hogg, MSU-Bozeman, MT

Email: ahogg@montana.edu

Phone: (406) 994-1876

CONTRIBUTORS:

- Dr. Pat Carr and Dr. Jed Eberly, MSU-CARC, Moccasin, MT
- Dr. Chengci Chen, Dr. Frankie Crutcher, Ms. Calla Kowatch-Carlson, Ms. Samantha Hoesel, and Ms. Stacy Hurley, Ms. Alma Chinchilla, Ms. Caitlin Gross, Ms. Debra Kunda, MSU-EARC, Sidney, MT
- Ms. Peggy Lamb, Ms. Eleri Haney, MSU-NARC, Havre, MT
- Dr. Dave Wichman, MSU-WTARC, Conrad, MT
- Dr. Linda Dykes, USDA-ARS, Fargo, ND
- Dr. Xianming Chen, USDA-ARS, Pullman, WA
- Dr. Zhaohui Liu, NDSU, Fargo, ND

f

- Funding provided by the Montana Wheat and Barley Committee, U.S. Wheat and Barley Scab Initiative and The Montana Agricultural Experiment Station.

OBJECTIVE:

To test advanced experimental durum lines for agronomic and quality traits relative to currently grown cultivars under Montana growing conditions.

METHODS:

In 2024, 18 experimental durum lines developed at MSU (MTD) and 12 released durum varieties including releases from WestBred, North Dakota State University (NDSU) and the Montana Agricultural Experiment Station (MAES) (Table 1). Rainfed experiments were carried out in collaboration with the MAES in Bozeman, MT (MSU-Post Agronomy Farm), and at off-campus Research Centers near Havre, MT (MSU-NARC), Sidney, MT (MSU-EARC), Conrad, MT (MSU-WTARC), and Moccasin, MT (MSU-CARC) and one experiment was carried out in Conrad in cooperation with 2nd Nature Research, LLC. Four off-station experiments were planted in Eastern Montana in Roosevelt, McCone, Valley and Sheridan counties by EARC staff, and three off-station experiments were planted in North Central Montana near Loring, Turner, and Chester by NARC staff. Off-station trials did not encompass all experimental lines and consisted primarily of released varieties.

There were three replicates of each line/variety grown at each location in either a randomized complete block design or an alpha-lattice design to determine statistical differences. Prior to planting, seed was treated with CruiserMaxx Vibrance for Cereals® (Syngenta) (5 fl oz/100 lb). Cooperators provided agronomic data such as plant height, heading date, pest/disease pressure, lodging, grain protein content, grain test weight, and grain yield. Sub-samples from the three replicates per line per location from on-station locations were bulked and submitted to Dr. Linda Dykes (USDA-ARS, Fargo, ND) for analysis of seed traits, milling and semolina quality, and semolina mixing strength. Disease evaluations for Fusarium head blight were conducted by Dr. Frankie Crutcher in Sidney, MT (EARC). Disease evaluations for stripe rust were conducted at three locations in Washington state by Dr. Xianming Chen (USDA-ARS, Pullman, WA). Disease evaluations for fungal leafspot were conducted in the greenhouse at NDSU by Dr. Zhaohui Liu.

Mean agronomic performance for both 2024 irrigated on-station trials can be found in Table 2 and for all rainfed on-station trials in Table 3. Agronomic performance for individual 2024 on-station and private trials are found in Tables 4-11 and data for off-station trials is found in Tables 12-18. Mean seed quality is summarized in Table 19, milling data in Table 20, and semolina quality in Table 21. Disease evaluations for Fusarium head blight, stripe rust, fungal leaf spot, and stem rust are found in Tables 22-24.

Table 1. Varieties tested in 2024 Intrastate Durum Advanced Yield Trial.

Entry	ID	Origin ³	Release Year
1	Alzada	Westbred	2004
2	Carpio	NDSU	2012
3	Divide	NDSU	2005
4	Joppa	NDSU	2013
5	Lustre ¹	MAES	2021
6	Mountrail	NDSU	1998
7	MT Blackbeard ¹	MAES/MSU	2022
8	MT Raska	MAES/MSU	2022
9	WB8148	Westbred	2023
10	ND Grano ¹	NDSU	2017
11	ND Riveland ¹	NDSU	2017
12	ND Stanley ¹	NDSU	2021
13	MTD19011 ¹	MSU	\
14	MTD19077 ¹	MSU	\
15	MTD19089 ¹	MSU	\
16	MTD19103 ¹	MSU	\
17	MTD19109 ¹	MSU	\
18	MTD19115 ¹	MSU	\
19	MTD19209 ¹	MSU	\
20	MTD19241 ^{1,2}	MSU	\
21	MTD19349 ¹	MSU	\
22	MTD19499 ^{1, 2}	MSU	\
23	MTD19507 ¹	MSU	\
24	MTD19511 ¹	MSU	\
25	MTD19529	MSU	\
26	MTD19611 ²	MSU	\
27	MTD19617 ²	MSU	\
28	MTD19623 ¹	MSU	\
29	MTD19653 ¹	MSU	\
30	MTD19703	MSU	\

¹Low cadmium accumulating line.

²Solid stem line.

³MAES- Montana Agricultural Experiment Station, MSU-Montana State University, NDSU-North Dakota State University.

Table 2. Agronomic Data All Irrigated 2024 Durum Advanced Yield Trials (n=2).

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Heading ³ Julian
Alzada	94.2	60.9	9.7	13.9	33.2	180.0
Carpio	101.2	61.6	10.1	13.4	41.8	<u>184.6</u>
Divide	102.6	62.9	9.9	13.8	42.9	182.9
Joppa	108.0	62.3	9.9	13.1	41.7	182.5
Lustre	109.1	61.7	9.6	13.8	40.6	183.6
Mountrail	111.9	62.2	9.6	13.4	40.2	182.0
MT Blackbeard	111.0	61.6	10.3	13.3	<u>44.5</u>	183.7
MT Raska	99.1	62.1	10.0	13.7	28.9	180.0
WB8148	101.8	60.6	<u>10.5</u>	13.6	28.0	181.4
ND Grano	112.0	62.6	9.5	13.5	40.6	183.0
ND Riveland	106.0	61.8	9.8	13.7	42.3	182.8
ND Stanley	110.1	62.5	9.8	13.8	40.3	183.1
MTD19011	109.9	61.6	10.2	13.8	40.4	182.0
MTD19077	111.3	62.7	9.9	<u>14.3</u>	41.7	183.7
MTD19089	<u>116.2</u>	62.9	9.8	14.3	40.9	183.2
MTD19103	110.4	62.1	10.2	13.7	39.7	183.6
MTD19109	112.7	61.7	9.9	13.1	37.6	183.8
MTD19115	109.3	62.2	9.8	13.4	39.1	182.1
MTD19209	115.0	62.5	9.8	13.6	42.6	183.3
MTD19241	109.2	<u>63.0</u>	9.8	13.7	37.5	182.5
MTD19349	114.4	61.4	9.5	13.5	39.5	182.5
MTD19499	105.2	60.3	9.6	13.8	38.9	182.4
MTD19507	109.5	62.1	10.1	14.0	37.2	181.8
MTD19511	108.5	60.8	9.8	13.7	36.5	182.0
MTD19529	105.3	61.5	10.0	13.3	40.4	182.1
MTD19611	106.8	62.6	9.7	14.3	35.5	181.7
MTD19617	108.5	62.4	10.3	14.0	40.4	182.7
MTD19623	108.5	61.0	10.2	13.2	40.7	182.5
MTD19653	107.2	62.5	9.8	14.0	38.7	182.0
MTD19703	99.9	62.1	10.0	13.1	40.9	182.1
Mean	107.9	62.0	9.9	13.6	39.1	182.5
LSD (p=0.05)	10.9	1.4	0.6	0.6	2.2	1.2
Prob > F	0.066	0.029	0.219	0.003	<0.001	<0.001
CV%	26.1	0.8	0.9	0.6	2.9	0.2

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³>50% of heads 100% out of boot.

Bold and underlined indicate the highest numerical value within a column.

Table 3. Agronomic Data All Rainfed 2024 Durum Advanced Yield Trials (n=6).

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Heading ³ Julian
Alzada	47.0	59.6	10.0	14.7	27.4	177.6
Carpio	42.5	58.4	10.2	15.4	32.2	<u>181.9</u>
Divide	44.9	60.0	10.1	14.7	33.1	180.4
Joppa	43.5	59.8	10.0	14.9	32.2	180.5
Lustre	45.6	58.9	9.9	15.0	31.9	181.0
Mountrail	44.6	59.2	9.9	15.3	31.6	181.0
MT Blackbeard	47.3	59.4	<u>10.3</u>	15.1	<u>35.0</u>	181.5
MT Raska	44.9	<u>61.0</u>	10.0	15.4	24.9	177.8
WB8148	48.9	59.9	10.1	15.3	24.5	179.5
ND Grano	44.6	60.1	10.0	15.2	31.1	181.4
ND Riveland	40.9	58.8	10.1	15.5	33.2	180.9
ND Stanley	45.5	60.5	10.2	15.2	31.5	181.3
MTD19011	49.0	59.6	10.1	14.7	31.7	179.7
MTD19077	45.3	59.4	10.0	16.2	32.7	181.1
MTD19089	45.1	59.4	9.9	16.1	33.1	181.3
MTD19103	<u>49.3</u>	59.0	10.0	15.7	31.3	181.7
MTD19109	44.9	59.3	10.1	15.0	30.6	181.8
MTD19115	45.0	60.5	9.9	15.4	29.7	180.5
MTD19209	48.3	60.1	9.9	15.4	34.0	182.1
MTD19241	47.5	59.8	10.0	15.3	31.0	180.9
MTD19349	44.3	58.0	10.0	15.4	31.1	180.7
MTD19499	47.8	58.4	10.1	15.3	31.0	180.2
MTD19507	45.1	59.6	10.1	15.2	30.3	179.7
MTD19511	46.4	58.7	10.1	15.1	29.4	179.7
MTD19529	47.5	59.7	10.2	14.7	31.2	180.3
MTD19611	45.3	60.6	10.2	15.6	29.0	180.1
MTD19617	46.2	60.6	10.1	15.6	31.8	181.5
MTD19623	47.6	59.0	10.0	15.2	31.8	180.5
MTD19653	41.3	60.3	10.1	<u>16.6</u>	30.9	180.4
MTD19703	46.5	60.6	10.2	15.0	32.1	180.6
Mean	45.8	59.6	10.1	15.3	31.0	180.6
LSD (p=0.05)	3.6	0.7	0.2	0.6	1.4	1.3
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV%	21.8	0.6	0.2	1.6	4.6	0.4

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³>50% of heads 100% out of boot. N=3.

Bold and underlined indicate the highest numerical value within a column.

*Hail damage effected yields from 2 locations

Table 4. Agronomic Data Bozeman 2024 Irrigated Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Heading ³ Julian
Alzada	88.5	59.2	9.0	13.7	30.5	187.9
Carpio	90.4	58.3	9.6	13.2	41.1	<u>191.9</u>
Divide	89.8	60.9	9.4	13.9	41.6	189.6
Joppa	100.1	59.3	9.2	12.9	39.4	189.9
Lustre	99.7	59.0	8.9	14.3	38.5	190.4
Mountrail	103.9	60.2	8.9	13.5	37.1	189.8
MT Blackbeard	110.1	58.4	9.9	13.1	<u>43.9</u>	190.8
MT Raska	101.7	59.8	9.7	13.9	26.8	188.4
WB8148	97.1	57.3	<u>10.5</u>	13.9	27.7	189.1
ND Grano	100.8	59.7	8.6	13.5	38.5	190.5
ND Riveland	96.0	59.1	9.2	13.6	40.7	189.7
ND Stanley	99.3	59.4	9.0	13.5	38.7	190.9
MTD19011	106.8	59.5	9.8	13.8	38.9	189.6
MTD19077	109.0	60.9	9.5	<u>14.5</u>	40.2	191.3
MTD19089	<u>113.9</u>	<u>61.2</u>	9.3	14.3	39.6	191.3
MTD19103	105.9	59.8	9.9	13.6	37.9	191.3
MTD19109	108.2	59.4	9.3	13.4	34.0	191.4
MTD19115	105.9	59.6	9.2	13.5	37.6	189.9
MTD19209	106.6	60.0	9.2	13.8	41.3	190.9
MTD19241	100.6	61.2	9.1	13.7	36.6	189.9
MTD19349	106.4	58.5	8.7	13.5	37.1	189.9
MTD19499	104.2	57.2	8.7	13.6	37.4	190.3
MTD19507	106.8	60.0	9.7	13.8	36.7	189.4
MTD19511	102.4	57.5	9.1	13.8	35.7	190.0
MTD19529	103.5	58.9	9.5	13.2	38.8	190.4
MTD19611	103.6	60.2	9.0	14.3	33.4	190.0
MTD19617	99.1	59.5	9.8	13.7	39.2	190.6
MTD19623	105.4	58.2	9.9	13.4	39.6	190.3
MTD19653	102.9	59.6	9.0	14.4	37.5	189.8
MTD19703	96.3	59.6	9.5	13.3	39.7	189.9
Mean	102.2	59.4	9.3	13.7	37.5	190.2
LSD (p=0.05)	11.4	1.4	1.4	0.7	3.2	0.8
Prob > F	0.006	<0.001	0.731	0.002	<0.001	<0.001
CV%	5.7	1.1	8.3	2.6	4.9	0.2
Lattice RE% ⁴	148.2	182.3	101.2	100.9	114.6	108.1

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³>50% of heads 100% out of boot.⁴Adjusted means provided for Lattice RE% values equal to or greater than 100.

Bold and underlined indicate the highest numerical value within a column.

Table 5. Agronomic Data Bozeman 2024 Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Heading ³ Julian
Alzada	42.3	58.5	9.5	16.0	30.3	187.2
Carpio	45.4	58.9	9.5	16.3	40.4	189.6
Divide	39.5	60.0	9.6	15.9	41.4	188.4
Joppa	41.9	60.5	9.7	15.4	39.0	188.6
Lustre	37.1	58.0	9.5	16.0	37.4	189.9
Mountrail	38.1	59.0	9.3	15.7	37.4	189.5
MT Blackbeard	48.3	59.6	<u>9.7</u>	15.8	<u>43.4</u>	189.9
MT Raska	38.1	59.5	9.5	17.0	27.0	188.1
WB8148	42.8	58.1	9.4	16.9	26.2	188.7
ND Grano	42.9	60.6	9.5	16.0	37.4	189.9
ND Riveland	37.2	59.4	9.4	16.5	39.9	189.1
ND Stanley	45.2	60.6	9.5	16.4	39.0	189.8
MTD19011	45.3	59.4	9.6	15.9	38.4	188.4
MTD19077	44.9	59.4	9.6	17.5	40.3	190.1
MTD19089	47.2	60.0	9.4	16.9	39.7	189.9
MTD19103	49.0	59.4	9.6	16.3	37.9	190.4
MTD19109	42.0	58.3	9.5	16.4	36.5	190.0
MTD19115	47.4	59.7	9.3	16.4	37.8	190.2
MTD19209	40.4	59.7	9.3	16.7	41.4	<u>191.1</u>
MTD19241	41.8	59.8	9.5	15.9	35.8	189.4
MTD19349	41.8	57.1	9.3	17.1	37.5	189.5
MTD19499	47.4	57.3	9.5	16.4	37.2	189.0
MTD19507	42.4	58.9	9.5	16.3	37.1	188.7
MTD19511	47.4	58.2	9.4	15.9	35.9	188.7
MTD19529	50.9	58.7	9.6	15.5	38.9	189.1
MTD19611	43.9	60.4	9.7	16.8	36.0	190.0
MTD19617	43.9	<u>60.9</u>	9.5	16.7	39.5	189.6
MTD19623	<u>52.6</u>	58.9	9.5	15.9	39.6	189.6
MTD19653	42.2	60.3	9.5	<u>17.5</u>	37.9	189.0
MTD19703	45.0	60.4	9.6	16.0	40.2	189.9
Mean	43.8	59.3	9.5	16.3	37.5	189.4
LSD (p=0.05)	9.0	0.9	0.2	0.7	2.2	1.0
Prob > F	0.112	<0.001	0.004	<0.001	<0.001	<0.001
CV%	12.0	0.8	1.0	2.3	3.5	0.3
Lattice RE% ⁴	105.2	128.5	153.0	166.1	102.7	122.8

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³>50% of heads 100% out of boot.⁴Adjusted means provided for Lattice RE% values equal to or greater than 100.

Bold and underlined indicate the highest numerical value within a column.

**Trial was damaged by hail on 7/25/2024.

Table 6. Agronomic Data EARC 2024 Irrigated Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Heading ³ Julian
Alzada	100.0	62.7	10.4	14.2	36.0	172.2
Carpio	112.0	64.9	10.6	13.7	42.5	<u>177.3</u>
Divide	115.5	64.9	10.5	13.8	44.2	176.3
Joppa	116.0	65.4	10.7	13.3	44.0	175.2
Lustre	118.6	64.4	10.4	13.4	42.7	176.9
Mountrail	120.0	64.3	10.4	13.3	43.4	174.3
MT Blackbeard	111.9	64.8	10.8	13.4	<u>45.1</u>	176.6
MT Raska	96.5	64.4	10.4	13.4	31.0	171.6
WB8148	106.5	64.0	10.5	13.3	28.3	173.7
ND Grano	123.3	65.6	10.5	13.4	42.7	175.6
ND Riveland	116.1	64.6	10.4	13.8	44.0	175.9
ND Stanley	121.0	<u>65.7</u>	10.6	14.0	42.0	175.4
MTD19011	113.1	63.8	10.6	13.7	41.9	174.4
MTD19077	113.6	64.6	10.4	14.1	43.3	176.1
MTD19089	118.5	64.7	10.4	14.2	42.3	175.1
MTD19103	115.0	64.4	10.6	13.8	41.6	176
MTD19109	117.2	64.1	10.6	12.7	41.2	176.3
MTD19115	112.7	64.9	10.4	13.3	40.6	174.4
MTD19209	<u>123.5</u>	65.0	10.4	13.3	44.0	175.7
MTD19241	117.9	64.8	10.5	13.7	38.5	175.1
MTD19349	122.4	64.4	10.4	13.5	41.9	175.1
MTD19499	106.3	63.4	10.6	13.9	40.4	174.6
MTD19507	112.3	64.3	10.5	14.1	37.8	174.2
MTD19511	114.7	64.1	10.6	13.6	37.3	174
MTD19529	107.1	64.1	10.5	13.3	42.0	173.9
MTD19611	110.1	65.0	10.5	14.2	37.7	173.4
MTD19617	118.0	65.4	<u>10.8</u>	<u>14.3</u>	41.6	174.8
MTD19623	111.7	63.8	10.5	13.0	41.9	174.7
MTD19653	111.6	65.5	10.6	13.7	40.0	174.3
MTD19703	103.5	64.6	10.5	12.8	42.1	174.4
Mean	113.6	64.6	10.5	13.6	40.7	174.9
LSD (p=0.05)	5.2	0.5	0.2	0.5	2.9	1.7
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV%	2.8	0.4	0.9	2.2	4.4	0.6
Lattice RE%	100.0	114.4	110.9	105.8	100.0	101.7

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³>50% of heads 100% out of boot.⁴>50% of heads senesced.⁵Adjusted means provided for Lattice RE% values equal to or greater than 100.

Bold and underlined indicate the highest numerical value within a column.

Table 7. Agronomic Data EARC 2024 Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Heading ³ Julian
Alzada	76.0	62.8	9.7	13.2	27.8	169.7
Carpio	70.6	61.9	10.1	14.2	31.7	<u>173.7</u>
Divide	73.2	62.7	9.7	13.5	32.7	172.7
Joppa	70.0	63.0	9.7	13.4	32.5	173
Lustre	74.6	62.0	9.6	13.6	33.0	173
Mountrail	76.6	62.6	9.6	13.4	31.6	173.3
MT Blackbeard	77.7	62.1	<u>10.1</u>	13.9	<u>36.3</u>	173
MT Raska	73.4	<u>65.0</u>	9.7	12.5	26.1	169
WB8148	76.2	62.5	9.7	13.6	25.3	171.7
ND Grano	72.9	63.4	9.8	13.7	31.1	172.7
ND Riveland	72.3	62.4	9.9	13.8	35.1	173
ND Stanley	76.2	64.2	9.9	13.7	32.0	173
MTD19011	77.6	63.0	9.8	13.4	32.6	172.3
MTD19077	76.7	62.5	9.7	14.1	34.2	173.3
MTD19089	70.8	62.0	9.6	14.5	35.0	173.3
MTD19103	77.4	62.2	9.6	<u>14.6</u>	32.6	173
MTD19109	72.4	62.7	9.8	13.0	32.6	173.7
MTD19115	73.9	63.6	9.7	13.6	31.3	172.3
MTD19209	77.6	62.8	9.8	13.6	33.5	173.3
MTD19241	<u>79.6</u>	63.2	9.8	14.0	33.4	172.7
MTD19349	77.0	62.0	9.6	13.5	32.9	173.7
MTD19499	72.8	62.6	9.9	13.4	33.5	173.3
MTD19507	75.8	63.4	9.6	13.5	32.4	172.3
MTD19511	74.5	62.4	9.7	13.7	30.8	172.7
MTD19529	74.5	63.5	9.8	13.1	34.2	173
MTD19611	73.8	64.0	9.9	13.9	29.7	173
MTD19617	72.9	64.2	10.0	13.5	33.2	173.3
MTD19623	73.2	61.6	9.7	13.5	32.8	173.3
MTD19653	69.7	64.1	9.8	13.7	32.3	173
MTD19703	76.7	64.1	9.8	13.6	33.1	172.7
Mean	74.6	63.0	9.8	13.6	32.2	172.7
LSD (p=0.05)	4.8	0.7	0.1	0.7	2.2	1.1
Prob > F	0.007	<0.001	<0.002	0.002	<0.001	<0.001
CV%	3.8	0.7	0.7	3.0	4.0	0.4
Lattice RE%	100.9	115.8	112.0	180.2	105.2	100.0

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³>50% of heads 100% out of boot.

Bold and underlined indicate the highest numerical value within a column.

Table 8. Agronomic Data CARC 2024 Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches
Alzada	33.7	61.1	10.2	13.9	24.2
Carpio	29.8	60.6	10.5	15.1	29.6
Divide	35.6	62.1	10.5	13.2	30.8
Joppa	28.2	61.0	10.1	14.8	28.6
Lustre	30.6	60.2	10.1	14.8	29.3
Mountrail	28.7	59.3	9.9	15.9	28.5
MT Blackbeard	33.0	61.1	10.5	14.4	<u>31.6</u>
MT Raska	29.3	61.6	10.0	<u>16.4</u>	20.7
WB8148	31.5	61.2	10.3	14.1	22.1
ND Grano	27.3	60.5	10.1	16.3	27.4
ND Riveland	26.9	60.9	10.3	14.5	28.6
ND Stanley	31.3	<u>63.0</u>	10.5	14.0	27.7
MTD19011	34.3	61.6	10.4	13.5	27.7
MTD19077	<u>35.7</u>	61.4	10.0	16.4	28.9
MTD19089	30.8	61.8	10.0	15.1	29.4
MTD19103	32.8	59.7	10.1	15.3	28.3
MTD19109	32.0	61.4	10.2	14.8	26.4
MTD19115	28.1	62.0	10.2	16.1	27.0
MTD19209	29.3	61.6	10.2	15.1	29.4
MTD19241	29.9	60.9	10.2	15.8	26.7
MTD19349	26.6	59.8	10.3	15.3	27.0
MTD19499	28.2	60.1	10.4	15.1	26.0
MTD19507	29.4	59.7	10.1	15.7	24.7
MTD19511	31.5	60.1	10.3	14.6	26.1
MTD19529	29.1	61.7	<u>10.7</u>	13.7	26.6
MTD19611	29.8	61.9	10.4	15.6	24.4
MTD19617	33.3	62.3	10.4	15.6	27.8
MTD19623	31.1	60.5	10.3	15.1	28.8
MTD19653	29.8	62.3	10.3	16.1	28.2
MTD19703	31.6	62.1	10.2	15.1	28.0
Mean	30.6	61.1	10.3	15.0	27.3
LSD (p=0.05)	5.6	1.2	0.4	1.5	2.0
Prob > F	0.078	<0.001	0.030	0.004	<0.001
CV%	10.0	1.0	2.1	5.5	4.3
Lattice RE%	154.7	218.9	139.5	184.5	101.4

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.

Bold and underlined indicate the highest numerical value within a column.

**Yield was impacted by hail storm.

Table 9. Agronomic Data NARC 2024 Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Heading ³ Julian	Maturity ⁴ Julian	Stand %	Falling number ⁵ Sec
Alzada	54.6	57.5	8.6	15.0	30.1	176.0	207.1	99.3	570.2
Carpio	40.2	56.4	8.6	15.1	32.5	182.3	208.8	98.7	499.1
Divide	48.5	57.9	8.8	15.3	35.3	180.0	208.3	98.9	493.0
Joppa	45.5	57.8	8.7	14.9	34.6	180.0	206.4	98.9	482.3
Lustre	51.4	57.8	8.6	14.2	33.5	180.0	206.0	99.3	490.7
Mountrail	48.9	57.9	8.5	15.4	33.1	180.3	206.1	98.2	489.7
MT Blackbeard	48.5	57.1	<u>8.9</u>	15.3	<u>37.2</u>	181.7	209.5	99.2	510.2
MT Raska	<u>57.1</u>	<u>59.7</u>	8.8	15.1	28.5	176.3	207.4	99.3	518.5
WB8148	52.4	58.4	8.8	15.3	25.6	178.0	206.5	99.6	<u>578.0</u>
ND Grano	50.1	58.3	8.8	15.1	34.1	181.7	209.0	98.8	457.2
ND Riveland	39.5	56.1	8.6	15.8	33.7	180.7	208.5	97.8	482.3
ND Stanley	45.1	58.1	8.8	15.8	32.8	181.0	208.8	99.6	462.9
MTD19011	51.3	57.1	8.8	14.9	32.7	178.3	207.6	99.0	471.4
MTD19077	48.3	57.3	8.7	16.3	34.9	180.0	208.2	99.4	397.1
MTD19089	44.1	56.8	8.5	16.9	33.5	180.7	207.8	99.6	333.0
MTD19103	50.7	56.8	8.7	15.5	32.9	181.7	206.4	97.7	404.7
MTD19109	45.1	57.1	8.7	15.0	31.6	181.7	208.1	98.9	531.3
MTD19115	47.8	58.6	8.6	15.1	31.7	179.0	207.5	99.6	515.5
MTD19209	50.5	58.9	8.6	14.6	36.6	<u>182.0</u>	207.9	<u>99.7</u>	495.9
MTD19241	50.5	57.8	8.7	15.2	32.3	180.7	208.2	99.7	485.1
MTD19349	46.2	57.0	8.5	14.8	32.1	179.0	206.2	98.9	465.3
MTD19499	52.0	56.6	8.8	15.3	31.8	178.3	207.8	98.9	415.1
MTD19507	48.0	57.9	8.8	14.9	30.0	178.0	205.3	99.3	348.5
MTD19511	49.8	56.7	8.7	15.5	30.1	177.7	206.5	97.9	389.0
MTD19529	47.2	56.9	8.8	15.1	31.0	178.7	207.7	99.3	337.4
MTD19611	46.8	58.3	8.8	15.4	30.3	177.3	207.4	97.7	434.8
MTD19617	43.5	57.8	8.7	16.0	31.9	181.7	209.7	99.6	487.2
MTD19623	48.1	57.0	8.7	15.0	32.0	178.7	209.3	98.2	498.8
MTD19653	40.9	57.5	8.8	<u>17.4</u>	32.2	179.3	<u>209.9</u>	98.6	443.7
MTD19703	49.8	58.6	8.8	14.9	32.8	179.3	209.0	99.3	428.1
Mean	48.1	57.6	8.7	15.3	32.4	179.7	207.8	99.0	463.9
LSD (p=0.05)	6.9	0.5	0.1	0.8	2.5	1.5	1.6	1.6	38.0
Prob > F	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.232	<0.001
CV%	8.8	0.6	0.6	3.2	4.7	0.5	0.4	0.9	4.9
Lattice RE% ⁶	100.0	100.0	106.7	104.0	100.0	100.0	109.1	101.0	100.8

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³>50% of heads 100% out of boot.⁴>50% of heads 100% loss of green color.⁵Falling number reported on a 14% moisture basis.⁶Adjusted means provided for Lattice RE% values equal to or greater than 100.

Bold and underlined indicate the highest numerical value within a column.

Table 10. Agronomic Data WTARC 2024 Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches
Alzada	34.3	60.6	10.1	15.5	28.0
Carpio	31.8	57.9	10.0	15.7	31.7
Divide	35.0	60.7	10.1	15.2	30.7
Joppa	36.5	60.2	10.2	15.5	31.7
Lustre	35.5	59.5	10.0	15.9	30.7
Mountrail	33.3	60.1	9.9	16.2	31.7
MT Blackbeard	32.3	59.9	<u>10.3</u>	15.9	33.3
MT Raska	30.7	<u>62.0</u>	10.2	16.4	24.7
WB8148	40.1	61.4	10.3	15.7	26.0
ND Grano	32.0	60.9	10.1	15.3	30.3
ND Riveland	29.3	58.4	10.0	16.6	<u>33.7</u>
ND Stanley	35.4	60.4	10.1	15.9	31.0
MTD19011	39.9	59.7	10.1	15.4	31.3
MTD19077	29.9	59.9	10.0	17.6	30.7
MTD19089	35.7	59.8	9.9	17.3	33.3
MTD19103	40.6	59.5	10.1	16.0	29.7
MTD19109	34.9	59.9	10.0	15.9	30.3
MTD19115	37.2	61.3	10.1	15.7	28.3
MTD19209	39.5	60.3	9.9	16.3	33.3
MTD19241	39.3	60.0	10.0	15.6	32.0
MTD19349	33.0	58.7	9.9	16.2	30.3
MTD19499	40.3	57.7	10.1	16.6	31.0
MTD19507	34.3	60.9	10.2	15.7	30.3
MTD19511	33.0	59.0	10.0	16.2	28.3
MTD19529	39.0	60.4	10.2	15.3	30.3
MTD19611	33.3	61.1	10.2	16.6	28.0
MTD19617	40.5	60.9	10.2	17.0	31.3
MTD19623	37.4	59.9	10.0	16.2	31.0
MTD19653	32.0	60.6	10.1	<u>18.1</u>	29.7
MTD19703	<u>40.8</u>	61.3	10.2	15.2	31.0
Mean	35.6	60.1	10.1	16.1	30.5
LSD (p=0.05)	6.4	1.4	0.1	0.9	2.3
Prob > F	0.003	<0.001	<0.001	<0.001	<0.001
CV%	10.8	1.4	0.8	3.0	4.7
Lattice RE% ³	100.0	100.0	120.4	116.7	100.0

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³Adjusted means provided for Lattice RE% values equal to or greater than 100.

Bold and underlined indicate the highest numerical value within a column.

Table 11. Agronomic Data 2nd Nature LLC. Conrad, MT 2024 Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches
Alzada	35.1	57.2	11.8	14.9	23.8
Carpio	33.1	54.7	<u>12.6</u>	16.1	27.1
Divide	32.5	56.4	11.9	15.2	27.6
Joppa	34.4	56.6	11.9	15.3	26.6
Lustre	39.1	55.9	11.8	15.3	27.6
Mountrail	37.0	56.1	12.3	15.2	27.1
MT Blackbeard	38.7	56.6	12.4	15.2	28.1
MT Raska	34.6	<u>58.3</u>	12.0	15.1	22.5
WB8148	44.6	57.8	12.4	16.5	21.8
ND Grano	36.8	56.9	11.8	15.1	26.1
ND Riveland	36.2	55.8	12.2	15.8	<u>28.3</u>
ND Stanley	35.4	56.7	12.5	15.4	26.4
MTD19011	40.5	56.7	11.8	15.2	27.7
MTD19077	30.9	55.7	11.8	15.6	27.4
MTD19089	37.2	55.8	11.8	16.1	27.8
MTD19103	39.9	56.2	12.2	16.3	26.1
MTD19109	38.4	56.4	12.2	14.9	26.0
MTD19115	30.8	57.8	11.8	15.7	22.3
MTD19209	<u>47.2</u>	57.3	11.7	16.1	29.7
MTD19241	38.8	57.0	11.7	15.4	25.7
MTD19349	36.5	53.7	12.4	15.8	27.0
MTD19499	40.5	56.0	11.7	15.3	26.4
MTD19507	35.7	56.7	12.4	15.4	27.2
MTD19511	37.2	56.0	12.3	14.9	24.9
MTD19529	39.4	57.0	12.3	15.4	26.1
MTD19611	39.3	57.9	12.0	15.3	25.7
MTD19617	38.5	57.3	12.0	14.7	27.1
MTD19623	37.9	56.2	11.7	15.6	26.7
MTD19653	28.8	57.2	12.1	<u>16.6</u>	25.3
MTD19703	29.7	57.2	12.4	15.1	27.4
Mean	36.8	56.6	12.1	15.5	26.3
LSD (p=0.05)	7.0	0.9	0.7	1.2	2.7
Prob > F	0.002	<0.001	0.256	0.221	<0.001
CV%	10.9	0.9	3.3	4.8	5.8
Lattice RE% ³	107.5	100.0	132.1	100.0	108.3

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³Adjusted means provided for Lattice RE% values equal to or greater than 100.

Bold and underlined indicate the highest numerical value within a column.

Table 12. Agronomic Data Valley Co., MT 2024 Off-station Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height inches	Lodge 1-10
Alzada	<u>34.9</u>	59.3	10.7	16.2	27.0	2.3
Carpio	25.6	59.5	10.7	18.2	29.3	2.3
Divide	28.3	60.9	10.7	17.2	31.2	3.0
Joppa	27.6	60.6	10.7	17.0	32.4	3.3
Lustre	27.9	59.5	10.5	<u>18.2</u>	30.3	3.0
MTD19011	28.4	60.4	<u>10.8</u>	17.0	29.0	3.7
Mountrail	27.6	60.3	10.5	17.0	29.7	<u>4.0</u>
MT Raska	30.5	<u>62.2</u>	10.6	16.6	23.6	1.3
MT Blackbeard	26.8	59.0	10.8	17.6	<u>34.6</u>	1.7
ND Riveland	28.5	59.7	10.6	17.5	33.6	3.0
Tioga	25.8	60.4	10.7	18.2	32.8	2.0
WB8148	32.0	60.2	10.6	16.1	23.0	3.3
Mean	28.6	60.2	10.7	17.2	29.7	2.8
LSD (p=0.05)	5.2	0.5	0.1	0.8	2.6	1.1
Prob > F	0.046	<0.001	<0.001	<0.001	<0.001	<0.001
CV%	10.5	0.5	0.7	2.6	5.3	22.2

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.

Bold and underlined indicate the highest numerical value within a column.

Table 13. Agronomic Data Sheridan Co., MT 2024 Off-station Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height inches	Lodge 1-10
Alzada	41.3	56.4	10.3	16.7	27.6	0.7
Carpio	40.0	59.7	10.6	<u>17.4</u>	36.4	1.3
Divide	40.1	60.8	10.5	16.3	36.6	1.3
Joppa	41.6	<u>60.8</u>	10.5	16.4	35.4	1.3
Lustre	41.3	59.5	10.3	17.1	36.2	1.7
MTD19011	<u>45.6</u>	60.4	10.5	15.8	36.5	0.3
Mountrail	44.1	59.3	10.4	16.5	36.9	1.0
MT Raska	39.4	60.1	10.3	16.7	25.2	0.3
MT Blackbeard	38.9	59.7	<u>10.7</u>	15.9	<u>39.8</u>	1.0
ND Riveland	42.0	59.7	10.4	16.6	37.3	<u>1.7</u>
Tioga	42.9	60.7	10.6	16.7	38.3	1.3
WB8148	40.5	58.5	10.3	16.3	24.3	0.7
Mean	41.5	59.6	10.4	16.5	34.2	1.1
LSD (p=0.05)	2.1	0.9	0.1	1.3	1.8	1.1
Prob > F	<0.001	<0.001	<0.001	0.481	<0.001	0.210
CV%	3.0	0.9	0.8	4.1	3.0	60.6

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.

Bold and underlined indicate the highest numerical value within a column.

Table 14. Agronomic Data Roosevelt Co., MT 2024 Off-station Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height inches	Lodge 1-10
Alzada	32.3	58.3	10.4	17.0	25.6	0.7
Carpio	26.5	58.3	10.6	19.7	32.0	1.3
Divide	29.5	59.6	10.5	18.8	31.2	1.7
Joppa	27.6	59.7	10.5	19.0	29.3	3.0
Lustre	28.7	58.5	10.3	19.8	29.8	1.3
MTD19011	33.1	60.2	10.6	17.3	29.0	1.7
Mountrail	28.4	58.7	10.3	19.0	29.4	1.3
MT Raska	31.5	60.1	10.4	18.6	23.0	1.0
MT Blackbeard	30.4	59.0	10.6	18.9	32.5	1.0
ND Riveland	25.8	58.2	10.4	19.5	28.7	1.7
Tioga	26.1	58.9	10.5	20.2	30.1	1.7
WB8148	30.0	58.7	10.4	18.4	23.0	1.3
Mean	29.2	59.0	10.5	18.9	28.6	1.5
LSD (p=0.05)	3.4	1.1	0.1	1.1	2.9	1.1
Prob > F	0.001	0.008	<0.001	<0.001	<0.001	0.039
CV%	6.8	1.1	0.7	3.3	6.0	43.0

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.

Bold and underlined indicate the highest numerical value within a column.

Table 15. Agronomic Data McCone Co., MT 2024 Off-station Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Lodge 1-10
Alzada	46.9	63.4	11.0	15.3	29.7	2.3
Carpio	57.8	63.6	11.3	14.1	35.3	1.3
Divide	54.1	64.2	11.2	14.9	35.4	0.7
Joppa	51.9	64.5	11.3	14.5	37.3	2.3
Lustre	57.5	63.3	11.0	15.2	36.2	1.0
MTD19011	55.7	63.3	11.3	15.0	35.3	1.3
Mountrail	56.3	64.1	11.1	15.2	35.2	1.3
MT Raska	43.6	64.6	11.0	16.0	27.6	0.3
MT Blackbeard	52.2	64.5	11.4	14.9	39.6	2.0
ND Riveland	51.2	63.2	11.2	15.7	37.9	1.0
Tioga	49.0	63.8	11.3	15.4	38.7	1.7
WB8148	50.6	64.5	11.1	15.5	26.8	1.0
Mean	52.2	63.9	11.2	15.1	34.6	1.4
LSD (p=0.05)	5.5	0.5	0.1	0.3	2.1	1.2
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV%	6.2	0.5	0.5	1.4	3.6	49.1

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.

Bold and underlined indicate the highest numerical value within a column.

Table 16. Agronomic Data Turner, MT 2024 Off-station Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Lodge Sawfly %	Stand %	Falling Number ³ sec
Alzada	36.8	60.5	10.0	12.2	26.3	3.8	97.6	<u>484.0</u>
Carpio	34.6	58.8	10.1	13.1	29.7	2.8	96.6	453.7
Divide	36.2	60.1	10.1	12.7	29.3	3.4	<u>98.3</u>	441.3
Joppa	35.0	60.4	10.1	<u>13.3</u>	29.6	6.9	96.3	449.7
Lustre	38.0	59.3	9.9	12.1	30.4	4.2	97.3	448.7
MTD19011	36.3	60.4	<u>10.3</u>	11.1	27.1	3.1	97.0	468.7
Mountrail	38.3	60.2	10.0	11.7	28.9	2.7	97.6	439.3
MT Raska	36.2	<u>62.2</u>	10.1	12.6	24.0	2.2	97.3	478.0
MT Blackbeard	<u>38.6</u>	59.9	10.3	12.3	30.5	7.7	96.6	467.7
ND Riveland	37.0	59.4	10.1	13.2	30.1	5.2	97.3	456.0
Tioga	37.1	60.1	10.2	12.5	<u>33.1</u>	<u>8.2</u>	97.6	424.0
WB8148	37.1	60.9	10.2	12.0	23.1	2.2	97.0	453.0
Mean	36.8	60.2	10.1	12.4	28.5	4.4	97.2	455.3
LSD (p=0.05)	1.5	0.7	0.1	0.5	1.9	3.7	2.0	20.8
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	0.024	0.737	<0.001
CV%	2.3	0.6	0.6	2.2	3.9	46.0	1.2	2.6
Lattice RE% ⁴	100.0	111.8	110.3	100.0	100.0	112.9	100.0	100.0

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³Falling number reported on a 14% moisture basis.⁴Adjusted means provided for Lattice RE% values equal to or greater than 100.

Bold and underlined indicate the highest numerical value within a column.

Table 17. Agronomic Data Chester, MT 2024 Off-station Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Lodge Sawfly %	Stand %	Falling Number ³ sec
Alzada	28.4	53.6	9.5	17.6	24.6	0.3	96.5	<u>532.5</u>
Carpio	26.1	51.3	9.5	18.9	26.6	1.1	96.1	424.0
Divide	27.1	53.5	9.5	18.7	28.1	0.3	94.1	436.3
Joppa	25.9	53.2	9.5	18.2	28.1	1.0	97.0	408.6
Lustre	22.6	52.4	9.3	18.8	26.1	0.3	<u>98.9</u>	433.5
MTD19011	28.2	52.3	9.6	18.5	25.8	0.4	95.9	425.6
Mountrail	26.2	53.6	9.3	19.2	27.1	1.0	96.2	421.9
MT Raska	23.2	<u>55.2</u>	9.6	18.2	23.8	0.1	96.3	452.4
MT Blackbeard	<u>29.5</u>	52.6	<u>9.6</u>	18.8	<u>30.2</u>	<u>3.7</u>	97.6	487.7
ND Riveland	24.0	52.2	9.5	18.6	29.1	0.6	96.5	453.4
Tioga	21.4	52.9	9.5	<u>19.5</u>	26.5	0.7	93.0	375.5
WB8148	26.3	53.7	9.6	18.4	23.2	0.0	97.6	509.3
Mean	25.7	53.0	9.5	18.6	26.6	0.8	96.3	446.7
LSD (p=0.05)	2.6	0.7	0.1	0.4	1.1	1.3	3.4	36.2
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.109	<0.001
CV%	5.9	0.7	0.7	1.3	2.2	88.9	1.9	4.3
Lattice RE% ⁴	100.0	106.9	127.5	100.0	152.2	102.7	109.6	151.3

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³Falling number reported on a 14% moisture basis.⁴Adjusted means provided for Lattice RE% values equal to or greater than 100.

Bold and underlined indicate the highest numerical value within a column.

Table 18. Agronomic Data Loring, MT 2024 Off-station Rainfed Durum Advanced Yield Trial.

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height inches	Lodge Sawfly %	Stand %	Falling Number ³ sec
Alzada	47.5	58.4	11.0	14.6	30.3	11.7	98.3	<u>554.0</u>
Carpio	40.2	57.7	11.3	15.2	32.8	8.3	97.7	462.7
Divide	42.8	58.9	11.2	15.0	31.2	5.0	98.0	461.0
Joppa	38.0	58.9	11.3	14.8	32.3	13.3	98.0	450.3
Lustre	42.6	57.7	11.0	14.4	34.4	10.0	99.0	477.3
MTD19011	<u>48.5</u>	58.3	<u>11.5</u>	14.6	31.0	8.3	98.0	513.7
Mountrail	47.7	58.3	11.0	14.6	32.7	13.3	98.7	456.7
MT Raska	45.0	<u>60.2</u>	11.1	15.2	25.9	3.7	<u>99.0</u>	509.0
MT Blackbeard	43.3	58.0	11.4	15.3	34.4	10.0	98.0	492.0
ND Riveland	39.0	57.4	11.3	15.4	32.6	10.0	97.3	488.3
Tioga	40.5	58.3	11.4	<u>15.5</u>	<u>35.8</u>	<u>13.3</u>	98.3	456.7
WB8148	44.9	59.4	11.2	14.8	27.3	6.7	97.7	498.0
Mean	43.3	58.5	11.2	15.0	31.7	9.5	98.2	485.0
LSD (p=0.05)	3.1	0.3	0.2	0.6	2.7	6.3	1.6	25.4
Prob > F	<0.001	<0.001	<0.001	0.035	<0.001	0.056	0.528	<0.001
CV%	3.7	0.3	0.8	2.3	4.8	38.1	0.9	3.0
Lattice RE% ⁴	185.1	161.9	100.0	111.0	103.6	100.0	100.0	100.0

¹Grain yield reported on a 13% moisture basis.²Grain protein reported on a 12% moisture basis.³Falling number reported on a 14% moisture basis.⁴Adjusted means provided for Lattice RE% values equal to or greater than 100.

Bold and underlined indicate the highest numerical value within a column.

Table 19. Seed Traits from All 2024 On-station Durum Advanced Yield Trials (n=7).

ID	Test Weight lbs/bu	Large Seeds ¹ %	Small Seeds ² %	Hardness Index ³	Individual Seed Weight ³ mg	Individual Seed Diameter ³ mm	Grain Protein ⁴ %	Grain Ash ⁴ %	Falling Number ⁵ sec
Alzada	60.0	<u>65.2</u>	9.5	69.7	<u>42.0</u>	<u>3.00</u>	14.4	1.48	<u>528.1</u>
Carpio	59.9	44.6	18.4	70.8	37.6	2.77	14.8	1.43	445.7
Divide	60.8	44.3	16.4	71.9	38.9	2.81	14.2	1.39	448.7
Joppa	60.8	36.5	21.8	72.6	38.6	2.76	14.3	1.44	477.4
Lustre	59.7	29.8	20.9	72.0	37.4	2.73	14.5	1.40	466.4
Mountrail	59.8	29.6	26.2	71.1	37.6	2.73	15.2	1.47	449.1
MT Blackbeard	60.3	63.0	12.3	72.2	41.1	2.91	14.5	1.48	484.4
MT Raska	<u>61.4</u>	45.1	19.2	<u>78.5</u>	35.8	2.78	15.1	1.47	454.9
WB8148	60.2	37.1	21.1	77.0	36.2	2.76	14.7	1.47	504.9
ND Grano	61.0	38.3	21.3	71.3	38.0	2.76	14.7	1.45	450.9
ND Riveland	60.1	48.1	16.7	69.1	39.5	2.80	14.9	1.49	498.9
ND Stanley	61.4	44.6	17.9	72.7	38.4	2.81	15.0	1.49	449.9
MTD19011	60.0	51.0	15.4	70.9	40.0	2.82	14.5	1.40	486.1
MTD19077	60.3	47.7	16.7	68.7	38.8	2.81	<u>15.9</u>	1.53	427.3
MTD19089	60.4	47.8	16.5	68.6	38.5	2.79	15.7	1.50	427.9
MTD19103	60.0	51.8	14.9	69.3	40.1	2.82	14.9	1.45	409.4
MTD19109	60.1	29.2	27.7	73.6	34.3	2.65	14.5	<u>1.54</u>	488.1
MTD19115	61.1	40.4	22.1	73.4	35.2	2.74	14.9	1.50	445.6
MTD19209	60.9	30.9	25.7	76.0	36.1	2.65	14.8	1.43	475.3
MTD19241	60.7	33.3	23.6	75.6	34.6	2.69	14.8	1.42	469.3
MTD19349	59.6	35.0	23.0	74.3	34.8	2.72	14.9	1.42	461.1
MTD19499	59.2	45.9	17.9	76.6	35.5	2.80	14.9	1.52	435.0
MTD19507	60.3	29.7	<u>28.1</u>	76.1	32.7	2.66	14.9	1.52	454.6
MTD19511	59.6	48.9	16.2	75.8	35.4	2.78	14.9	1.50	415.0
MTD19529	60.5	47.0	17.9	74.2	35.9	2.82	14.2	1.44	379.1
MTD19611	61.1	48.7	16.9	75.7	37.3	2.85	15.4	1.50	447.4
MTD19617	61.3	37.6	21.2	76.7	36.3	2.77	15.3	1.49	489.3
MTD19623	59.8	53.2	14.9	72.7	38.9	2.85	14.6	1.48	463.1
MTD19653	61.4	40.5	21.4	72.8	35.8	2.76	15.5	1.52	497.6
MTD19703	61.3	39.9	21.3	75.1	36.9	2.76	14.7	1.42	443.3
Mean	60.4	42.8	19.4	73.2	37.3	2.78	14.8	1.47	459.1
LSD(0.05)	0.7	7.1	4.3	2.5	1.7	0.07	0.6	0.1	44.1
Prob>F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV(%)	1.1	15.8	21.1	3.2	4.2	2.3	4.0	3.3	9.1

¹Seeds $\geq$ #7 Tyler Mesh²Seeds #9 $\geq$ #12 Tyler Mesh³Determined using the single kernel characterization system.⁴Reported on a 12% moisture basis⁵Reported on a 14% moisture basis

Bold and underlined indicate the highest numerical value within a column.

Table 20. Milling Quality from All 2024 On-station Durum Advanced Yield Trials (n=7).

ID	Bran ¹ %	Shorts ¹ %	Semolina Yield ¹ %	Semolina Protein ² %	Semolina Ash ² %
Alzada	26.6	8.1	65.3	13.2	0.73
Carpio	29.5	7.6	63.0	13.4	0.69
Divide	28.3	7.1	64.6	12.8	0.65
Joppa	28.4	7.1	64.6	12.9	0.67
Lustre	28.3	7.4	64.3	13.2	0.67
Mountrail	28.7	7.2	64.1	14.1	0.71
MT Blackbeard	28.2	7.6	64.2	13.0	0.71
MT Raska	27.3	7.2	<u>65.5</u>	13.8	0.69
WB8148	28.4	7.8	63.8	13.6	0.70
ND Grano	28.2	7.1	64.6	13.3	0.66
ND Riveland	30.8	7.7	61.5	13.5	0.68
ND Stanley	28.4	7.2	64.5	13.5	0.67
MTD19011	27.8	7.6	64.6	13.0	0.65
MTD19077	29.9	7.6	62.5	<u>14.4</u>	<u>0.74</u>
MTD19089	30.0	7.6	62.4	14.2	0.74
MTD19103	28.9	8.1	63.0	13.5	0.71
MTD19109	29.7	7.1	63.2	13.1	0.71
MTD19115	29.9	7.4	62.7	13.4	0.70
MTD19209	28.5	8.0	63.4	13.6	0.71
MTD19241	<u>30.9</u>	7.5	61.6	13.3	0.66
MTD19349	29.8	7.7	62.4	13.6	0.69
MTD19499	29.7	7.2	63.1	13.4	0.69
MTD19507	29.4	7.3	63.4	13.4	0.72
MTD19511	30.1	7.4	62.5	13.4	0.69
MTD19529	29.8	7.7	62.5	12.8	0.68
MTD19611	29.4	7.5	63.2	14.0	0.69
MTD19617	30.5	8.1	61.4	14.1	0.70
MTD19623	30.3	<u>8.5</u>	61.2	13.2	0.72
MTD19653	28.9	7.3	63.8	14.2	0.70
MTD19703	28.9	6.8	64.3	13.3	0.66
Mean	29.1	7.5	63.4	13.5	0.69
LSD(0.05)	0.8	0.3	0.9	0.6	0.0
Prob>F	<0.001	<0.001	<0.001	<0.001	<0.001
CV(%)	2.5	4.3	1.4	4.5	4.5

¹Milled on Brabender Quadrumat Jr. Mill. Shorts sifted using a #35 US sieve.²Reported on a 14% moisture basis

Bold and underlined indicate the highest numerical value within a column.

Table 21. Semolina Quality from All 2024 On-station Durum Advanced Yield Trials (n=7).

ID	L^* ¹	b^* ¹	a^* ¹	Mix Time ² min	Peak Intergral ² % Tq ³ min	Gluten Index ³
Alzada	83.6	32.0	-2.6	4.6	240.0	90.3
Carpio	84.2	30.9	-3.0	4.4	220.7	90.5
Divide	84.5	28.2	-2.6	3.7	172.7	68.8
Joppa	84.5	31.2	-2.9	4.4	196.6	75.6
Lustre	84.1	29.3	-2.4	3.6	166.8	65.0
Mountrail	<u>84.5</u>	27.2	<u>-2.4</u>	2.5	109.5	13.6
MT Blackbeard	84.3	31.2	-3.0	4.9	<u>249.6</u>	<u>92.6</u>
MT Raska	83.9	29.6	-2.5	4.6	192.0	80.2
WB8148	83.6	32.4	-2.7	5.1	237.8	90.0
ND Grano	84.4	31.5	-3.0	3.7	175.0	76.8
ND Riveland	84.2	31.0	-2.9	4.2	202.7	75.7
ND Stanley	84.5	30.4	-2.9	3.8	180.8	79.9
MTD19011	84.2	31.2	-2.7	3.9	177.6	61.7
MTD19077	83.7	34.9	-3.1	3.6	162.4	47.7
MTD19089	83.7	35.2	-3.1	3.4	153.9	40.8
MTD19103	83.8	30.7	-2.5	4.5	201.3	83.1
MTD19109	84.2	32.9	-3.1	3.9	193.1	82.0
MTD19115	84.0	33.0	-2.9	4.2	189.0	71.8
MTD19209	83.7	30.1	-2.5	3.9	176.0	53.5
MTD19241	83.9	32.2	-2.9	4.1	182.3	59.7
MTD19349	83.8	31.8	-2.6	3.3	155.9	53.1
MTD19499	83.8	34.5	-3.0	4.2	191.0	73.7
MTD19507	83.8	35.3	-2.9	4.5	214.9	86.8
MTD19511	83.7	<u>35.7</u>	-3.0	4.4	209.9	81.4
MTD19529	83.7	35.0	-3.0	4.4	195.3	82.0
MTD19611	84.1	31.7	-2.8	<u>5.4</u>	231.5	85.6
MTD19617	84.1	30.9	-2.8	3.6	168.3	45.4
MTD19623	83.5	34.0	-2.9	4.6	225.2	85.6
MTD19653	84.1	30.4	-2.7	3.8	170.0	59.8
MTD19703	84.1	31.4	-2.7	3.8	161.6	51.7
Mean	84.0	31.9	-2.79	4.1	190.1	70.1
LSD(0.05)	0.3	0.7	0.1	0.4	20.4	14.9
Prob>F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV(%)	0.3	2.1	4.8	9.2	10.2	10.4

¹Determined using the Konica Minolta CR-400 Chroma Meter using CIELAB Color Space L^* =whiteness, b^* =yellowness, a^* =redness.

²Determined using MixSmart software.

³n=2, Bozeman rainfed and NARC rainfed. Determined using Perten Glutomatic.

Bold and underlined indicate the highest numerical value within a column.

Table 22. Durum Fusarium Head Blight Evaluation 2024 (Dr. Frankie Crutcher, EARC, Sidney, MT).

ID	Severity ^a %	Incidence ^b %	Index ^c	FDK ^d %	Yield ^e lbs/ac	DON Ppm
Alzada	72.9 A	98.9 AB	72.1 A		466.8 F	
Carpio	17.4 EF	77.8 A-D	13.6 DE		2619.0 A	
Divide	23.6 C-F	74.4 CD	17.6 C-E		2553.0 AB	
Joppa	28.3 C-F	80.0 A-D	22.7 C-E		1873.8 A-D	
Lustre	37.8 B-E	80.0 A-D	30.7 B-E		2126.8 A-C	
Mountrail	34.6 B-F	92.2 A-D	32.1 B-E		1614.5 A-E	
MT Blackbeard	25.9 C-F	77.8 A-D	21.1 C-E		2329.9 A-C	
MT Raska	70.6 A	100.0 A	70.6 A		882.0 D-F	
MTD19011	28.8 C-F	82.2 A-D	23.7 C-E		2175.2 A-C	
MTD19077	15.6 F	70.0 D	11.1 E		2246.8 A-C	
MTD19089	19.7 D-F	70.0 D	13.8 DE		2303.5 A-C	
MTD19103	24.9 C-F	76.7 B-D	19.2 C-E		2211.7 A-C	
MTD19109	26.4 C-F	80.0 A-D	21.1 C-E		1841.3 A-D	
MTD19115	30.6 C-F	86.7 A-D	27.0 C-E		1728.0 A-E	
MTD19209	28.2 C-F	81.1 A-D	23.4 C-E		2152.5 A-C	
MTD19241	33.6 B-F	84.4 A-D	28.6 C-E		1793.8 A-D	
MTD19349	34.7 B-F	81.1 A-D	28.8 C-E		1660.6 A-E	
MTD19499	41.3 BC	92.2 A-D	38.2 BC		1440.9 B-F	
MTD19507	39.1 B-D	87.8 A-D	34.2 B-D		1767.0 A-D	
MTD19511	41.2 B-D	93.3 A-C	38.7 BC		1457.0 B-F	
MTD19529	40.9 B-D	88.9 A-D	37.3 BC		1897.0 A-D	
MTD19611	37.7 B-E	88.9 A-D	33.3 B-E		1351.0 C-F	
MTD19617	31.6 C-F	86.7 A-D	27.2 C-E		1971.5 A-C	
MTD19623	25.1 C-F	84.4 A-D	21.2 C-E		1829.1 A-D	
MTD19653	32.6 B-F	88.9 A-D	29.3 B-E		1398.2 C-F	
MTD19703	34.3 B-F	84.4 A-D	29.1 C-E		1758.9 A-E	
ND Grano	34.1 B-F	81.1 A-D	27.6 C-E		1746.5 A-E	
ND Riveland	21.2 C-F	75.6 CD	16.0 C-E		2733.6 A	
ND Stanley	34.4 B-F	92.2 A-D	31.8 B-E		1418.0 C-F	
WB8148	53.9 AB	96.7 A-C	52.1 AB		741.7 EF	
Mean	34.0	84.5	29.8		1796.5	
% CV	41.2	11.6	51.3		32.1	
HSD (0.05)	21.6	23.3	22.9		1255.3	
<i>P</i> -value	<0.0001	<0.0001	<0.0001		<0.0001	

Letters in common did not differ significantly according to a Tukey's HSD test at a significance level of 5%.

^aPest Severity: Mean percent area of head covered by disease. Thirty heads were evaluated for each plot.

^bPest Incidence: Percent of thirty plants per plot that had visible FHB symptoms.

^cIndex: Severity X Incidence / 100.

^dFusarium diseased kernels.

^eGrain yield adjusted to 14.0% moisture.

Table 23. Durum Stripe Rust Evaluation by Natural Infection 2024 (Dr. Xianming Chen, USDA-ARS, Pullman, WA).

ID	Pullman, WA		Mount Vernon, WA ³				Central Ferry, WA ⁴	
	7/11		6/6		6/25		7/2	
	Feekes IT ¹	10.5 % ²	Feekes IT ¹	6 % ²	Feekes IT ¹	10.5 % ²	Feekes IT ¹	10.5 % ²
Alzada	5	20	2	5	2	10	2	5
Carpio	3	10	2	5	2	20	2	5
Divide	2	10	2	5	3	20	2	5
Joppa	3	20	8	10	3	30	2	5
Lustre	3	20	2	5	2	20	2	5
Mountrail	3	20	2	5	8	70	5	10
MT Blackbeard	5	40	2	5	5	40	2	5
MT Raska	5	40	8	20	8	80	-	-
WB8148	3	20	8	30	5	50	5	10
ND Grano	2	10	2	5	2	10	2	10
ND Riveland	2	10	2	5	5	40	2	10
ND Stanley	2	10	2	5	3	30	3	10
MTD19011	3	20	2	5	2	20	2	5
MTD19077	3	20	2	5	2	20	2	5
MTD19089	3	20	2	5	2	20	2	5
MTD19103	3	20	2	5	2	20	2	5
MTD19109	3	20	2	5	2	20	2	5
MTD19115	8	50	2	5	3	30	-	-
MTD19209	3	20	5	20	3	30	2	5
MTD19241	3	20	2	5	2	20	-	-
MTD19349	3	20	2	5	3	20	5	30
MTD19499	3	30	2	5	2	20	8	20
MTD19507	3	20	8	20	3	30	-	-
MTD19511	3	20	2	10	2	20	8	20
MTD19529	5	20	2	5	2	20	5	10
MTD19611	3	20	2	10	2	10	5	10
MTD19617	3	20	2	5	3	20	2	5
MTD19623	5	50	5	20	3	20	8	30
MTD19653	5	50	3	20	3	20	8	20
MTD19703	3	20	5	20	3	20	5	10
AvS	9	100	9	80	9	100	8	80

¹Infection Type (IT) was recorded based on the 0-9 scale with ITs 8 and 9 combined as 8 (the most susceptible reaction) in field data. Generally, IT 0-3 are considered resistant, 4-6 intermediate, and 7-9 susceptible.

²Percent severity.

³Entries with a high IT in the first note, but a low IT in the second note at Mt. Vernon may indicate that they have high-temperature, adult-plant (HTAP) resistance.

⁴Stripe rust did not reach uniform level.

Table 24. Durum Fungal Leaf Spot Evaluation 2024 (Dr. Zhaohui Liu, NDSU, Fargo, ND).

ID	ToxA ¹	Pti2R2 ²	Pti2R3 ²	DW5R1 ²	Sn4 ³
Alzada	0	3	3	3	2.5
Carpio	3	2.5	2	3	2.5
Divide	3	2.5	3.5	3	1.5
Joppa	3	2.5	3	3.5	2
Lustre	3	2.5	4.5	1	2
Mountrail	0	4	2.5	3.5	3.5
MT Blackbeard	3	2	2	3	1
MT Raska	3	1	2	1	2
WB8148	3	2	2.5	1.5	3
ND Grano	3	3	4	2	4.5
ND Riveland	0	1	2	2.5	3.5
ND Stanley	3	2	2.5	1.5	2
MTD19011	3	2	2	2	2.5
MTD19077	0	1	4	3	1
MTD19089	0	3.5	4	2.5	1
MTD19103	1	1.5	2.5	4	3
MTD19109	3	3	3	4	2.5
MTD19115	3	3	3.5	3.5	2.5
MTD19209	3	2.5	4	3.5	3
MTD19241	3	2	2.5	1	2
MTD19349	3	1	2	1	1
MTD19499	3	3	4	4	2.5
MTD19507	3	3	4.5	4	3
MTD19511	3	3	3	3	2
MTD19529	2	3	4	4	2
MTD19611	2	2.5	3	3	3.5
MTD19617	3	2.5	4	4	3
MTD19623	3	3	3	2	1
MTD19653	3	3.5	4.5	3.5	3.5
MTD19703	3	2.5	4.5	4	2.5
Salamouni	0	1	1.5	1	
Glenlea	3	3.5	5	3	
6B365	0	4	3.5	2.5	
6B662	0	2	3	4	

¹*P. tritici-repentis* (Ptr) ToxA: 0=insensitive; 1-3=sensitive, ND=no data. ToxA sensitivity is conferred by wheat *Tsn1*

²Evaluation with Ptr races (predominant in North Dakota) and DW5 using a 0-5 scale, 1,2=resistant, 3=moderately susceptible, 4, 5=highly susceptible, averaged over 3 plants.

³Evaluation with *Septoria nodorum* isolate Sn4 (predominant in North Dakota) using 0-5 scale, 0-2=resistant, 3=moderately susceptible, 4,5=highly susceptible, averaged over 3 plants.