

PROJECT TITLE:

2022 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 2022, 20 experimental durum lines developed at MSU (MT), and 10 released durum varieties were tested under eight different environments across Montana. Durum varieties tested include releases from North Dakota State University, University of Saskatchewan-Canadian Crop Development Center, and Montana State University (Table 1). Dryland experiments were grown in collaboration with the Montana Agricultural Experiment Station (MAES), on-station in Bozeman, MT (MSU-Post Agronomy Farm), and at off-campus Research Centers near Havre, MT (MSU-NARC), Sidney, MT (MSU-EARC), and Moccasin, MT (MSU-CARC). One contracted dryland trial was planted near Conrad, MT by 2nd Nature Research. Irrigated trials were grown in Bozeman, MT (MSU-Post Agronomy Farm) and Sidney, MT (MSU-EARC). Three off-station experiments were planted in Eastern Montana in Valley, 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. 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 for off-station trials or an alpha-lattice design for on-station trials 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. On-station grain sub-samples from the three replicates per line per location 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.

Overall statewide agronomic performance for 2022 on-station trials can be found in Table 1. Agronomic performance for 2022 on-station trials separated by environment is presented in Tables 2 (irrigated) and 3 (dryland). Agronomic data for individual 2022 on-station trials is found in Tables 4-10 and data for off-station trials is found in Tables 11-16. Mean seed quality is summarized in Table 17, milling data in Table 18, and semolina quality in Table 19. Disease evaluations for fungal leaf spot, stripe rust and Fusarium head blight are found in Tables 20-22.

Table 1. Agronomic Data from All On-Station Locations 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches
Alzada	53.1	59.3	9.7	14.8	26.3
Divide	54.8	59.8	9.8	15.0	31.9
Carpio	55.5	59.8	9.8	14.9	31.4
Joppa	53.9	59.9	9.8	14.9	32.1
Lustre	56.4	59.1	9.6	15.3	32.4
Mountrail	58.0	59.6	9.6	14.8	31.2
ND Riveland	58.6	59.7	9.8	14.9	33.4
ND Grano	56.9	60.5	9.8	15.1	31.9
MT Raska	53.6	60.8	9.7	15.1	24.7
MTD18148	54.1	59.9	9.7	14.8	24.1
MT Blackbeard	58.9	60.2	10.0*	14.8	34.4*
MTD19011	59.0*	59.9	9.8	14.9	32.6
MTD19077	55.5	59.8	9.7	16.2*	32.6
MTD19089	57.1	59.8	9.6	15.9	32.3
MTD19103	58.9	59.8	9.8	15.3	32.1
MTD19109	57.3	59.5	9.8	14.9	31.1
MTD19115	54.5	60.2	9.7	14.8	30.9
MTD19209	57.1	60.1	9.8	15.1	33.7
MTD19241	58.5	60.0	9.7	15.1	31.3
MTD19349	55.9	58.7	9.7	15.3	31.0
MTD19375	55.9	57.7	9.7	15.9	31.2
MTD19499	55.8	58.5	9.9	15.3	30.9
MTD19507	54.2	59.6	9.8	15.3	30.8
MTD19511	57.0	58.9	9.7	14.9	29.4
MTD19529	53.7	59.4	9.9	14.9	30.1
MTD19611	55.2	60.6	9.8	15.6	29.9
MTD19617	57.1	60.8	9.9	15.4	31.6
MTD19623	58.4	59.3	9.8	14.8	32.1
MTD19653	54.1	61.0*	9.8	15.8	31.5
MTD19703	58.4	60.6	9.8	14.9	32.5
Mean	56.2	59.8	9.8	15.2	31.0
LSD (p=0.05)	4.3	0.7	0.1	0.4	1.4
Prob > F	0.087	<0.001	<0.001	<0.001	<0.001
CV%	7.3	1.0	0.9	2.8	4.2

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

*Indicates highest entry within a column

Table 2. Agronomic Data All On-Station Irrigated Locations 2022

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches
Alzada	81.8	62.0	10.2	13.8	29.4
Divide	91.8	63.8	10.4	13.2	36.0
Carpio	99.6	64.3	10.4	13.0	36.7
Joppa	96.7	64.2	10.5	13.1	37.4
Lustre	97.9	63.2	10.1	13.6	37.7
Mountrail	98.9	63.7	10.2	13.3	36.5
ND Riveland	101.9	63.3	10.3	13.4	38.2
ND Grano	99.8	64.6	10.4	13.6	38.1
MT Raska	87.2	63.6	10.3	13.9	28.1
MTD18148	87.5	63.0	10.3	13.6	27.4
MT Blackbeard	100.5	63.8	10.6*	13.4	40.0*
MTD19011	96.4	63.2	10.4	13.7	37.4
MTD19077	101.6	64.2	10.1	14.8*	38.6
MTD19089	102.0*	64.2	10.2	14.2	38.1
MTD19103	99.7	63.9	10.3	13.7	37.0
MTD19109	104.6	63.6	10.5	12.7	36.1
MTD19115	93.7	63.8	10.2	13.4	35.9
MTD19209	95.5	63.9	10.4	13.7	39.3
MTD19241	100.8	64.0	10.3	13.7	36.1
MTD19349	97.8	63.0	10.3	13.3	36.1
MTD19375	100.3	61.8	10.3	14.1	36.3
MTD19499	95.6	62.2	10.6	13.7	35.2
MTD19507	93.4	63.8	10.4	13.9	36.2
MTD19511	99.7	62.5	10.4	13.6	34.8
MTD19529	89.9	62.7	10.5	13.3	34.8
MTD19611	93.9	64.2	10.4	14.1	35.0
MTD19617	99.6	64.8	10.5	13.4	36.3
MTD19623	100.4	63.1	10.5	12.9	37.1
MTD19653	96.3	65.1*	10.3	13.8	37.0
MTD19703	99.5	64.2	10.3	13.4	38.3
Mean	96.8	63.6	10.3	13.6	36.0
LSD (p=0.05)	6.8	0.8	0.2	0.9	2.7
Prob > F	<0.001	<0.001	<0.001	0.045	<0.001
CV%	3.4	0.6	1.0	3.2	3.7

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

*Indicates highest entry within a column

Table 3. Agronomic Data All On-Station Dryland Locations 2022

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches
Alzada	41.7	58.2	9.5	15.2	25.0
Divide	40.0	58.2	9.6	15.7	30.3
Carpio	37.9	58.0	9.6	15.7	29.3
Joppa	36.8	58.1	9.6	15.6	30.0
Lustre	39.7	57.5	9.4	15.9	30.3
Mountrail	41.7	58.0	9.4	15.3	29.0
ND Riveland	41.3	58.2	9.6	15.5	31.5
ND Grano	39.8	58.9	9.6	15.7	29.4
MT Raska	40.2	59.7*	9.5	15.6	23.3
MTD18148	40.8	58.7	9.5	15.3	22.9
MT Blackbeard	42.3	58.8	9.7*	15.4	32.2*
MTD19011	44.0*	58.6	9.6	15.4	30.6
MTD19077	37.1	58.0	9.5	16.8*	30.2
MTD19089	39.1	58.1	9.4	16.6	30.0
MTD19103	42.5	58.1	9.6	16.0	30.1
MTD19109	38.4	57.9	9.6	15.7	29.1
MTD19115	38.9	58.7	9.5	15.4	28.9
MTD19209	41.7	58.6	9.5	15.7	31.5
MTD19241	41.6	58.4	9.5	15.6	29.4
MTD19349	39.2	57.0	9.5	16.1	28.9
MTD19375	38.1	56.1	9.4	16.5	29.1
MTD19499	39.9	57.1	9.6	15.9	29.2
MTD19507	38.5	58.0	9.6	15.8	28.7
MTD19511	39.9	57.5	9.5	15.4	27.2
MTD19529	39.2	58.0	9.6	15.6	28.2
MTD19611	39.7	59.2	9.6	16.2	27.9
MTD19617	40.1	59.2	9.6	16.2	29.7
MTD19623	41.7	57.8	9.6	15.6	30.2
MTD19653	37.3	59.4	9.6	16.6	29.4
MTD19703	41.9	59.2	9.6	15.5	30.2
Mean	40.0	58.2	9.5	15.8	29.1
LSD (p=0.05)	4.2	0.8	0.1	0.5	1.6
Prob > F	0.114	<0.001	<0.001	<0.001	<0.001
CV%	8.4	1.1	1.0	2.6	4.5

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

*Indicates highest entry within a column

Table 4. Agronomic Data Bozeman Irrigated 2022 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	107.7	62.0	8.7	13.5	28.6	193.1	227.3
Divide	114.1	62.6	8.8	13.9	35.9	194.6	226.8
Carpio	124.6	63.6	8.8	13.3	37.7	195.8	229.6
Joppa	117.2	63.2	8.8	13.4	39.0	194.9	228.6
Lustre	119.8	62.1	8.6	14.0	38.8	196.2	228.3
Mountrail	125.9	63.1	8.7	13.5	37.6	195.3	228.2
ND Riveland	124.3	62.8	8.6	13.6	39.0	195.3	230.1
ND Grano	121.9	63.6	8.8	14.2	38.9	195.8	229.0
MT Raska	113.1	62.8	8.8	14.0	27.5	192.2	229.1
MTD18148	106.6	62.3	8.8	13.4	26.7	193.2	230.4
MT Blackbeard	122.3	62.9	8.9	14.1	42.3*	196.4	228.9
MTD19011	120.9	62.4	8.9	14.0	38.6	195.1	230.4
MTD19077	123.8	63.3	8.6	14.9*	40.6	196.1	228.8
MTD19089	124.7	63.1	8.6	14.6	38.0	195.9	227.6
MTD19103	123.3	63.3	8.7	14.2	39.6	196.3	230.1
MTD19109	124.9	62.7	8.8	13.1	38.3	197.3*	231.8*
MTD19115	114.2	63.1	8.7	13.6	36.8	195.6	230.9
MTD19209	118.4	63.2	8.8	13.9	40.3	196.9	230.5
MTD19241	125.2	63.0	8.7	13.9	36.8	195.6	229.1
MTD19349	122.1	61.8	8.6	13.9	36.9	196.0	229.7
MTD19375	122.3	60.8	8.7	14.3	36.2	196.8	230.4
MTD19499	119.4	60.8	8.9	14.2	35.0	195.2	229.6
MTD19507	117.8	63.2	8.8	13.6	37.5	194.5	228.6
MTD19511	129.5*	61.9	8.8	13.5	36.0	194.8	230.2
MTD19529	117.5	62.4	8.9	13.6	35.2	195.3	229.3
MTD19611	115.2	63.5	8.8	14.3	37.7	195.0	228.7
MTD19617	125.0	64.1	9.0*	14.0	37.7	196.6	230.9
MTD19623	125.6	62.1	8.9	13.7	38.4	195.5	229.2
MTD19653	120.4	64.6*	8.7	14.7	38.3	195.6	229.6
MTD19703	124.5	63.4	8.8	13.5	40.0	195.4	227.9
Mean	120.4	62.8	8.8	13.9	37.0	195.4	229.3
LSD (p=0.05)	11.3	0.6	0.1	0.3	2.9	0.8	1.5
Prob > F	0.032	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV%	5.2	0.5	0.9	1.1	4.8	0.2	0.4
Lattice RE% ⁵	165	187	110	141	100	131	275

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%. Some lines used in analysis are excluded from data table

*Indicates highest entry within a column

Table 5. Agronomic Data Bozeman Dryland 2022 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	51.0	57.8	9.8	15.5	26.7	192.4	217.7
Divide	48.8	59.3	9.9	16.1	37.4	194.7	219.1
Carpio	51.5	58.5	9.9	15.6	34.9	196.4	220.5
Joppa	46.3	58.9	10.0	15.8	36.3	194.9	218.8
Lustre	44.4	58.0	9.7	16.6	36.4	196.6	219.8
Mountrail	50.5	58.6	9.7	15.7	35.5	195.7	218.4
ND Riveland	54.7	59.7	9.9	16.1	37.9	195.0	220.3
ND Grano	47.0	59.8	9.8	15.8	34.9	196.3	220.0
MT Raska	42.8	59.6	9.8	16.0	23.8	192.3	219.3
MTD18148	41.0	58.2	9.9	15.9	23.0	192.0	219.0
MT Blackbeard	49.0	60.2	10.1*	15.4	38.2*	196.5	220.5
MTD19011	55.2*	59.4	10.0	15.8	36.5	194.3	220.2
MTD19077	43.0	58.6	9.8	17.3*	36.0	196.2	219.6
MTD19089	45.9	58.9	9.7	16.9	34.4	196.3	220.1
MTD19103	52.3	58.7	9.9	16.3	35.2	196.6	220.5
MTD19109	44.6	59.0	9.9	15.5	34.1	197.4*	220.8
MTD19115	44.0	59.4	9.7	15.6	32.6	195.6	220.0
MTD19209	42.9	59.4	9.7	15.9	36.7	197.1	220.8
MTD19241	47.9	59.3	9.9	15.7	34.0	196.0	220.4
MTD19349	48.2	56.9	9.7	16.4	34.3	196.0	220.0
MTD19375	41.1	56.5	9.7	17.3	33.4	196.8	221.5
MTD19499	49.2	57.4	10.0	16.0	33.0	195.9	220.5
MTD19507	44.6	59.1	9.9	15.7	34.2	195.1	219.4
MTD19511	44.8	57.7	9.9	15.5	31.3	194.9	221.0
MTD19529	49.6	58.4	10.0	15.5	33.3	194.9	219.8
MTD19611	46.6	60.2	9.9	16.5	31.4	195.2	220.4
MTD19617	48.8	60.7	10.0	16.6	33.4	196.5	221.5*
MTD19623	52.3	57.9	9.9	15.8	34.8	195.2	220.4
MTD19653	44.0	60.9*	10.0	17.1	34.8	195.5	220.5
MTD19703	43.6	60.2	9.9	16.1	35.1	195.6	219.8
Mean	47.2	58.9	9.9	16.1	33.8	195.5	220.0
LSD (p=0.05)	5.4	0.8	0.1	0.5	1.5	1.0	1.3
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV%	6.3	0.7	0.7	1.6	2.5	0.3	0.3
Lattice RE% ⁵	163	138	100	116	110	110	130

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%. Some lines used in analysis are excluded from data table

*Indicates highest entry within a column

Table 6. Agronomic Data NARC Dryland 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Sawfly ³ %	Heading ⁴ Julian	FN14 sec	Stand ⁵ %
Alzada	37.0	58.1	7.5	15.7	23.9	4.0	169.0	510.2*	91.1
Divide	36.9	58.3	7.6	16.3	28.6	6.5	172.7	417.8	85.6
Carpio	35.3	57.7	7.6	16.7	28.4	3.6	174.3	420.1	92.1
Joppa	32.5	57.4	7.6	16.5	27.7	13.2	171.3	411.9	71.3
Lustre	36.9	56.8	7.5	16.9	29.1	5.1	173.3	426.1	88.9
Mountrail	32.6	56.7	7.5	16.8	26.0	6.6	173.7	440.2	85.7
ND Riveland	39.7	57.8	7.6	16.5	30.4	11.4	173.7	447.7	75.0
ND Grano	40.7	58.6	7.6	16.4	29.3	15.0*	175.0	418.3	67.0
MT Raska	39.3	60.0*	7.6	16.1	23.1	1.1	169.0	426.5	97.7
MTD18148	40.2	58.6	7.5	15.8	22.4	6.8	170.0	505.0	85.2
MT Blackbeard	36.1	57.2	7.8*	16.9	30.3*	1.6	174.3	495.0	96.5
MTD19011	42.4	58.7	7.7	16.0	30.1	0.9	172.7	487.1	98.0
MTD19077	38.9	57.9	7.5	17.2	29.8	5.4	175.0	434.2	88.3
MTD19089	36.8	57.4	7.5	17.7	29.2	7.0	174.0	428.6	85.3
MTD19103	41.4	57.5	7.6	16.9	29.2	1.1	175.3	412.6	97.6
MTD19109	35.6	57.1	7.6	17.0	28.7	6.6	174.7	470.7	85.6
MTD19115	40.7	58.9	7.5	16.5	28.1	2.1	174.0	432.7	95.3
MTD19209	42.6*	58.7	7.6	16.4	30.8	0.4	176.3*	432.9	99.1*
MTD19241	42.3	58.2	7.7	16.1	27.5	1.9	173.0	442.7	95.8
MTD19349	35.9	56.2	7.5	17.2	26.6	8.2	173.7	403.5	82.0
MTD19375	38.6	55.2	7.6	18.0*	27.6	3.7	174.7	400.2	91.9
MTD19499	33.8	54.9	7.8	17.6	27.7	0.6	174.0	385.9	98.7
MTD19507	35.0	56.5	7.7	16.9	27.2	3.8	172.3	441.3	91.8
MTD19511	35.9	56.4	7.6	16.7	27.5	6.8	171.3	435.8	85.2
MTD19529	36.3	56.1	7.6	17.1	27.8	6.6	172.0	366.4	85.7
MTD19611	38.7	58.8	7.7	17.0	27.3	1.2	173.0	434.9	97.4
MTD19617	33.5	58.2	7.7	17.8	28.2	0.7	174.0	480.4	98.4
MTD19623	40.3	57.3	7.7	16.4	29.1	4.8	173.3	448.5	89.5
MTD19653	35.3	59.2	7.6	17.8	28.8	11.6	173.0	471.3	75.1
MTD19703	40.3	58.6	7.7	16.8	29.7	3.9	173.0	424.7	91.4
Mean	37.7	57.6	7.6	16.8	28.0	5.1	173.2	438.4	88.9
LSD (p=0.05)	3.1	0.8	0.1	0.5	1.6	4.8	1.7	21.0	10.5
Prob > F	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001
CV%	5.0	0.9	0.9	1.8	3.3	56.1	0.6	2.8	7.1
Lattice RE% ⁶	100	100	100	100	105	101	100	102	101

¹Grain yield reported on a 13% moisture basis²Grain protein reported on a 12% moisture basis³Lodging due to sawfly cutting⁴>50% of heads 100% out of boot⁵Visual rating of percent stand at early tillering⁶Adjusted means provided for Lattice RE% values equal to or greater than 100%

*Indicates highest entry within a column

Table 7. Agronomic Data Conrad Dryland 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches
Alzada	29.0	58.6	8.7	15.9	22.3
Divide	23.5	57.1	8.8	16.2	24.0
Carpio	24.7	56.7	8.7	16.4	23.0
Joppa	23.5	57.6	8.8	16.1	23.3
Lustre	29.1	56.9	8.5	16.5	24.0
Mountrail	28.5	58.2	8.5	16.5	22.0
ND Riveland	28.3	57.7	8.6	16.4	24.0
ND Grano	25.3	58.6	8.7	16.3	21.0
MT Raska	27.0	59.7*	8.6	16.9	21.3
MTD18148	28.5	58.5	8.7	16.3	20.3
MT Blackbeard	29.6	59.5	8.8	15.7	23.7
MTD19011	30.4	57.9	8.8	15.8	24.0
MTD19077	28.1	57.8	8.7	18.2*	24.0
MTD19089	29.1	58.2	8.5	17.3	24.0
MTD19103	31.9	58.5	8.7	17.1	24.0
MTD19109	25.7	57.4	8.7	16.4	22.0
MTD19115	30.9	58.3	8.5	16.2	22.7
MTD19209	34.3*	58.0	8.7	16.5	24.7*
MTD19241	32.4	57.7	8.5	16.3	24.3
MTD19349	30.1	57.1	8.4	16.5	22.7
MTD19375	29.5	55.6	8.6	16.7	22.7
MTD19499	29.8	58.3	8.7	16.1	23.0
MTD19507	30.9	58.1	8.7	16.3	22.0
MTD19511	30.9	58.1	8.7	15.3	20.0
MTD19529	30.3	59.4	8.8	16.3	21.3
MTD19611	28.3	59.3	8.7	16.9	21.7
MTD19617	30.5	58.7	8.6	17.4	24.3
MTD19623	31.3	58.6	8.8	16.4	24.0
MTD19653	24.5	59.2	8.6	17.9	22.7
MTD19703	30.6	58.9	8.8	16.2	23.7
Mean	28.9	58.1	8.7	16.5	22.9
LSD (p=0.05)	4.6	1.6	0.2	0.8	2.6
Prob > F	0.003	0.001	<0.001	<0.001	0.030
CV%	8.9	1.6	1.2	2.6	7.0
Lattice RE% ³	130	100	106	170	100

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%

*Indicates highest entry within a column

Table 8. Agronomic Data EARC Irrigated 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Heading ³ Julian
Alzada	55.9	62.0	11.6	14.1	30.2	180.0
Divide	69.5	64.9	11.9	12.5	36.1	182.7
Carpio	74.6	64.9	12.0	12.8	35.6	182.0
Joppa	76.1	65.1	12.1	12.9	35.7	181.7
Lustre	76.0	64.2	11.6	13.2	36.6	182.3
Mountrail	71.9	64.3	11.6	13.1	35.4	182.0
ND Riveland	79.5	63.8	12.0	13.2	37.3	182.7
ND Grano	77.7	65.6*	12.0	13.1	37.3	182.7
MT Raska	61.2	64.4	11.8	13.9	28.6	178.7
MTD18148	68.3	63.7	11.7	13.9	28.0	180.0
MT Blackbeard	78.7	64.7	12.3	12.7	37.7	183.0
MTD19011	71.9	63.9	11.9	13.5	36.2	182.7
MTD19077	79.3	65.0	11.6	14.7*	36.6	183.7
MTD19089	79.3	65.3	11.8	13.8	38.1	184.7
MTD19103	76.1	64.4	11.8	13.3	34.3	183.0
MTD19109	84.2*	64.5	12.1	12.3	33.9	185.0*
MTD19115	73.2	64.4	11.7	13.2	34.9	181.0
MTD19209	72.6	64.6	12.0	13.5	38.2*	183.3
MTD19241	76.3	64.9	11.8	13.6	35.3	181.7
MTD19349	73.4	64.1	11.9	12.8	35.2	182.3
MTD19375	78.2	62.7	11.9	14.0	36.4	183.7
MTD19499	71.8	63.5	12.2	13.3	35.3	182.0
MTD19507	69.0	64.4	11.9	14.3	34.8	180.3
MTD19511	69.9	63.0	11.9	13.8	33.6	181.0
MTD19529	62.3	62.9	12.0	13.1	34.3	181.7
MTD19611	72.5	64.9	11.9	14.0	32.2	180.7
MTD19617	74.1	65.4	12.0	12.8	34.9	183.0
MTD19623	75.1	64.1	12.0	12.1	35.7	181.7
MTD19653	72.2	65.5	11.9	12.9	35.7	182.0
MTD19703	74.5	64.9	11.7	13.3	36.6	182.0
Mean	73.2	64.3	11.9	13.3	35.0	182.1
LSD (p=0.05)	8.0	0.8	0.4	0.8	2.4	1.3
Prob > F	<0.001	<0.001	0.019	<0.001	<0.001	<0.001
CV%	6.4	0.7	1.8	3.6	4.3	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

*Indicates highest entry within a column

Table 9. Agronomic Data EARC Dryland 2022 Durum Variety Trial Using Adj. Yield

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Heading ³ Julian
Alzada	58.0	63.1	11.9	13.6	27.6	181.3
Divide	57.8	63.4	12.0	13.3	34.1	185.1
Carpio	51.6	63.1	12.3	13.2	32.4	186.0
Joppa	53.7	63.3	11.9	13.0	34.1	185.5
Lustre	52.9	62.2	11.8	13.4	33.0	185.1
Mountrail	62.4	63.3	11.9	12.7	33.9	185.6
ND Riveland	56.3	62.5	12.2	12.9	35.0	187.0
ND Grano	57.0	63.7	12.1	13.5	33.4	185.4
MT Raska	56.3	64.7*	11.9	13.2	25.3	180.7
MTD18148	59.6	63.6	11.9	13.0	25.0	181.7
MT Blackbeard	61.4	63.5	12.3	12.5	36.6*	185.2
MTD19011	58.9	63.8	12.1	12.8	33.2	184.7
MTD19077	54.5	63.2	11.9	14.0	33.8	186.2
MTD19089	58.3	62.9	11.9	14.6*	33.9	185.8
MTD19103	57.7	62.7	12.1	13.2	33.5	185.6
MTD19109	52.4	62.1	12.1	13.8	33.0	187.0*
MTD19115	53.9	63.5	12.1	12.9	32.5	185.4
MTD19209	60.8	64.1	12.2	12.9	35.1	185.9
MTD19241	55.4	63.8	12.1	13.1	32.0	184.7
MTD19349	53.2	61.5	12.1	13.9	33.7	186.5
MTD19375	51.7	60.7	11.8	14.4	31.6	186.6
MTD19499	56.6	61.7	12.2	13.8	33.0	185.3
MTD19507	54.5	62.9	12.0	13.9	31.9	184.2
MTD19511	54.4	62.0	12.0	13.5	29.8	182.9
MTD19529	51.6	63.1	12.1	13.1	32.5	185.1
MTD19611	50.9	63.8	12.1	13.9	31.3	183.6
MTD19617	56.3	64.4	12.3	13.1	33.1	185.7
MTD19623	58.4	61.8	12.0	13.3	34.7	184.9
MTD19653	55.2	64.6	12.1	14.3	32.7	185.8
MTD19703	63.0*	64.1	12.0	13.2	34.3	185.2
Mean	56.2	63.1	12.0	13.4	32.5	185.0
LSD (p=0.05)	4.9	0.6	0.3	0.6	1.8	1.0
Prob > F	<0.001	<0.001	0.018	<0.001	<0.001	<0.001
CV%	4.9	0.5	2.0	2.4	3.3	0.3
Lattice RE% ³	108	129	188	176	107	131

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%

*Indicates highest entry within a column

Table 10. Agronomic Data CARC Dryland 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Sawfly ³ %
Alzada	33.5	53.2	9.6	15.2	24.6	0.0
Divide	33.4	52.9	9.5	16.6	27.4	1.7
Carpio	28.7	54.2	9.5	16.6	27.7	2.0
Joppa	29.1	53.5	9.6	16.5	28.7	1.3
Lustre	36.7	53.5	9.6	16.3	29.2	1.3
Mountrail	35.8	53.2	9.6	15.0	27.7	1.3
ND Riveland	31.1	53.3	9.5	15.4	30.0	2.0
ND Grano	31.8	53.9	9.6	16.3	28.5	1.3
MT Raska	36.9	54.3	9.7	15.6	23.0	0.0
MTD18148	37.8	54.4*	9.5	15.5	23.6	0.0
MT Blackbeard	39.3*	53.5	9.7	16.3	32.3*	0.0
MTD19011	36.9	53.2	9.5	16.5	29.3	0.1
MTD19077	23.5	52.5	9.5	17.1*	27.5	0.0
MTD19089	26.4	53.0	9.4	16.3	28.6	0.0
MTD19103	30.9	53.3	9.5	16.3	28.8	0.3
MTD19109	35.8	53.7	9.6	16.0	27.8	0.9
MTD19115	30.6	53.6	9.6	15.9	28.5	0.0
MTD19209	31.8	53.0	9.5	16.7	30.3	0.6
MTD19241	37.6	52.8	9.4	16.9	29.2	0.0
MTD19349	29.8	53.2	9.6	16.3	27.4	2.6*
MTD19375	32.9	52.5	9.4	16.3	30.3	0.6
MTD19499	31.7	53.2	9.5	15.9	29.3	0.0
MTD19507	32.4	53.2	9.5	16.2	28.2	0.7
MTD19511	34.8	53.1	9.3	15.8	27.4	1.0
MTD19529	31.2	53.2	9.6	15.9	26.0	0.7
MTD19611	39.0	53.7	9.5	16.8	28.0	0.0
MTD19617	32.3	54.1	9.6	16.1	29.5	0.0
MTD19623	30.0	53.3	9.6	16.1	28.2	0.1
MTD19653	28.5	52.9	9.6	16.1	27.8	1.4
MTD19703	33.2	54.2	9.6	15.3	28.3	0.4
Mean	32.8	53.4	9.5	16.1	28.1	0.7
LSD (p=0.05)	7.6	1.5	0.3	1.7	2.5	1.4
Prob > F	0.015	0.537	0.823	0.858	<0.001	0.006
CV%	13.7	1.6	1.7	6.1	5	119.7
Lattice RE% ⁴	102	102	100	111	132	101

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

³Visual estimate of lodging due to sawfly cutting

⁴Adjusted means provided for Lattice RE% values equal to or greater than 100%

*Indicates highest entry within a column

Table 11. Agronomic Data NARC Off-Station Loring, MT Dryland 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Stand ³ %	Sawfly ⁴ %	FN ⁵ sec
Alzada	25.8	59.1	8.2	13.8	21.1	99.7	1.0	484.9*
Carpio	22.9	59.1	8.2	14.1	23.5	100.0*	5.0	427.3
Divide	22.8	59.2	8.3	14.1	25.5*	97.8	3.7	411.3
Grenora	21.6	59.2	8.3	13.9	23.7	97.1	3.7	424.6
Joppa	22.7	59.8	8.3	13.9	25.2	97.4	8.3	416.7
Lustre	21.6	57.6	8.0	14.8*	24.5	97.1	5.0	431.4
Mountrail	26.0	58.4	8.1	14.1	25.0	97.4	3.7	397.1
MTD18148	23.9	59.6	8.3	13.6	19.6	97.4	1.0	476.0
MT Raska	25.0	60.6*	8.4	14.0	20.8	100.0	0.7	412.4
MT Blackbeard	26.1	59.6	8.4	14.0	25.3	98.4	1.0	459.6
MTD18172	27.9*	60.1	8.3	14.6	25.2	97.4	5.0	401.0
CDC Vivid	21.0	59.1	8.3	14.5	24.3	97.1	1.0	413.1
ND Grano	20.5	59.5	8.2	14.3	24.0	97.7	5.3	416.6
ND Riveland	22.8	59.3	8.2	13.8	25.4	96.8	3.7	430.7
Tioga	22.7	60.0	8.3	14.4	26.5	98.4	10.0*	421.6
Mean	23.6	59.3	8.2	14.1	24	98	3.9	428.3
LSD (p=0.05)	3.2	0.7	0.1	0.3	1.4	3.3	3.1	17.4
Prob > F	0.001	<0.001	<0.001	<0.001	<0.001	0.558	<0.001	<0.001
CV%	8.1	0.7	0.8	1.2	3.5	2.0	47.0	2.4

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

³Percent stand visually estimated at early tillering

⁴Lodging due to sawfly cutting visually estimated at maturity

⁵Falling number reported on a 14% moisture basis

*Indicates highest entry within a column

Table 12. Agronomic Data NARC Off-Station Chester, MT Dryland 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Stand ³ %	Sawfly ⁴ %	FN ⁵ sec
Alzada	25.3	56.9	7.5	16.5	21.8	91.7	0.7	515.5*
Carpio	23.2	55.2	7.6	17.1	24.6	78.1	0.7	368.8
Divide	25.9	56.9	7.5	16.9	23.9	83.2	0.0	376.5
Grenora	24.7	55.7	7.5	16.9	22.6	86.3	0.7	415.1
Joppa	24.8	56.5	7.5	16.9	25.0	85.4	0.7	370.6
Lustre	21.8	54.5	7.3	18.2	24.4	88.6	0.7	357.2
Mountrail	27.9	55.7	7.3	16.8	23.5	90.2	0.7	435.8
MTD18148	26.5	55.6	7.5	17.2	20.8	94.3*	0.3	502.5
MT Raska	28.0	57.9*	7.6	17.3	21.1	91.1	0.3	396.9
MT Blackbeard	25.7	54.7	7.7	16.8	26.0	84.4	0.0	470.6
MTD18172	29.7*	57.0	7.5	17.7	24.5	91.1	0.3	426.8
CDC Vivid	22.0	55.4	7.7	18.3*	24.8	93.3	1.0	417.2
ND Grano	26.3	55.2	7.4	17.8	24.0	84.4	1.0*	401.7
ND Riveland	27.1	55.5	7.5	17.1	26.1	83.2	0.3	454.1
Tioga	22.1	55.4	7.6	17.6	26.5*	71.7	0.7	439.5
Mean	25.4	55.9	7.5	17.3	24.0	86.5	0.5	423.2
LSD (p=0.05)	2.2	0.7	0.1	0.3	1.7	13.7	0.8	24.5
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	0.127	0.377	<0.001
CV%	5.1	0.8	1.1	1.1	4.2	9.5	98.9	3.5

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

³Percent stand visually estimated at early tillering

⁴Lodging due to sawfly cutting visually estimated at maturity

⁵Falling number reported on a 14% moisture basis

*Indicates highest entry within a column

Table 13. Agronomic Data NARC Off-Station Turner, MT Dryland 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Stand ³ %	Sawfly ⁴ %	FN ⁵ sec
Alzada	36.9	59.6	8.4	14.5	24.0	97.1	1.0	485.9*
Carpio	32.4	59.5	8.5	14.3	24.8	98.0	5.0	419.4
Divide	32.8	59.7	8.6	14.6	25.2	96.1	1.0	416.3
Grenora	35.5	59.8	8.5	14.6	23.7	97.3	3.7	443.5
Joppa	30.7	60.5	8.6	14.5	23.9	98.7*	2.3	422.0
Lustre	30.5	58.5	8.4	15.1	25.5	97.7	1.0	437.5
Mountrail	34.2	58.9	8.3	14.8	24.6	97.7	5.3	417.6
MTD18148	36.5	60.4	8.6	14.9	20.6	97.4	0.7	469.7
MT Raska	30.6	61.2*	8.5	15.4*	19.8	97.7	0.0	453.8
MT Blackbeard	34.3	59.9	8.6	14.4	25.6	98.0	2.3	448.2
MTD18172	36.4	60.4	8.5	15.3	23.0	97.7	2.3	402.6
CDC Vivid	38.1*	60.1	8.6	15.3	24.8	96.7	0.7	435.6
ND Grano	33.8	60.3	8.4	14.5	25.0	97.0	3.7	430.6
ND Riveland	32.8	59.3	8.4	14.6	26.9*	97.4	3.7	446.2
Tioga	34.1	59.6	8.5	14.5	26.4	98.0	6.7*	430.5
Mean	34.0	59.8	8.5	14.8	24.2	97.5	2.6	437.3
LSD (p=0.05)	2.2	0.5	0.1	0.4	1.5	2.2	3.4	20.7
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	0.786	0.008	<0.001
CV%	3.8	0.5	0.2	1.8	3.7	1.3	77.8	2.8

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

³Percent stand visually estimated at early tillering

⁴Lodging due to sawfly cutting visually estimated at maturity

⁵Falling number reported on a 14% moisture basis

*Indicates highest entry within a column

Table 14. Agronomic Data EARC Off-Station Sheridan Co., MT Dryland 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Lodge ³ %
Alzada	51.6	62.2	12.8	11.9*	28.0	90.0*
Carpio	64.6	64.3	13.1	11.4	34.4	3.3
Divide	67.9	63.6	13.2	10.5	36.5	40.0
Grenora	68.0	63.0	13.3	10.6	33.9	0.0
Joppa	64.2	63.7	13.0	10.5	36.1	6.7
Lustre	62.9	62.4	12.8	11.0	34.5	86.7
Mountrail	69.6*	63.8	13.0	10.2	35.4	36.7
MTD18148	60.4	62.9	13.0	11.2	26.5	16.7
MT Raska	58.7	63.7	13.0	10.7	29.0	0.0
MT Blackbeard	65.8	64.1	13.2	10.4	37.7	6.7
MTD18172	64.3	64.4*	13.0	10.7	34.9	0.0
CDC Vivid	63.1	63.6	13.0	11.3	34.4	0.0
ND Grano	65.7	64.2	13.2	10.7	35.6	6.7
ND Riveland	60.6	63.4	13.3	10.9	38.1*	3.3
Tioga	66.6	63.4	13.3	9.9	37.9	30.0
Mean	63.6	63.5	13.1	10.8	34.2	21.8
LSD (p=0.05)	5.5	0.9	0.3	1.0	2.8	28.8
Prob > F	<0.001	<0.001	0.063	0.088	<0.001	<0.001
CV%	5.1	0.8	1.4	5.7	4.9	79.2

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

³Visual estimate of lodging due to weather

*Indicates highest entry within a column

Table 15. Agronomic Data EARC Off-Station Valley Co., MT Dryland 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Sawfly ³ %
Alzada	24.6*	60.9	9.4	15.6	22.7	20.0
Carpio	15.3	59.7	9.5	17.5	19.9	36.7
Divide	16.1	61.0	9.4	17.1	21.0	50.0
Grenora	15.0	59.9	9.5	16.0	20.3	33.3
Joppa	18.3	61.7	9.4	16.5	23.1	46.7
Lustre	16.2	59.0	9.2	17.7*	20.1	23.3
Mountrail	18.0	59.9	9.3	17.2	21.1	36.7
MTD18148	21.7	61.2	9.4	15.9	18.9	20.0
MT Raska	23.5	62.5*	9.5	15.7	20.5	36.7
MT Blackbeard	18.0	60.6	9.*6	16.8	22.2	26.7
MTD18172	17.2	61.9	9.6	17.2	22.8	40.0
CDC Vivid	18.9	59.8	9.4	17.3	24.9*	36.7
ND Grano	15.4	60.7	9.3	17.3	20.1	40.0
ND Riveland	13.3	60.9	9.4	16.8	23.4	56.7
Tioga	16.3	61.7	9.4	17.3	21.9	63.3*
Mean	17.9	60.8	9.4	16.8	21.5	37.8
LSD (p=0.05)	3.7	0.7	0.2	0.7	1.9	26.8
Prob > F	<0.001	<0.001	0.002	<0.001	<0.001	0.078
CV%	11.8	0.7	1.0	2.6	5.3	42.4

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

³Lodging due to sawfly cutting visually estimated at maturity

*Indicates highest entry within a column

Table 16. Agronomic Data EARC Off-Station Roosevelt Co., MT Dryland 2022 Durum Variety Trial

ID	Yield ¹ bu/ac	Test Weight lb/bu	Moisture %	Protein ² %	Plant Height Inches	Sawfly ³ %
Alzada	21.5	62.3	10.7	14.1	19.7	30.0
Carpio	15.5	62.3	11	14.6	21.8	63.3
Divide	17.5	62.6	10.8	14.2	20.7	60.0
Grenora	13.7	62.1	10.7	14.3	19.7	40.0
Joppa	17.1	62.6	10.9	14.1	22.6	53.3
Lustre	15.6	61.4	10.6	15.1	22.2	40.0
Mountrail	15	62.1	10.6	14.6	22	60.0
MTD18148	19.3	61.8	10.8	14.3	17.5	36.7
MT Raska	19.3	63.9	10.7	14.8	17.6	30.0
MT Blackbeard	20.7	62.8	11.2	14.1	23.5	40.0
MTD18172	15.8	63.5	10.8	15.4	21.9	33.3
CDC Vivid	17.3	61.7	10.9	15.3	23	30.0
ND Grano	16.3	62.6	10.8	14.8	23.5	46.7
ND Riveland	14.6	62.7	10.6	14.5	24.1	63.3*
Tioga	16.5	63	10.6	14.4	22.3	56.7
Average	17.1	62.5	10.8	14.6	21.5	45.6
LSD (p=0.05)	3.4	0.4	0.1	0.7	2.5	24.3
Prob > F	0.002	<0.001	<0.001	0.005	<0.001	0.028
CV%	11.9	0.4	0.7	2.8	6.9	31.8

¹Grain yield reported on a 13% moisture basis

²Grain protein reported on a 12% moisture basis

³Lodging due to sawfly cutting visually estimated at maturity

*Indicates highest entry within a column

Table 17. Seed Quality Data All On-Station 2022 Durum Variety Trials (n=7).

ID	Test weight lbs/bu	Large seeds %	Small seeds %	Hardness index ¹	Individual seed weight ¹ mg	Individual seed diameter ¹ mm	Grain Protein ² %	Grain ash ³ %	Falling number ³ sec
Alzada	60.0	65.1*	8.9	73.8	40.2*	2.92**	14.6	1.60	541.5*
Divide	60.8	43.0	16.6	73.5	37.4	2.74	14.8	1.53	430.7
Carpio	60.4	48.7	14.0	71.1	38.0	2.77	14.5	1.55	467.4
Joppa	60.8	38.4	19.1*	74.1	38.4	2.73	14.6	1.59	431.4
Lustre	59.7	34.7	17.0	73.2	38.1	2.74	14.9	1.54	494.2
Mountrail	60.4	34.0	19.1*	71.9	37.7	2.74	14.5	1.56	440.0
ND-Riveland	60.5	52.3	12.4	70.3	40.3*	2.82	14.6	1.56	464.8
ND-Grano	61.3*	39.3	17.0	74.0	38.1	2.75	15.0	1.56	445.8
MT Raska	61.8*	50.0	14.3	81.3**	35.0	2.76	15.0	1.56	464.2
MTD18148	60.8	43.4	15.0	80.3*	36.5	2.77	14.6	1.54	481.3
MT Blackbeard	60.9	66.3**	8.7	75.2	40.7*	2.89*	14.6	1.59	513.5
MTD19011	60.4	53.9	11.1	74.1	40.4*	2.83	14.6	1.53	482.8
MTD19077	60.7	48.7	13.1	70.2	38.8	2.78	16.2**	1.63*	480.4
MTD19089	60.8	46.4	14.7	69.8	38.0	2.75	15.9*	1.60	450.8
MTD19103	60.3	57.9	10.1	71.6	40.7**	2.84	15.1	1.56	464.3
MTD19109	60.4	33.9	21.6**	76.0	34.5	2.65	14.6	1.66**	482.5
MTD19115	61.3*	44.3	16.0	74.6	34.9	2.73	14.7	1.59	472.3
MTD19209	61.2	38.7	17.0	77.8	37.3	2.72	14.6	1.50	452.3
MTD19241	60.9	38.0	18.0	77.8	34.9	2.70	14.7	1.52	473.0
MTD19349	59.5	39.3	16.6	78.0	34.6	2.70	15.0	1.58	453.7
MTD19375	58.4	37.0	17.3	79.8*	35.0	2.67	15.7	1.60	455.0
MTD19499	59.3	49.9	14.0	79.6*	35.5	2.77	15.2	1.65*	449.4
MTD19507	60.4	37.4	19.0*	78.7	33.3	2.67	15.2	1.62*	502.7
MTD19511	59.6	52.4	12.9	79.8*	35.7	2.79	14.8	1.60	470.4
MTD19529	59.9	46.3	16.1	78.0	34.4	2.75	14.7	1.60	420.9
MTD19611	61.5*	53.1	11.7	77.2	37.9	2.85	15.5	1.59	448.8
MTD19617	61.6*	41.7	16.4	79.5*	36.4	2.75	15.2	1.61*	487.7
MTD19623	59.9	59.1	11.1	75.8	39.5*	2.85	14.7	1.60	469.0
MTD19653	61.9**	47.1	15.7	76.6	35.6	2.76	15.6	1.64*	508.9
MTD19703	61.3	45.6	14.4	77.1	37.6	2.77	14.9	1.55	446.3
Average	60.6	46.2	15.0	75.7	37.2	2.77	15.0	1.58	468.2
LSD(0.05)	0.63	7.05	3.12	2.6	1.5	0.056	0.455	0.05	25.3
Prob>F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV(%)	1.0	14.5	19.7	3.3	3.8	1.9	2.9	3.1	5.1

¹Determined using the single kernel characterization system²Reported on a 12% moisture basis³Reported on a 14% moisture basis

** Indicates highest entry within a column

* Indicates entries ranking equal to the highest entry based on Fisher's Unrestricted LSD at the 0.05 level

Table 18. Milling Data All On-station 2022 Durum Variety Trials (n=7).

ID	Bran %	Shorts %	Semolina Yield %	Semolina Protein ¹ %	Semolina ash ¹ %
Alzada	24.0	16.1*	59.9*	13.4	0.72*
Divide	25.9	14.4	59.7*	13.4	0.67
Carpio	26.0	15.4	58.7	13.4	0.67
Joppa	26.1	14.6	59.3	13.2	0.67
Lustre	25.7	15.0	59.3	13.8	0.66
Mountrail	25.7	14.0	60.2*	13.4	0.67
ND Riveland	27.5**	15.6	56.8	13.2	0.65
ND Grano	25.5	14.0	60.5**	13.6	0.64
MT Raska	25.0	14.8	60.2*	13.4	0.64
MTD18148	25.5	15.8*	58.8	13.6	0.68
MT Blackbeard	25.0	14.8	60.1*	13.0	0.69
MTD19011	24.7	14.9	60.4*	13.3	0.64
MTD19077	26.9*	14.8	58.3	14.8**	0.72*
MTD19089	26.8	14.7	58.4	14.5*	0.73*
MTD19103	25.5	16.2**	58.3	13.7	0.69
MTD19109	26.7	13.7	59.6*	13.2	0.69
MTD19115	26.9	14.4	58.6	13.3	0.67
MTD19209	25.4	16.2*	58.5	13.5	0.68
MTD19241	27.6	14.7	57.7	13.3	0.64
MTD19349	26.8	15.1	58.1	13.8	0.67
MTD19375	26.7	15.5	57.8	14.3	0.68
MTD19499	26.8	14.3	58.9	13.7	0.69
MTD19507	26.3	14.5	59.2	13.7	0.71*
MTD19511	27.1	14.9	58.1	13.3	0.67
MTD19529	27.0	15.5	57.5	13.4	0.71*
MTD19611	26.3	14.8	58.9	14.1	0.67
MTD19617	27.3	15.7	57.0	13.9	0.69
MTD19623	27.0	16.1*	56.9	13.2	0.69
MTD19653	26.2	14.4	59.4	14.2	0.66
MTD19703	25.9	14.3	59.8	13.4	0.64
Average	26.2	15.0	58.8	13.6	0.68
LSD(0.05)	0.677	0.457	0.948	0.463	0.025
Prob>F	<0.001	<0.001	<0.001	<0.001	<0.001
CV(%)	2.5	2.9	1.5	3.2	3.5

¹Reported on a 14% moisture basis

** Indicates highest entry within a column

* Indicates entries ranking equal to the highest entry based on Fisher's Unrestricted LSD at the 0.05 level

Table 19. Semolina Quality Data All On-Station 2022 Durum Variety Trials (n=7).

ID	<i>L</i> *	<i>b</i> *	<i>a</i> *	Mix Time min	Peak Integral ¹ %TQ*min	Gluten Index ²
Alzada	84.3	31.6	-2.88	4.5	242**	95.0*
Divide	84.9	27.9	-2.79	3.6	172	76.0
Carpio	84.8	30.8	-3.27	4.5	231*	96.5**
Joppa	84.9	30.7	-3.10	4.3	200	88.0
Lustre	84.7	28.7	-2.70*	3.4	165	65.5
Mountrail	85.2**	26.1	-2.68*	2.3	104	34.5
ND Riveland	84.9	30.3	-3.15	4.3	224*	92.5*
ND Grano	84.9	30.7	-3.24	3.4	169	83.0
MT Raska	84.7	28.9	-2.85	4.0	176	80.0
MTD18148	84.2	31.4	-2.88	4.5	216	94.5*
MT Blackbeard	84.8	30.8	-3.18	4.4	218	94.5*
MTD19011	84.6	30.5	-2.88	3.7	175	71.5
MTD19077	84.4	34.1	-3.35	3.3	152	61.5
MTD19089	84.3	34.3*	-3.32	3.5	160	59.5
MTD19103	84.1	30.3	-2.67**	4.3	194	87.0
MTD19109	84.7	32.5	-3.23	3.6	174	86.5
MTD19115	84.5	32.4	-3.12	3.7	164	79.5
MTD19209	84.3	29.6	-2.75*	3.6	168	57.5
MTD19241	84.6	31.9	-3.17	3.7	169	70.0
MTD19349	84.5	31.6	-2.92	3.2	156	57.5
MTD19375	84.2	31.8	-2.95	3.1	150	57.0
MTD19499	84.5	33.7	-3.21	3.8	173	82.5
MTD19507	84.4	34.2*	-3.17	4.2	200	88.5
MTD19511	84.3	34.7**	-3.26	3.8	181	82.5
MTD19529	84.2	34.3*	-3.16	4.1	192	85.5
MTD19611	84.7	30.9	-3.02	5.0**	224*	88.5
MTD19617	84.8	30.6	-3.10	3.3	157	69.0
MTD19623	84.4	33.4	-3.20	4.2	211	91.5*
MTD19653	84.8	30.3	-3.03	3.4	155	67.0
MTD19703	84.7	30.7	-2.97	3.5	151	60.0
Average	84.6	31.3	-3.04	3.8	181	76.7
LSD(0.05)	0.1911	0.624	0.0967	0.352	331.6	7.355
Prob>F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV(%)	0.2	1.9	3.0	8.8	2.4	4.7

¹Determined using MixSmart software (Ver. 2.0.609).

²Only two locations were analyzed

** Indicates highest entry within a column

* Indicates entries ranking equal to the highest entry based on Fisher's Unrestricted LSD at the 0.05 level

Table 20. Durum Fungal Leaf Spot Evaluation 2022 (Dr. Zhaohui Liu, NDSU, Fargo, ND).

ID	ToxA ¹	Ptr-ND ²	DW5 ²	Sn4 ³
Alzada	0	3.3	3.7	3.2
Divide	3	3.2	2.3	2.8
Carpio	3	2.7	2.5	2.8
Joppa	3	2.8	2.5	3.5
Lustre	3	2.7	1.3	3.0
Mountrail	0	4.0	2.8	3.2
ND Riveland	0	3.8	2.5	2.8
ND Grano	3	3.0	3.3	3.0
MT Raska	3	2.8	1.3	2.2
MTD18148	3	2.8	3.7	3.0
MT Blackbeard	3	2.5	3.5	2.8
MTD19011	3	3.0	2.8	3.3
MTD19077	0	2.7	3.0	3.0
MTD19089	0	3.3	1.7	2.7
MTD19103	ND	2.8	1.2	1.7
MTD19109	3	3.5	1.7	3.5
MTD19115	ND	2.8	1.5	2.3
MTD19209	3	3.7	2.8	4.2
MTD19241	3	2.5	1.3	2.5
MTD19349	3	2.8	1.7	3.3
MTD19375	3	3.7	1.7	3.0
MTD19499	3	2.7	1.8	3.2
MTD19507	3	2.7	2.5	3.8
MTD19511	3	3.2	2.5	3.7
MTD19529	3	3.5	2.7	3.5
MTD19611	3	3.0	1.5	3.5
MTD19617	ND	3.8	3.0	4.0
MTD19623	3	2.8	2.0	3.3
MTD19653	3	3.2	3.7	3.8
MTD19703	3	3.3	4.0	1.7
Salamouni (check)	0	1.3	1.0	2.7
Glealea (check)	3	4.0	2.5	4.5
6B662 (check)	0	2.3	3.7	3.8
6B365 (check)	0	4.2	2.2	3.0
BR34 (check)	0			1.2

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

²Evaluation 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

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

Table. 21 Durum Stripe Rust Evaluation 2022 (Dr. Xianming Cheng, USDA-ARS Pullman, WA.).

Location (WA)	Pullman		MT. Vernon		MT. Vernon		Central Ferry	
Date	7/5/2022		5/19/2022		6/27/2022		6/23/2022	
Feekes	10.54		2		10.54		10.5	
ID	IT ¹	% ²	IT ¹	% ²	IT ¹	% ²	IT ¹	% ²
Alzada	2	5	8	20	2	20	2	15
Divide	2	5	5	20	2	10	2	10
Carpio	2	10	8	10	2	15	2	2
Joppa	3	20	5	30	3	20	5	40
Lustre	2	5	3	30	2	15	2	10
Mountrail	2	15	8	10	3	20	5	40
ND Riveland	3	20	8	20	3	20	2	10
ND Grano	2	5	5	20	2	5	2	10
MT Raska	7	70	8	20	7	90	5	60
MTD18148	2	15	8	20	5	50	5	40
MT Blackbeard	5	50	8	20	5	50	5	40
MTD19011	2	10	5	20	2	5	2	10
MTD19077	3	20	8	20	2	5	3	15
MTD19089	3	20	8	20	2	5	3	15
MTD19103	3	20	8	20	2	5	2	10
MTD19109	2	15	8	10	2	5	2	10
MTD19115	3	20	7	20	2	5	3	15
MTD19209	2	20	8	20	3	20	2	10
MTD19241	2	15	8	20	2	5	2	5
MTD19349	2	15	7	30	2	5	2	10
MTD19375	2	15	8	20	2	10	2	10
MTD19499	2	10	8	20	2	5	2	10
MTD19507	3	30	8	20	3	20	3	15
MTD19511	2	10	8	20	2	15	2	10
MTD19529	3	15	8	20	2	5	2	10
MTD19611	2	5	8	20	2	10	2	10
MTD19617	2	5	8	10	2	5	2	10
MTD19623	5	30	8	10	2	10	3	15
MTD19653	5	30	8	10	2	15	3	20
MTD19703	5	30	7	20	2	15	5	30
AvS (Sus check)	9	100	8	20	9	100	9	100
MOREX barley	5	20	0	0	8	30	8	50

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. Heterogenous reactions of an entry were indicated by two or more ITs separated by "," for most plants with the first IT and few plants with the second IT or connected with "-" for entries containing plants with continuous ITs.

²Entries 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.

Table 22. Durum Fusarium Head Blight Evaluation 2022 (Dr. Frankie Crutcher, EARC, Sidney, MT).

ID	Severity ¹ %	Incidence ² %	Index ³	FDK ⁴ %	DON ⁵ ppm
Alzada	58.1 AB	100.0	58.1 AB	58.3	27.7 AB
Carpio	49.6 AB	100.0	49.6 AB	48.3	15.4 C-E
Divide	47.6 AB	98.9	47.0 AB	38.3	13.4 C-E
ND Grano	56.0 AB	97.8	54.7 AB	45.0	18.6 A-E
Joppa	50.6 AB	100.0	50.6 AB	66.7	17.2 B-E
Lustre	53.8 AB	98.9	53.2 AB	51.7	16.6 B-E
Mountrail	72.1 A	100.0	72.1 A	48.3	22.1 A-D
ND Riveland	55.9 AB	100.0	55.9 AB	36.7	11.0 C-E
MTD18148	50.6 AB	97.8	49.5 AB	48.3	30.3 A
MT Raska	48.6 AB	100.0	48.6 AB	40.0	21.7 A-D
MT Blackbeard	58.8 AB	100.0	58.8 AB	40.0	20.5 A-E
MTD19011	49.4 AB	100.0	49.4 AB	38.3	10.7 DE
MTD19077	36.1 B	98.9	35.8 B	45.0	16.7 B-E
MTD19089	42.4 B	100.0	42.4 B	60.0	20.0 A-E
MTD19103	46.8 AB	98.9	46.2 AB	55.0	14.8 C-E
MTD19109	53.1 AB	100.0	53.1 AB	60.0	11.6 C-E
MTD19115	58.9 AB	100.0	58.9 AB	41.7	17.5 B-E
MTD19209	57.2 AB	98.9	56.6 AB	45.0	9.8 E
MTD19241	55.9 AB	100.0	55.9 AB	41.7	20.6 A-E
MTD19349	57.6 AB	100.0	57.6 AB	46.7	18.4 B-E
MTD19375	61.1 AB	100.0	61.1 AB	36.7	16.2 B-E
MTD19499	48.7 AB	98.9	48.3 AB	75.0	15.9 C-E
MTD19507	45.8 AB	100.0	45.8 AB	46.7	18.6 B-E
MTD19511	51.0 AB	100.0	51.0 AB	43.3	18.7 A-E
MTD19529	58.0 AB	100.0	58.0 AB	63.3	17.7 B-E
MTD19611	49.2 AB	98.9	48.7 AB	48.3	19.2 A-E
MTD19617	56.9 AB	100.0	56.9 AB	55.0	17.4 B-E
MTD19623	58.0 AB	100.0	58.0 AB	51.7	17.7 B-E
MTD19653	60.3 AB	100.0	60.3 AB	48.3	22.5 A-C
MTD19703	53.2 AB	100.0	53.2 AB	48.3	19.8 A-E
Mean	53.4	99.6	53.2	49.1	17.9
<i>p</i> -value	0.0492	0.2219	0.0460	0.0700	<0.0001
CV (%)	18.7	1.1	18.9	28.5	29.7
HSD (5%)	29.1	3.4	29.3	41.2	11.7

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

¹Severity: Average percent area of head covered by disease; thirty heads were evaluated for each plot

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

³Index: Severity X Incidence / 100

⁴FDK: Percent fusarium damaged kernels

⁵Deoxynivalenol content