PROJECT TITLE:

2023 STATEWIDE DURUM VARIETY TRIALS

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OBJECTIVE:

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

METHODS:

In 2023, 18 experimental durum lines developed at MSU (MT), one experimental line developed by Nutrien Ag Solutions, and 11 released durum varieties including releases from WestBred, North Dakota State University and the Montana Agricultural Experiment Station (MAES) (Table 1). Dryland 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). A dryland re-crop trial and an irrigated trial was grown in Sidney, MT (MSU-EARC). Two off-station experiments were planted in Eastern Montana in Roosevelt 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. One off-station trial was planted near Valier, MT and maintained by WTARC 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 a 5x6 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, 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 by Dr. Xianming Chen (USDA). Disease evaluations for fungal leaf spot were conducted in the greenhouse at North Dakota State University by Dr. Zhaohui Liu and stem rust evaluations were conducted at MSU in the greenhouse by Dr. Li Huang.

Mean agronomic performance for all 2023 on-station trials can be found in Table 2. Agronomic performance for individual 2023 on-station trials is found in Tables 3-8 and data for off-station trials and re-crop is found in Tables 9-15. Mean seed quality is summarized in Table 16, milling data in Table 17, and semolina quality in Table 18. Disease evaluations for Fusarium head blight, stripe rust, fungal leaf spot, and stem rust are found in Tables 19-22.

Table 1. Varieties tested in 2023 State Durum Trial

ID	Origin[3]	Release Year
Alzada	Westbred	2004
Carpio	NDSU	2012
Divide	NDSU	2005
Joppa	NDSU	2013
Lustre[1]	MAES	2021
Mountrail	NDSU	1998
MT Blackbeard[1]	MAES	2022
MT Raska	MAES	2022
ND Grano[1]	NDSU	2017
ND Riveland[1]	NDSU	2017
WB8148	Westbred	2023
YUM-816-065	Nutrien Ag Solutions	\
MTD19011[1]	MSU	\
MTD19077[1]	MSU	\
MTD19089[1]	MSU	\
MTD19103[1]	MSU	\
MTD19109[1]	MSU	\
MTD19115[1]	MSU	\
MTD19209[1]	MSU	\
MTD19241[1,2]	MSU	\
MTD19349[1]	MSU	\
MTD19499[1, 2]	MSU	\
MTD19507[1]	MSU	\
MTD19511[1]	MSU	\
MTD19529	MSU	\
MTD19611[2]	MSU	\
MTD19617[2]	MSU	\
MTD19623[1]	MSU	\
MTD19653[1]	MSU	\
MTD19703	MSU	\

[1]Low cadmium accumulating line.
[2]Solid stem line.
[3]MAES- Montana Agricultural Experiment Station, MSU-Montana State University, NDSU-North Dakota State University.

Table 2. Agronomic Data On-Station All Locations 2023 Durum Variety Trial (n=5)

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %	Plant Height Inches	Heading[3] Julian
Alzada	86.1	60.1	10.2	13.7	29.6	179.5
Carpio	87.1	62.3	10.2	13.7	40.3	183.9
Divide	80.8	61.8	10.1	13.8	38.9	182.8
Joppa	85.5	62.1	10.0	13.5	38.9	182.4
Lustre	85.3	60.6	10.0	13.6	39.1	183.5
Mountrail	80.3	61.2	10.0	13.9	38.2	183.1
MT Blackbeard	84.8	62.5	10.3	13.6	**42.8**	184.5
MT Raska	87.5	62.5	10.2	13.6	28.3	180.1
WB8148	79.5	60.6	10.0	14.0	26.3	180.8
MTD19011	85.1	61.7	10.1	13.9	38.7	182.3
MTD19077	81.6	62.2	10.2	**14.6**	40.9	184.0
MTD19089	81.8	62.5	9.9	14.4	40.1	184.7
MTD19103	79.0	61.5	10.1	13.8	38.5	182.5
MTD19109	79.0	61.7	9.9	13.4	38.9	184.5
MTD19115	83.0	62.2	9.8	13.4	38.8	182.6
MTD19209	86.3	62.8	9.9	13.8	41.9	**184.6**
MTD19241	83.4	61.6	9.8	14.0	38.1	183.0
MTD19349	84.5	60.9	9.8	13.7	39.1	184.3
YUM-816-065	78.1	59.4	9.8	13.0	29.0	179.5
MTD19499	81.1	60.7	10.2	13.8	38.0	183.2
MTD19507	84.4	60.9	10.1	14.2	38.2	182.1
MTD19511	**88.7**	61.0	10.1	13.4	35.5	182.3
MTD19529	81.1	61.0	10.1	13.6	39.8	182.4
MTD19611	83.3	62.5	10.1	14.6	37.2	182.1
MTD19617	87.1	**63.1**	**10.2**	14.2	38.4	183.5
MTD19623	80.9	61.2	10.2	13.7	39.0	182.4
MTD19653	80.4	62.9	10.2	14.5	38.1	183.8
MTD19703	85.6	62.4	10.1	14.0	40.2	183.6
ND Grano	84.3	62.3	10.1	13.9	39.5	183.4
ND Riveland	84.7	61.9	10.2	13.6	41.5	183.2
Average	83.4	61.7	10.1	13.8	37.7	186.2
LSD (p=0.05)	8.6	0.7	0.3	0.6	2.6	1.0
Prob > F	0.637	<0.001	0.056	<0.001	<0.001	<0.001
CV%	8.2	1.0	2.5	3.6	5.5	0.4

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]>50% of heads 100% out of boot.
-No Data from WTARC or NARC
Bold and underlined indicate the highest numerical value within a column.

Table 3. Agronomic Data Bozeman Dryland-A 2023 Durum Variety Trial

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %	Plant Height Inches	Heading[3] Julian	Maturity[4] Julian
Alzada	114.0	57.2	8.9	14.4	28.3	189.0	219.4
Carpio	106.2	60.4	8.9	14.0	46.0	193.0	225.0
Divide	90.8	59.3	8.6	14.3	40.0	192.0	223.4
Joppa	110.2	61.1	9.0	13.0	43.7	191.7	224.0
Lustre	104.4	58.3	8.5	14.2	44.3	192.0	223.3
Mountrail	79.4	59.7	8.5	14.1	43.3	192.3	221.7
MT Blackbeard	94.7	60.6	9.1	13.6	**47.7**	193.0	224.5
MT Raska	109.9	60.1	8.9	14.2	28.0	189.3	222.3
WB8148	90.6	59.0	8.7	14.6	25.7	190.0	222.8
MTD19011	98.3	60.2	8.6	13.9	43.7	192.0	223.6
MTD19077	85.0	60.8	8.7	14.9	46.3	193.0	225.2
MTD19089	109.0	61.2	8.6	14.6	47.3	193.0	225.2
MTD19103	89.2	59.4	8.6	14.4	44.3	192.0	224.6
MTD19109	83.5	59.1	7.5	13.5	44.0	193.0	**225.9**
MTD19115	98.4	59.5	7.5	14.0	43.7	192.0	225.1
MTD19209	96.3	60.8	8.4	13.9	47.3	193.0	225.3
MTD19241	92.1	58.7	7.9	13.9	41.0	192.3	223.7
MTD19349	95.9	58.3	7.7	14.5	43.3	**193.3**	223.9
YUM-816-065	98.0	58.4	7.4	12.7	28.3	189.3	221.7
MTD19499	98.1	59.5	8.9	14.1	42.0	192.3	226.1
MTD19507	94.4	59.3	9.0	14.6	43.3	192.0	223.1
MTD19511	**118.5**	59.2	8.6	14.5	42.3	192.0	224.3
MTD19529	97.2	60.1	8.8	13.6	45.7	192.3	225.5
MTD19611	103.9	60.5	8.6	**15.1**	40.7	192.0	224.4
MTD19617	113.1	**61.7**	**9.1**	14.1	42.3	192.3	226.3
MTD19623	105.0	59.4	9.0	14.2	43.3	192.0	224.7
MTD19653	94.0	61.4	9.0	15.1	44.0	193.0	224.6
MTD19703	98.3	60.1	8.9	14.0	45.3	193.0	223.6
ND Grano	87.9	61.0	8.7	13.7	44.3	192.3	224.1
ND Riveland	96.1	60.2	8.7	13.9	45.7	192.0	225.6
Average	98.4	59.8	8.6	14.1	41.8	192.0	224.1
LSD (p=0.05)	23.0	1.2	0.6	0.9	2.1	0.7	1.9
Prob > F	0.246	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV%	12.1	1.2	1.7	3.5	3.0	0.2	0.5
Lattice RE%[5]	109.2	131.6	100.0	127.5	100.0	100.1	109.5

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]>50% of heads 100% out of boot.
[4]>50% of heads senesced.
[5]Adjusted means provided for Lattice RE% values equal to or greater than 100.
Bold and underlined indicate the highest numerical value within a column.

Table 4. Agronomic Data Bozeman Dryland-B 2023 Durum Variety Trial

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %	Plant Height Inches	Heading[3] Julian	Maturity[4] Julian
Alzada	102.3	58.7	10.7	14.7	27.7	188.1	218.6
Carpio	102.7	61.0	10.5	15.2	43.7	193.0	223.3
Divide	89.2	59.6	10.2	15.2	41.0	191.6	221.1
Joppa	87.6	59.3	10.4	14.6	42.0	191.1	222.5
Lustre	84.8	58.0	10.2	15.1	40.7	191.9	220.4
Mountrail	81.9	59.0	10.1	**15.5**	42.7	191.8	220.4
MT Blackbeard	94.3	60.6	10.7	14.4	**46.3**	193.3	225.4
MT Raska	97.3	61.0	**10.9**	13.9	27.3	190.0	221.9
WB8148	91.0	59.4	10.3	15.0	26.0	188.9	221.0
MTD19011	100.0	60.2	10.6	15.2	42.3	191.0	222.9
MTD19077	99.4	61.0	10.6	15.1	45.0	193.2	223.6
MTD19089	87.9	61.1	10.1	14.8	44.3	**193.4**	224.0
MTD19103	96.4	60.2	10.5	14.9	42.7	191.7	223.5
MTD19109	92.6	60.1	10.6	15.5	41.3	193.1	226.0
MTD19115	83.5	60.9	10.4	14.8	41.0	191.7	224.1
MTD19209	94.7	61.4	10.6	15.1	45.7	193.0	223.7
MTD19241	93.5	60.0	10.4	15.4	39.0	191.5	220.6
MTD19349	88.6	58.4	10.6	14.6	42.0	193.0	223.0
YUM-816-065	83.1	56.8	10.5	14.3	27.3	188.1	219.0
MTD19499	93.3	58.5	10.6	14.8	41.3	191.9	222.8
MTD19507	100.7	59.4	10.3	14.7	40.3	191.0	220.7
MTD19511	98.8	59.2	10.6	15.1	38.0	190.9	222.9
MTD19529	98.7	59.2	10.4	14.2	43.3	191.4	225.1
MTD19611	92.7	61.2	10.5	15.1	38.3	191.6	222.7
MTD19617	103.2	**61.9**	10.4	14.9	41.0	192.3	**226.4**
MTD19623	84.9	59.4	10.4	15.0	41.7	191.9	223.7
MTD19653	90.0	61.4	10.6	14.5	40.3	192.8	223.0
MTD19703	90.3	61.1	10.4	15.2	43.7	192.6	222.4
ND Grano	**103.6**	60.9	10.5	14.1	42.7	192.1	221.8
ND Riveland	101.6	60.3	10.4	14.4	44.7	191.8	224.1
Average	93.6	60.0	10.5	14.8	40.1	191.7	222.7
LSD (p=0.05)	18.6	1.5	0.4	1.1	2.0	0.9	2.6
Prob > F	0.422	<0.001	0.065	0.327	<0.001	<0.001	<0.001
CV%	11.2	1.4	2.3	4.1	3.0	0.3	0.6
Lattice RE%[5]	122.1	125.3	110.2	110.3	100.0	129.6	159.6

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]>50% of heads 100% out of boot.
[4]>50% of heads senesced.
[5]Adjusted 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 NARC Dryland 2023 Durum Variety Trial

ID	Plant Height Inches	Sawfly[1] %	Heading[2] Julian
Alzada	30.7	0.9	171.0
Carpio	30.1	0.6	175.7
Divide	32.8	0.1	175.3
Joppa	31.4	0.3	174.0
Lustre	31.9	0.4	175.7
Mountrail	30.3	1.1	175.3
MT Blackbeard	33.6	1.0	177.0
MT Raska	26.0	0.7	172.0
WB8148	25.1	2.3	172.3
MTD19011	31.9	1.9	175.0
MTD19077	31.2	0.8	177.7
MTD19089	33.8	2.0	177.7
MTD19103	31.4	0.2	175.0
MTD19109	31.5	0.7	177.7
MTD19115	31.6	0.4	175.3
MTD19209	33.1	0.3	**178.0**
MTD19241	32.4	0.5	175.7
MTD19349	30.5	0.3	176.0
YUM-816-065	28.3	2.4	170.7
MTD19499	32.1	1.0	175.0
MTD19507	32.1	2.4	172.7
MTD19511	30.7	0.6	174.0
MTD19529	**34.3**	0.4	174.7
MTD19611	32.1	0.6	173.7
MTD19617	30.6	0.2	176.0
MTD19623	31.7	1.9	174.7
MTD19653	30.8	0.7	175.7
MTD19703	31.9	0.3	175.7
ND Grano	32.7	2.4	176.3
ND Riveland	32.0	**2.5**	175.0
Average	31.3	1.0	175.0
LSD (p=0.05)	1.9	2.2	1.0
Prob > F	<0.001	0.422	<0.001
CV%	3.7	133.3	0.4
Lattice RE%[3]	100.0	102.0	100.0

[1]Lodging due to sawfly cutting visually estimated at maturity.
[2]>50% of heads 100% out of boot.
[3]Adjusted means provided for Lattice RE% values equal to or greater than 100%.
Bold and underlined indicate the highest numerical value within a column.

Table 6. Agronomic Data CARC Dryland 2023 Durum Variety Trial

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %	Plant Height Inches	Heading[3] Julian
Alzada	**52.0**	62.9	9.8	13.3	30.0	192.3
Carpio	41.6	63.1	9.9	14.3	33.0	194.0
Divide	45.1	64.5	10.1	13.1	35.4	192.7
Joppa	42.9	63.4	9.2	13.7	34.7	193.0
Lustre	45.5	62.3	10.2	14.1	34.6	193.7
Mountrail	41.5	61.2	9.7	15.1	31.9	193.3
MT Blackbeard	45.4	63.9	9.8	13.7	**35.7**	194.0
MT Raska	41.2	64.0	10.0	14.5	25.4	192.0
WB8148	39.3	61.8	9.6	14.3	23.4	193.0
MTD19011	44.9	62.8	9.7	14.2	31.1	192.3
MTD19077	41.4	63.7	**10.2**	15.5	33.0	194.7
MTD19089	41.2	64.2	9.6	15.5	31.0	**195.0**
MTD19103	37.2	62.6	9.9	14.3	31.7	193.3
MTD19109	38.9	63.2	9.7	14.4	30.9	194.0
MTD19115	46.4	64.0	9.8	14.0	33.3	193.0
MTD19209	48.3	64.2	9.1	14.2	35.1	194.0
MTD19241	47.8	63.9	9.3	14.7	32.9	193.7
MTD19349	47.0	62.8	9.5	14.6	31.5	194.3
YUM-816-065	49.6	61.3	9.6	13.5	27.6	191.3
MTD19499	44.8	62.9	9.9	14.2	32.4	193.3
MTD19507	38.5	61.3	9.5	15.2	31.3	193.3
MTD19511	42.3	62.2	9.7	14.3	29.0	191.7
MTD19529	34.7	61.8	9.9	14.6	32.6	192.0
MTD19611	38.9	63.7	9.8	15.3	31.5	191.7
MTD19617	44.9	64.5	9.8	14.4	32.0	193.3
MTD19623	44.6	62.7	9.6	14.1	32.4	192.0
MTD19653	36.4	63.4	9.6	**15.9**	30.7	193.3
MTD19703	45.2	**64.5**	9.8	14.1	33.7	193.3
ND Grano	35.7	62.3	9.5	15.2	31.8	193.7
ND Riveland	41.0	62.8	10.2	14.5	34.3	193.0
Average	42.8	63.1	9.7	14.4	31.8	193.1
LSD (p=0.05)	9.7	1.0	0.7	0.9	3.4	1.5
Prob > F	0.100	<0.001	0.313	<0.001	<0.001	<0.001
CV%	13.6	0.9	4.0	3.5	6.5	0.5
Lattice RE%[4]	100.6	103.9	248.2	163.4	100.4	100.0

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]>50% of heads 100% out of boot.
[4]Adjusted 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 Irrigated 2023 Durum Variety Trial

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %	Plant Height Inches	Heading[3] Julian
Alzada	86.3	60.1	9.7	14.1	30.7	164.0
Carpio	109.7	63.7	9.9	13.2	42.4	170.0
Divide	101.9	63.1	9.8	14.5	41.7	170.3
Joppa	107.7	63.6	9.6	13.9	41.0	168.3
Lustre	115.5	62.6	9.6	13.5	40.7	170.7
Mountrail	117.1	63.3	9.8	13.0	39.4	169.3
MT Blackbeard	114.1	64.0	**9.9**	13.8	**45.0**	**172.0**
MT Raska	106.4	63.9	9.6	13.6	30.3	165.0
WB8148	98.5	61.5	9.7	14.0	27.9	167.0
MTD19011	104.4	62.5	9.8	14.0	40.7	168.3
MTD19077	103.4	63.0	9.7	14.6	42.3	171.3
MTD19089	96.9	62.7	9.6	**15.3**	39.8	171.0
MTD19103	96.0	62.5	9.7	13.9	40.1	168.3
MTD19109	106.7	63.2	9.7	12.4	41.3	171.3
MTD19115	105.8	62.8	9.7	13.2	39.9	168.0
MTD19209	111.2	64.2	9.8	13.6	43.0	172.0
MTD19241	103.2	62.8	9.8	13.9	40.4	169.3
MTD19349	111.4	62.9	9.7	13.3	41.6	170.7
YUM-816-065	85.3	59.8	9.7	13.0	30.8	164.0
MTD19499	95.0	60.9	9.8	14.3	39.2	168.3
MTD19507	107.9	62.5	9.6	14.6	39.3	167.0
MTD19511	105.5	61.9	9.7	12.9	36.9	167.7
MTD19529	101.2	62.1	9.7	13.8	39.3	167.7
MTD19611	102.6	63.1	9.7	14.9	39.2	167.0
MTD19617	98.9	64.0	9.8	14.7	39.3	170.3
MTD19623	91.8	62.0	9.9	13.3	40.3	168.3
MTD19653	105.6	63.8	9.9	14.9	39.3	170.3
MTD19703	114.8	63.3	9.7	14.1	40.8	169.0
ND Grano	**117.8**	**64.3**	9.9	14.0	41.3	170.0
ND Riveland	112.9	63.2	9.8	13.9	44.7	170.0
Average	104.5	62.8	9.7	13.9	39.3	168.9
LSD (p=0.05)	12.6	0.7	0.2	1.2	2.3	1.7
Prob > F	<0.001	<0.001	0.057	0.004	<0.001	<0.001
CV%	7.3	0.7	3.8	5.2	3.6	0.6
Lattice RE%[4]	100.0	101.2	120.5	100.4	100.3	100.0

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]>50% of heads 100% out of boot.
[4]Adjusted means provided for Lattice RE% values equal to or greater than 100%.
Bold and underlined indicate the highest numerical value within a column.

Table 8. Agronomic Data EARC Dryland 2023 Durum Variety Trial

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %	Plant Height Inches	Heading[3] Julian
Alzada	76.1	61.5	11.9	11.9	31.2	164.0
Carpio	75.2	63.2	12.0	12.0	36.6	169.7
Divide	77.2	62.5	12.0	12.1	36.5	167.3
Joppa	79.3	63.3	11.8	12.3	33.3	167.7
Lustre	76.5	61.9	11.7	11.1	35.4	169.3
Mountrail	81.6	62.8	11.7	11.7	33.9	168.7
MT Blackbeard	75.7	63.4	11.9	12.3	**39.1**	170.3
MT Raska	**82.5**	63.5	11.8	12.0	30.3	164.0
WB8148	77.9	61.5	11.9	12.1	28.6	165.3
MTD19011	77.9	62.6	11.9	12.4	35.8	167.7
MTD19077	78.8	62.7	11.7	**13.0**	37.7	167.7
MTD19089	74.0	63.1	11.6	12.0	38.3	**171.3**
MTD19103	76.4	62.8	11.9	11.7	33.7	167.3
MTD19109	73.2	62.8	**12.0**	11.3	36.9	171.0
MTD19115	81.0	63.6	11.6	10.9	36.0	168.3
MTD19209	80.9	63.4	11.8	12.3	38.3	171.0
MTD19241	80.4	62.7	11.8	12.3	37.1	168.3
MTD19349	79.8	62.1	11.7	11.5	37.1	170.3
YUM-816-065	74.5	60.5	11.7	11.6	31.2	164.7
MTD19499	74.5	61.7	11.9	11.5	35.3	170.0
MTD19507	80.7	62.1	11.9	11.9	36.7	167.3
MTD19511	78.3	62.3	11.8	10.1	31.5	169.3
MTD19529	73.5	61.8	11.9	11.8	38.3	168.7
MTD19611	78.6	63.9	11.9	12.8	36.1	168.3
MTD19617	75.6	63.3	12.0	12.8	37.3	169.3
MTD19623	78.1	62.3	12.0	11.7	37.1	168.0
MTD19653	75.9	**64.5**	11.9	12.1	36.0	169.7
MTD19703	79.6	63.2	11.9	12.4	37.3	169.7
ND Grano	76.5	63.2	12.0	12.5	37.5	169.7
ND Riveland	71.8	62.9	11.7	11.2	38.2	169.0
Average	77.4	62.7	11.8	11.9	35.6	185.1
LSD (p=0.05)	5.4	0.6	0.2	1.3	4.9	2.1
Prob > F	0.016	<0.001	<0.001	0.036	<0.001	<0.001
CV%	4.0	0.6	0.9	6.2	8.3	0.7
Lattice RE%[3]	104.9	100.0	237.7	145.8	100.0	100.0

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]>50% of heads 100% out of boot.
[4]Adjusted means provided for Lattice RE% values equal to or greater than 100%.
Bold and underlined indicate the highest numerical value within a column.

Table 9. Agronomic Data WTARC Off-station Valier, MT Dryland 2023 Durum Variety Trial

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %
Alzada	**64.9**	57.8	**9.5**	14.8
Carpio	40.7	55.0	9.0	14.9
Divide	35.0	57.9	8.9	15.8
Joppa	50.4	58.2	8.9	14.9
Lustre	28.1	56.5	8.7	15.9
Mountrail	39.4	57.5	9.5	14.9
MT Blackbeard	54.0	57.5	9.0	14.7
MT Raska	55.4	**59.6**	9.0	15.6
WB8148	61.3	57.1	9.3	15.5
MTD19011	53.4	57.7	9.1	15.3
MTD19077	40.2	57.3	9.1	16.3
MTD19089	41.3	56.8	9.2	16.5
MTD19103	58.7	58.2	9.0	15.3
MTD19109	39.6	58.4	9.0	15.1
MTD19115	52.0	58.9	9.3	15.5
MTD19209	28.0	57.3	8.5	15.3
MTD19241	29.3	57.5	8.7	15.7
MTD19529	56.0	58.4	9.0	15.1
MTD19611	56.6	59.0	9.3	15.9
MTD19617	43.0	57.8	8.9	16.2
MTD19623	55.7	57.8	9.6	15.4
MTD19653	38.3	58.5	8.8	**16.5**
MTD19703	29.1	58.2	8.9	15.2
ND Grano	38.7	56.7	8.8	15.7
ND Riveland	45.3	57.2	8.9	15.5
Average	45.4	57.7	9.0	15.5
LSD (0.05)	11.1	1.4	0.4	0.8
PROB > F	<0.001	<0.001	<0.001	<0.001
CV%	14.22	1.42	2.33	2.90

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
Bold and underlined indicate the highest numerical value within a column.

Table 10. Agronomic Data NARC Off-station Loring, MT Dryland 2023 Durum Variety Trial

ID	Yield[1]	Test Weight	Moisture	Protein[2]	Plant Height	Stand[3]	Lodge[4]	Falling number[5]
	bu/ac	lb/bu	%	%	Inches	%	%	sec
Alzada	46.6	57.4	9.3	14.4	25.2	80.2	8.3	511
Carpio	43.0	57.5	9.6	15.2	30.2	76.0	10.0	437
Divide	39.5	58.8	9.6	15.0	30.6	78.5	5.3	435
Joppa	43.7	59.0	9.5	14.9	29.7	81.1	**13.3**	446
Lustre	37.5	56.8	9.2	**15.5**	29.8	83.5	6.7	457
Mountrail	45.4	57.3	9.2	14.9	31.4	81.9	11.7	434
WB8148	46.4	58.6	9.5	14.4	22.9	85.1	6.7	**539**
MTD19011	**48.4**	58.0	9.5	15.2	30.2	84.8	13.3	539
MT Blackbeard	42.8	58.2	**9.6**	15.3	30.9	85.2	5.0	493
MT Raska	48.2	**60.6**	9.4	14.7	24.5	**89.7**	3.7	490
ND Grano	46.4	59.1	9.3	15.4	29.4	81.2	13.3	466
ND Riveland	45.3	58.1	9.3	15.1	**34.2**	80.6	13.3	483
Average	44.5	58.3	9.4	15.0	29.1	82.3	9.26	477
LSD (p=0.05)	3.9	1.0	0.2	0.4	2.0	6.9	6.8	21.6
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	0.041	0.027	<0.001
CV%	5.2	1.0	1.0	1.6	4.0	4.9	46.4	2.4

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]Percent stand visually estimated at early tillering.
[4]Lodging due to sawfly cutting visually estimated at maturity.
[5]Falling number reported on a 14% moisture basis.
Bold and underlined indicate the highest numerical value within a column.

Table 11. Agronomic Data NARC Off-station Chester, MT Dryland 2023 Durum Variety Trial

ID	Yield[1]	Test Weight	Moisture	Protein[2]	Plant Height	Stand[3]	Lodge[4]	Falling number[5]
	bu/ac	lb/bu	%	%	Inches	%	%	sec
Alzada	46.4	55.3	10.6	17.5	27.1	89.5	**0.6**	**593**
Carpio	38.5	53.1	10.9	18.6	31.4	91.2	0.1	476
Divide	42.2	**57.2**	10.8	17.9	31.1	90.6	0.2	503
Joppa	46.0	56.2	10.7	18.3	**33.0**	89.6	0.0	481
Lustre	42.3	55.1	10.6	19.3	31.1	88.0	0.1	433
Mountrail	**49.5**	56.2	10.5	18.8	29.2	88.5	0.1	497
WB8148	42.4	55.1	10.6	18.4	24.3	95.8	0.3	570
MTD19011	45.1	55.1	**10.9**	18.7	30.7	89.1	0.0	581
MT Blackbeard	40.8	54.1	10.8	18.1	32.2	92.6	0.4	538
MT Raska	45.6	55.5	10.7	19.0	27.2	**94.8**	0.0	460
ND Grano	43.1	55.3	10.6	**19.8**	30.8	88.5	0.0	485
ND Riveland	43.9	54.7	10.8	18.3	32.3	83.4	0.1	495
Average	43.8	55.2	10.7	18.5	30.0	90.4	0.1	509
LSD (p=0.05)	4.2	1.2	0.2	0.5	2.7	5.0	0.8	35.4
Prob > F	0.002	<0.001	0.010	<0.001	<0.001	0.004	0.477	<0.001
CV%	5.6	1.3	1.2	1.4	5.3	3.3	411.1	4.1

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]Percent stand visually estimated at early tillering.
[4]Lodging due to sawfly cutting visually estimated at maturity.
[5]Falling number reported on a 14% moisture basis.
Bold and underlined indicate the highest numerical value within a column.

Table 12. Agronomic Data NARC Off-station Turner, MT Dryland 2023 Durum Variety Trial

ID	Yield[1]	Test Weight	Moisture	Protein[2]	Plant Height	Stand[3]	Lodge[4]	Falling number[5]
	bu/ac	lb/bu	%	%	Inches	%	%	sec
Alzada	29.6	60.7	9.1	14.4	23.4	91.6	**16.1**	**522**
Carpio	29.7	60.3	9.2	14.5	26.0	90.0	9.6	473
Divide	29.3	61.2	9.3	14.7	25.6	89.4	10.0	471
Joppa	26.8	61.5	9.2	14.7	24.6	90.6	13.2	455
Lustre	24.1	59.6	9.1	**15.4**	24.7	92.3	9.6	451
Mountrail	27.6	60.1	9.1	14.9	25.7	91.3	13.0	402
WB8148	26.3	61.2	9.2	14.5	20.4	**94.5**	14.7	489
MTD19011	25.3	60.8	9.3	15.3	25.0	91.8	7.9	487
MT Blackbeard	**34.4**	61.6	**9.4**	14.0	**28.0**	93.5	8.3	479
MT Raska	32.5	**62.6**	9.3	14.3	19.8	94.3	8.2	481
ND Grano	26.9	61.3	9.2	15.0	24.2	91.0	12.3	487
ND Riveland	24.0	60.3	9.1	15.4	26.5	91.7	7.8	485
Average	28.0	60.9	9.2	14.8	24.5	91.9	10.7	473
LSD (p=0.05)	3.3	0.4	0.2	0.5	2.0	5.2	7.4	22.2
Prob > F	<0.001	<0.001	0.004	<0.001	<0.001	0.707	0.242	<0.001
CV%	4.0	0.4	1.2	1.9	4.7	3.3	40.9	2.8

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]Percent stand visually estimated at early tillering.
[4]Lodging due to sawfly cutting visually estimated at maturity.
[5]Falling number reported on a 14% moisture basis.
Bold and underlined indicate the highest numerical value within a column.

Table 13. Agronomic Data EARC Off-station Sheridan Co., MT Dryland 2023 Durum Variety Trial

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %	Plant Height inches	Lodge[3] %
Alzada	20.2	62.4	**8.5**	16.5	19.9	6.7
Carpio	28.3	62.5	7.8	16.5	22.7	10.0
Divide	30.0	63.0	8.1	16.7	23.2	16.7
Joppa	22.3	62.9	8.2	17.1	**24.3**	18.3
Lustre	32.0	62.0	7.4	16.8	22.4	**21.7**
Mountrail	**33.6**	63.4	7.8	16.6	21.7	13.3
MT Blackbeard	26.8	**63.7**	7.9	16.8	23.8	21.7
MT Raska	21.0	63.6	7.8	17.5	18.1	6.7
WB8148	16.3	62.8	7.8	17.5	18.1	3.3
MTD19011	24.9	62.1	7.9	**17.5**	21.8	15.0
ND Grano	25.6	63.3	7.8	17.1	21.1	13.3
ND Riveland	25.2	63.4	8.2	16.9	22.7	18.3
Average	25.5	62.9	7.9	17.0	21.7	13.8
LSD (p=0.05)	8.6	0.6	0.6	0.6	2.5	12.7
Prob > F	0.014	<0.001	0.187	0.012	<0.001	0.089
CV%	19.9	0.5	4.7	2.2	6.9	52.9

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]Lodging due to sawfly cutting visually estimated at maturity.
Bold and underlined indicate the highest numerical value within a column.

Table 14. Agronomic Data EARC Off-station Roosevelt Co., MT Dryland 2023 Durum Variety Trial

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %	Plant Height inches	Lodge[3] %
Alzada	39.6	62.3	10.3	14.1	25.3	8.3
Carpio	33.6	60.7	**10.7**	15.5	26.5	8.3
Divide	34.8	62.4	10.5	15.1	30.6	6.7
Joppa	34.6	62.6	10.5	15.0	29.5	10.0
Lustre	34.7	62.2	10.5	14.9	30.3	3.3
Mountrail	32.4	62.4	10.3	**16.0**	28.6	8.3
MT Blackbeard	34.0	60.9	10.6	15.2	29.5	6.7
MT Raska	**43.9**	**64.8**	10.4	14.6	23.8	1.7
WB8148	43.6	63.4	10.4	15.0	22.4	**13.3**
MTD19011	36.0	62.5	10.4	15.6	29.7	6.7
ND Grano	34.3	62.9	10.4	15.7	30.6	10.0
ND Riveland	35.2	61.5	10.3	15.7	**32.4**	5.0
Average	36.4	62.4	10.4	15.2	28.3	7.4
LSD (p=0.05)	6.6	0.8	0.2	1.0	3.4	4.2
Prob > F	0.014	0.001	0.002	0.035	<0.001	0.001
CV%	10.7	0.7	0.9	3.9	7.1	33.8

[1]Grain yield reported on a 13% moisture basis.
[2]Grain protein reported on a 12% moisture basis.
[3]Lodging due to sawfly cutting visually estimated at maturity.
Bold and underlined indicate the highest numerical value within a column.

Table 15. Agronomic Data EARC On-station Re-crop Dryland 2023 Durum Variety Trial

ID	Yield[1] bu/ac	Test Weight lb/bu	Moisture %	Protein[2] %	Plant Height inches	Heading[3] Julian
Alzada	57.5	62.1	11.2	13.2	27.3	166.3
Carpio	55.6	62.6	11.5	13.9	31.5	172.0
Divide	57.4	62.6	11.3	13.5	34.4	171.0
Joppa	57.0	62.6	11.2	13.4	31.1	169.7
Lustre	59.1	62.2	11.2	13.6	32.9	172.0
Mountrail	55.9	63.2	11.3	13.6	32.9	171.7
MT Blackbeard	58.0	63.0	**11.6**	13.3	**35.6**	**172.3**
MT Raska	**61.8**	**63.9**	11.3	**13.9**	25.5	165.7
WB8148	59.9	62.1	11.4	13.2	21.8	167.3
MTD19011	58.9	62.9	11.3	13.3	32.7	170.3
ND Grano	56.1	63.5	11.3	13.8	32.9	171.0
ND Riveland	53.6	61.9	11.2	14.3	33.2	170.3
Average	57.6	62.7	11.3	13.6	31	170
LSD (p=0.05)	5.3	0.7	0.3	0.7	2.3	1.7
Prob > F	0.205	<0.001	0.430	0.054	<0.001	<0.001
CV%	5.4	0.7	1.7	2.8	4.3	0.6

[1]Grain yield reported on a 13% moisture basis.
[2]Grain 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 16. Seed Quality Data All On-station 2023 Durum Variety Trials

ID	Test weight lb/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	59.0	63.0	10.0	68.6	**41.5**	**2.99**	13.6	1.52	457.3
Carpio	60.4	57.2	13.0	71.9	39.4	2.85	14.0	1.45	**458.3**
Divide	60.4	52.0	14.7	71.6	38.9	2.82	14.1	1.40	429.2
Joppa	60.7	48.8	17.7	72.9	39.6	2.80	13.6	1.44	401.0
Lustre	59.3	43.2	18.2	70.8	37.9	2.77	13.9	1.39	439.5
Mountrail	59.9	43.0	19.2	70.4	38.9	2.80	13.8	1.45	418.5
MT Blackbeard	61.2	**67.7**	8.8	72.8	41.2	2.96	13.8	1.44	431.8
MT Raska	61.7	55.2	13.5	77.6	36.7	2.85	13.9	1.43	428.8
WB8148	59.6	42.2	19.3	77.3	36.2	2.78	14.0	1.50	457.0
MTD19011	60.3	56.3	13.3	72.2	40.1	2.86	14.0	1.41	454.3
MTD19077	60.9	55.3	13.2	72.0	39.4	2.86	14.7	1.52	406.8
MTD19089	61.0	55.8	12.0	71.9	39.0	2.86	14.5	1.52	405.8
MTD19103	60.3	56.7	12.5	72.3	40.0	2.86	13.8	1.39	451.0
MTD19109	60.5	40.8	20.5	75.2	35.0	2.72	13.6	1.51	449.5
MTD19115	61.5	53.2	14.5	72.6	36.4	2.82	13.7	1.48	419.8
MTD19209	61.5	51.8	13.8	76.4	38.7	2.81	14.0	1.38	451.8
MTD19241	60.5	48.5	16.0	76.3	35.9	2.77	14.2	1.44	435.7
MTD19349	59.8	50.5	16.6	78.5	35.8	2.78	14.0	1.45	449.1
YUM-816-065	58.2	51.1	14.6	70.1	34.9	2.83	13.2	**1.59**	437.5
MTD19499	59.5	58.5	12.8	**78.9**	36.2	2.85	14.0	1.52	414.7
MTD19507	59.7	42.1	**20.8**	76.4	32.8	2.69	14.4	1.55	448.3
MTD19511	59.6	60.3	14.8	76.1	37.1	2.88	13.7	1.50	410.3
MTD19529	59.9	53.8	15.0	76.7	35.1	2.81	13.9	1.48	383.3
MTD19611	61.2	56.2	13.0	75.8	38.1	2.90	14.8	1.48	428.5
MTD19617	**61.8**	49.8	15.0	77.4	37.6	2.84	14.6	1.48	407.0
MTD19623	60.0	63.2	10.5	72.8	39.8	2.91	13.9	1.48	439.2
MTD19653	61.7	51.3	16.0	76.0	36.4	2.83	**15.0**	1.51	458.0
MTD19703	61.5	57.7	12.8	74.2	39.5	2.86	13.8	1.42	402.0
ND Grano	61.2	46.7	16.7	72.2	38.5	2.80	14.2	1.48	423.2
ND Riveland	60.6	56.7	12.3	69.3	40.6	2.85	13.8	1.45	451.8
Average	60.4	52.9	14.7	73.9	37.9	2.83	14.0	1.47	431.6
LSD(0.05)	0.9	7.3	4.3	2.3	1.9	0.07	0.5	0.05	26.9
Prob>F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV(%)	1.2	12.0	25.3	2.7	4.3	2.2	3.3	3.0	5.4

[1]Seeds ≥ #7 Tyler Mesh

[2]Seeds #9≥#12 Tyler Mesh

[3]Determined using the single kernel characterization system.

[4]Reported on a 12% moisture basis

[5]Reported on a 14% moisture basis

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

Table 17. Milling Data All On-station 2023 Durum Variety Trials

ID	Bran[1] %	Shorts[1] %	Semolina Yield[1] %	Semolina Protein[2] %[1]	Semolina ash[2] %[1]
Alzada	25.3	8.0	66.7	12.5	0.74
Carpio	26.6	7.2	66.2	12.6	0.68
Divide	26.4	6.9	66.7	12.7	0.65
Joppa	26.6	6.8	66.5	12.3	0.66
Lustre	26.6	7.2	66.3	12.6	0.66
Mountrail	26.6	6.8	66.6	12.7	0.68
MT Blackbeard	26.0	7.3	66.7	12.3	0.68
MT Raska	25.7	7.0	**67.3**	12.4	0.65
WB8148	26.6	7.5	65.8	13.0	0.71
MTD19011	25.8	7.3	67.0	12.7	0.65
MTD19077	27.8	7.4	64.9	13.5	0.73
MTD19089	27.7	7.3	65.0	13.2	0.72
MTD19103	25.8	7.3	66.9	12.5	0.65
MTD19109	27.6	6.9	65.6	12.1	0.68
MTD19115	27.8	7.0	65.2	12.3	0.67
MTD19209	25.5	7.4	67.1	12.7	0.68
MTD19241	27.9	7.2	64.9	12.8	0.66
MTD19349	27.9	7.5	64.6	12.8	0.68
YUM-816-065	27.8	7.1	65.1	11.9	**0.75**
MTD19499	27.2	7.0	65.9	12.7	0.68
MTD19507	27.5	6.8	65.7	12.8	0.72
MTD19511	27.8	7.4	64.8	12.3	0.69
MTD19529	27.7	7.5	64.9	12.6	0.71
MTD19611	26.8	7.4	65.8	13.6	0.70
MTD19617	27.6	7.6	64.9	13.3	0.70
MTD19623	27.5	**8.1**	64.4	12.5	0.72
MTD19653	26.6	7.3	66.1	**13.7**	0.68
MTD19703	26.0	6.9	67.2	12.5	0.64
ND Grano	26.2	7.0	66.8	12.9	0.67
ND Riveland	**29.0**	7.8	63.2	12.5	0.66
Average	26.9	7.3	65.8	12.7	0.69
LSD(0.05)	0.8	0.3	0.8	0.5	0.03
Prob>F	<0.001	<0.001	<0.001	<0.001	<0.001
CV(%)	2.4	3.9	1.1	3.6	4.1

[1]Milled on Quadrumat Jr. Mill. Shorts sifted using a #35 US sieve.
[2]Reported on a 14% moisture basis
Bold and underlined indicate the highest numerical value within a column.

Table 18. Semolina Quality Data All On-station 2023 Durum Variety Trials

ID	L[1]	b*[1]	a*[1]	Mix Time Min[2]	Peak Intergral %Tq*min[2]	Gluten Index[3]
Alzada	83.4	30.8	-2.6	4.4	225.5	**96.4**
Carpio	84.0	30.9	-3.0	4.6	231.3	95.6
Divide	84.2	28.2	-2.5	3.8	181.8	82.3
Joppa	84.3	30.6	-2.9	4.4	209.2	89.5
Lustre	84.2	29.2	-2.6	3.7	178.5	72.0
Mountrail	**84.5**	25.9	**-2.4**	2.5	117.4	23.8
MT Blackbeard	84.0	29.8	-2.8	4.6	228.5	94.4
MT Raska	83.9	28.3	-2.6	4.2	185.7	72.7
WB8148	83.5	31.0	-2.7	4.8	**232.3**	93.3
MTD19011	83.8	30.5	-2.7	4.2	203.4	77.6
MTD19077	83.6	33.7	-3.1	3.4	158.2	50.6
MTD19089	83.6	33.7	-3.1	3.4	156.0	44.3
MTD19103	83.9	30.4	-2.7	4.0	193.1	80.8
MTD19109	84.2	31.9	-3.0	4.0	198.6	91.3
MTD19115	84.0	31.7	-2.9	3.9	181.6	64.6
MTD19209	83.7	29.4	-2.6	4.0	191.5	47.9
MTD19241	83.8	31.5	-2.9	3.8	181.2	64.8
MTD19349	83.7	32.2	-2.7	3.3	169.7	56.8
YUM-816-065	83.9	29.7	-2.5	3.7	188.2	91.9
MTD19499	83.7	33.3	-3.0	3.8	175.5	63.9
MTD19507	83.8	**33.8**	-3.0	3.8	182.6	78.7
MTD19511	83.9	33.7	-3.0	3.8	180.1	79.7
MTD19529	83.4	33.7	-2.9	4.0	186.5	81.5
MTD19611	83.8	30.7	-2.7	**4.9**	222.2	87.5
MTD19617	83.7	30.7	-2.8	3.6	174.7	72.7
MTD19623	83.6	32.8	-2.9	4.2	210.7	91.5
MTD19653	83.9	30.0	-2.6	3.6	168.5	66.0
MTD19703	84.0	30.2	-2.8	3.7	168.1	53.6
ND Grano	84.1	30.2	-2.9	3.6	175.8	85.9
ND Riveland	84.1	30.2	-2.9	4.5	225.5	91.7
Average	83.9	30.9	-2.8	3.9	189.4	74.8
LSD(0.05)	0.3	0.7	0.1	0.3	16.7	12.5
Prob>F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV(%)	0.4	2.0	4.2	6.7	7.6	8.2

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

[2]Determined using MixSmart software.

[3]n=2, Bozeman dryland and EARC dryland.

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

Table 19. Durum Fusarium Head Blight Evaluation 2023 (Dr. Frankie Crutcher, EARC, Sidney, MT)

ID	Severity %[1]	Incidence %[2]	Index[3]	FDK %[4]	Test Weight lb/bu	Yield bu/ac[5]	Protein %[5]	DON ppm[6]
Alzada	71.3 AB	97.9 A	70.6 AB	56.7	53.5 FG	26.0 DE	15.5 AB	15.1 A-E
Carpio	18.1 H	65.7 A-F	12.1 G	35.0	59.7 A-C	69.7 A	13.4 AB	12.8 B-E
Divide	23.2 E-H	53.4 EF	13.9 FG	22.7	60.3 A-C	69.5 A	13.2 AB	06.5 C-E
Joppa	30.1 D-H	81.2 A-E	25.2 D-G	48.3	59.8 A-C	70.3 A	13.7 AB	09.6 C-E
Lustre	42.0 C-H	73.4 A-F	34.6 D-G	24.3	60.6 AB	72.3 A	12.7 B	06.4 C-E
Mountrail	35.4 D-H	75.7 A-F	27.3 D-G	35.0	59.0 A-D	60.6 A-C	13.1 AB	12.4 B-E
MT Blackbeard	22.4 F-H	59.0 C-F	13.5 F-G	46.7	58.9 A-D	60.3 A-C	13.1 AB	17.7 A-C
MT Raska	45.1 B-G	93.4 A-C	42.7 B-F	48.3	57.6 B-E	32.8 B-E	15.2 AB	12.0 B-E
WB8148	66.8 A-C	99.0 A	66.8 A-C	56.7	54.4 E-G	31.6 C-E	**15.9 A**	22.8 AB
MTD19011	34.4 D-H	79.0 A-E	27.5 D-G	25.0	59.2 A-D	70.6 A	13.3 AB	04.9 E
MTD19077	21.4 F-H	50.1 EF	10.8 G	36.7	59.9 A-C	65.8 A	14.5 AB	09.8 C-E
MTD19089	19.4 GH	41.2 F	10.1 G	24.3	60.9 AB	68.2 A	14.0 AB	06.1 C-E
MTD19103	28.1 D-H	77.9 A-F	22.2 D-G	31.7	59.2 A-D	63.4 A	14.4 AB	05.7 DE
MTD19109	34.5 D-H	92.3 A-D	32.3 D-G	41.7	57.9 B-D	62.8 AB	13.1 AB	16.8 A-D
MTD19115	47.1 B-F	96.8 AB	46.0 B-E	48.3	58.3 A-D	58.6 A-C	14.4 AB	15.8 A-E
MTD19209	23.1 F-H	55.7 D-F	13.1 FG	26.7	**61.4 A**	**73.4 A**	12.9 AB	11.1 B-E
MTD19241	27.1 D-H	65.7 A-F	17.7 E-G	23.3	58.6 A-D	68.2 A	12.6 B	10.0 C-E
MTD19349	41.2 C-H	85.7 A-E	35.9 D-G	28.3	58.9 A-D	71.4 A	12.8 B	13.2 B-E
YUM-816-065	**82.0 A**	**99.0 A**	**82.0 A**	56.7	50.3 G	18.8 E	13.6 AB	**25.8 A**
MTD19499	28.3 D-H	85.7 A-E	25.3 D-G	56.7	57.2 C-E	59.0 A-C	14.6 AB	13.6 B-E
MTD19507	51.4 B-D	93.4 A-C	48.7 B-D	28.3	58.5 A-D	60.7 A-C	13.6 AB	09.0 C-E
MTD19511	51.2 B-D	95.7 A-C	49.8 B-D	41.7	56.3 D-F	54.9 A-D	14.4 AB	13.3 B-E
MTD19529	49.8 B-E	97.9 A	49.4 B-D	40.0	57.1 C-E	54.4 A-D	13.2 AB	08.2 C-E
MTD19611	42.6 C-H	92.3 A-D	39.7 C-G	**58.3**	57.9 B-D	49.5 A-D	14.4 AB	15.7 A-E
MTD19617	25.4 D-H	63.4 A-F	16.3 E-G	43.3	59.6 A-C	63.3 A	14.2 AB	12.0 B-E
MTD19623	35.8 D-H	85.7 A-E	32.1 D-G	33.3	58.6 A-D	63.4 A	13.4 AB	12.3 B-E
MTD19653	31.8 D-H	86.8 A-E	28.7 D-G	36.7	59.5 A-C	60.9 A-C	14.0 AB	12.5 B-E
MTD19703	23.1 F-H	75.7 A-F	18.2 E-G	58.3	58.0 B-D	53.5 A-D	13.8 AB	15.7 A-E
ND Grano	29.6 D-H	80.1 A-E	24.5 D-G	33.3	60.6 AB	66.8 A	13.7 AB	14.0 A-E
ND Riveland	18.0 H	60.1 B-F	11.8 G	23.3	61.2 A	71.0 A	13.5 AB	07.0 C-E
Mean	36.7	78.6	31.6	39.0	58.7	59.1	13.8	12.3
% CV	47.1	24.2	63.4	41.1	3.6	27.1	8.3	45.9
HSD (0.05)	26.0	37.8	30.0	N/S	3.2	30.5	3.1	11.9
P -value	<.0001	<.0001	<.0001	<.0008	<.0001	<.0001	<.0062	<.0001

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

[1]Severity: Average percent area of head covered by disease. Thirty heads were evaluated for each plot.

[2]Incidence: Percent of thirty heads per plot that had visible FHB symptoms.

[3]Index: Severity X Incidence / 100.

[4]FDK: Percent fusarium damaged kernels.

[5]12% moisture basis.

[6]Deoxynivalenol concentration in parts per million.

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

Table. 20 Durum Stripe Rust Evaluation 2023 (Dr. Xianming Cheng, USDA-ARS Pullman, WA.)

Location	Pullman, WA		Mount Vernon, WA[2]			
Date Evaluated	7/3		6/7		6/27	
Growth Stage	Feekes 11.1		Feekes 4		Feekes 10.54	
ID	IT[1]	%	IT[1]	%	IT[1]	%
Alzada	5	30	3	30	2	10
Carpio	7	40	3	30	2	15
Divide	6	40	2	20	2	15
Joppa	6	60	8	60	3	30
Lustre	7	60	5	50	2	20
Mountrail	5	50	8	60	3	30
MT Blackbeard	5	50	8	60	3	30
MT Raska	7	70	8	60	8	60
WB8148	7	70	8	60	5	50
MTD19011	4	20	3	30	2	10
MTD19077	5	50	3	30	2	20
MTD19089	3	10	3	30	2	20
MTD19103	7	50	3	30	2	10
MTD19109	6	50	3	30	2	10
MTD19115	7	70	3	30	2	10
MTD19209	5	50	8	60	3	30
MTD19241	3	20	3	30	2	10
MTD19349	4	30	3	30	2	20
YUM-816-065	6	50	3	30	2	10
MTD19499	6	40	5	50	2	20
MTD19507	3	30	3	30	3	30
MTD19511	4	50	3	30	2	20
MTD19529	7	50	8	60	2	10
MTD19611	7	40	3	30	2	10
MTD19617	6	40	3	30	2	10
MTD19623	7	70	8	60	2	20
MTD19653	4	30	3	30	2	20
MTD19703	5	60	5	50	2	20
ND Grano	1	5	3	30	2	20
ND Riveland	7	60	2	20	3	30
AVS (S. check)	9	100	9	100	9	100
MOREX (barley)	0	0	2	5	0	0

[1]Infection 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.

[2]Entries 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-plan (HTAP) resistance.

No data was collected at Central Ferry due to low incidence.

Table 21. Durum Fungal Leaf Spot Evaluation 2023 (Dr. Zhaohui Liu, NDSU, Fargo, ND)

ID	ToxA[1]	Pti2 4/12[2]	PTi2 4/17[2]	Sn4[3]
Alzada	0	3	3	2.5
Carpio	3	1	2.5	3
Divide	3	3.5	4	3
Joppa	3	3	2.5	4
Lustre	3	1.5	2	4
Mountrail	0	2.5	ND	2
MT Blackbeard	3	1	1.5	4
MT Raska	3	1.5	2	2
WB8148	3	3	2.5	3.5
MTD19011	3	1.5	3.5	4
MTD19077	0	2.5	2	2.5
MTD19089	0	1	2.5	1
MTD19103	0	2	3.5	3
MTD19109	3	2.5	4	3
MTD19115	3	2	2.5	2.5
MTD19209	3	3.5	4	4
MTD19241	3	2	2.5	4
MTD19349	3	1.5	2.5	2.5
YUM-816-065	3	ND	3.5	2
MTD19499	3	4	3.5	3
MTD19507	3	3.5	4	3
MTD19511	3	3	4	3.5
MTD19529	3	2	3.5	4
MTD19611	3	2	3	3
MTD19617	3	3.5	4	3
MTD19623	3	2	3	2
MTD19653	3	3	3	3.5
MTD19703	3	1	3	2.5
ND Grano	3	4	3	3.5
ND Riveland	0	2.5	3	2.5
Salamouni	0			
Glenlea	3			
BR34 (check)	0	1.0		2.7
ND-495 (check)	3	3.5		4.5

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

Table 22. Durum Stem Rust Evaluation (2023 Dr. Li Huang, MSU, Bozeman, MT)

ID	Reaction[1]	Phenotype
Alzada	R	;
Carpio	R	;
Divide	R	;
Joppa	R	1_;
Lustre	R	;
Mountrail	R	;
MT Blackbeard	R	;1=
MT Raska	R	;
ND Grano	R	;
ND Riveland	R	;1=
WB8148	R	;
YUM-816-065	R	;
MTD19011	R	;1=
MTD19077	R	;1=
MTD19089	R	;
MTD19103	R	;
MTD19109	R	;1=
MTD19115	R	;
MTD19209	R	;1=
MTD19241	R	;
MTD19349	R	;
MTD19499	R	;
MTD19507	R	;
MTD19511	R	;
MTD19529	R	;
MTD19611	R	;
MTD19617	R	;
MTD19623	R	;
MTD19653	R	;
MTD19703	R	;
Cadenza (control)	S	3 2 ;

[1]Inoculated with *Puccinia graminis* isolate OFCSC on 3/15/2024 scored 3/29/2024. 0 = immune (R), ";" = Very Resistant (VR), 1=Resistant (R), 2 = Moderately resistant (MR), 3 = Moderately susceptible (MS), 4 = Susceptible (S), Chlorosis (C). Variations are given by + and = to indicate more or less than usual