



MONTANA
STATE UNIVERSITY

College of
AGRICULTURE &
MONTANA AGRICULTURAL
EXPERIMENT STATION

PROJECT TITLE:

2019 STATEWIDE DURUM VARIETY TRIALS

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- Dr. Linda Dykes, USDA-ARS, Fargo, ND

OBJECTIVE:

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

METHODS:

In 2019, ten experimental durum lines developed at MSU and fourteen elite durum varieties were tested at six Montana Agricultural Experiment Stations and six off-station locations. Experimental lines developed at MSU carry genetic markers associated with reduced cadmium accumulation and/or a licensed gene that increases pasta firmness (Table 1). Durum varieties tested include releases from North Dakota State University, University of Saskatchewan-Canadian Crop Development Center, and Westbred (Table 1). Dryland experiments were grown on-station in Bozeman, MT (MSU-Post Agronomy Farm), Havre, MT (MSU-NARC), Sidney, MT (MSU-EARC), Conrad, MT (MSU-WTARC), Huntley, MT (MSU-SARC), and Moccasin, MT (MSU-CARC). Irrigated trials were grown on-station in Bozeman, MT (MSU-Post Agronomy Farm) and Sidney, MT (MSU-EARC). At the Bozeman locations two additional MSU experimental lines, MT112219 and MTD16003, were grown to maintain experimental design. There were three off-station experiments planted in Eastern Montana by EARC staff and three off-station experiments planted in North Central Montana by NARC staff. The trial at SARC this year was destroyed before harvest by hail and the Wibaux off-station site in Eastern Montana was sprayed out by the cooperator. 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. Seed was treated with CruiserMaxx Vibrance for Cereals® (Syngenta) (5 fl oz/100 lb). MAES research cooperators provided agronomic data such as plant height, heading date, pest 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 mixing strength.

Overall statewide agronomic performance from 2019 can be found in Table 1. Statewide yield and protein evaluation over three years (2017-19) are presented in Table 2. Statewide agronomic performance for 2019 separated by environment (irrigated or dryland) is presented in Tables 3 and 4. Agronomic data for each individual location is found in Tables 5-12 with overall quality data summarized in Tables 13 and 14. Individual location quality data can be found in Tables 15-28. Agronomic data for off-station variety trails grown in the North Central and North Eastern Montana can be found in Tables 29-33. Fusarium head blight evaluations conducted by Dr. Crutcher at EARC are found in Table 34.

Table 1. Agronomic means from 2019 intrastate durum trials all locations (n=7) and conditions.

Cultivar	Source ¹	Yield bu/ac ²	Test weight lb/bu	Protein % ³	Plant height inch	Heading date	
						Julian	Calendar
Mountrail	NDSU	79.4*	60.5	14.3	37.8	186.0	Jul 5
Divide	NDSU	77.0	60.5	14.2	37.9	186.0	Jul 5
Alkabo	NDSU	80.5*	61.2	14.0	37.0	185.4	Jul 4
Grenora	NDSU	81.3*	60.5	14.3	34.9	185.4	Jul 4
Tioga	NDSU	77.2	60.5	14.8	38.9	186.1	Jul 5
Carpio	NDSU	75.3	60.6	14.1	37.4	187.5	Jul 7
Joppa	NDSU	77.1	60.8	14.3	38.7	185.1	Jul 4
ND-Riveland ⁺	NDSU	77.8	60.3	14.6	38.7	186.7	Jul 6
ND-Grano ⁺	NDSU	81.3*	61.2	14.4	37.0	187.7	Jul 7
Alzada	WestBred	71.0	60.3	14.3	29.6	182.4	Jul 1
CDC-Dynamic ⁺	CDC	79.9*	60.7	14.9	37.8	188.0	Jul 7
CDC-Fortitude ⁺	CDC	76.3	60.5	14.8	35.0	186.5	Jul 6
CDC-Precision ⁺	CDC	80.9*	60.7	14.8	37.0	185.5	Jul 5
CDC-Vivid ⁺	CDC	82.6*	61.1	14.9	37.4	186.5	Jul 6
MTD16001 [\]	MSU	79.8*	59.6	13.6	37.5	186.8	Jul 6
MTD16002 ^{+ \}	MSU	77.2	60.0	14.3	39.6	187.9	Jul 7
MTD16004 [\]	MSU	79.5*	61.4	14.0	36.8	185.8	Jul 5
MTD16005 ^{+ \}	MSU	84.2**	60.2	14.4	38.3	187.0	Jul 6
MTD16006 ⁺	MSU	77.3	60.7	14.2	38.6	185.9	Jul 5
MTD16007 ⁺	MSU	79.6*	61.1	14.4	37.4	186.1	Jul 5
MTD16008 ^{+ \}	MSU	79.5*	59.2	14.4	37.5	185.4	Jul 4
MTD16009	MSU	72.4	57.0	15.0	38.0	186.7	Jul 6
MTD16010 [\]	MSU	75.5	61.1	14.7	38.7	186.4	Jul 5
MTD16011 ^{+ \}	MSU	79.0*	60.1	14.1	38.0	187.0	Jul 6
Average	-	78.4	60.4	14.4	37.3	186.3	-
LSD (0.05)	-	5.4	0.6	0.4	1.2	0.7	-
Prob > F	-	<0.001	<0.001	<0.001	<0.001	<0.001	-
CV (%)	-	6.5	1.0	2.8	3.0	0.3	-

⁺Low cadmium accumulation gene.

[\]Pasta firmness gene.

¹NDSU-North Dakota State University, CDC-University of Saskatchewan Crop Development Center, MSU-Montana State University.

²Grain yield reported on a 13% moisture basis.

³Grain protein reported on a 12% moisture basis.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 2. Yield and protein evaluation for statewide durum testing 23 location-years.

Cultivar	-----Yield (bu/ac) ¹ -----				-----Protein (%) ² -----			
	3 year	2017	2018	2019	3 Year	2017	2018	2019
Mountrail	73.3	64.0	77.3	79.3*	14.5	14.5	14.5	14.5
Divide	72.7	66.5*	75.2	76.9	14.6	14.8	14.6	14.4
Alkabo	73.6	64.7	75.9	81.3*	14.2	14.2	14.2	14.1
Grenora	74.8*	66.4*	77.5	81.4*	14.4	14.4	14.4	14.5
Tioga	72.1	65.4	74.1	77.5	14.9	15.0	14.9	15.0
Carpio	72.9	67.0*	76.8	75.2	14.4	14.6	14.4	14.3
Joppa	71.2	63.9	73.6	76.7	14.3	14.3	14.3	14.4
Alzada	66	60.4	67.7	70.4	14.6	14.6	14.6	14.5
CDC-Dynamic	73.1	62.8	78.0	79.3*	15.6	16.1	15.5	15.1
CDC-Fortitude	71.9	62.1	78.2	76.0	15.2	15.5	15.0	14.9
CDC-Precision	73.8*	64.3	77.0	80.9*	15.2	15.4	15.1	15.0
CDC-Vivid	73.2	62.1	76.1	82.6*	15.4	15.4	15.4	15.1
MTD16001	76.4**	66.6*	83.0**	80.0*	14.0	14.4	13.8	13.7
MTD16002	73.1	66.3*	76.0	77.5	14.6	14.7	14.5	14.6
MTD16004	75.9*	68.8*	80.1*	79.3*	14.3	14.4	14.3	14.1
MTD16005	74.8*	65.4	76.0	84.3**	14.6	14.7	14.6	14.6
MTD16006	73.5	66.5*	77.6	76.9	14.5	14.6	14.5	14.5
MTD16007	74.9*	69.1*	77.0	79.0*	14.7	14.7	14.6	14.6
MTD16008	71.7	63.0	73.5	79.7*	14.7	14.5	15.0	14.6
MTD16009	69.1	61.9	73.3	72.6	15.4	15.5	15.4	15.2
MTD16010	71.6	64.9	74.8	75.7	14.9	15.0	14.9	14.9
MTD16011	72.9	66.4*	73.3	79.8*	14.6	14.9	14.6	14.3
Average	72.8	64.9	76.0	78.3	14.7	14.8	14.7	14.6
LSD (0.05)	2.7	3.3	4.7	5.3	0.3	0.4	0.4	0.5
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV (%)	6.3	5.2	6.2	6.4	2.9	3.0	2.8	2.8

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 3. Agronomic means from 2019 irrigated intrastate durum trials (n=2).

Cultivar	Yield bu/ac¹	Test weight lb/bu	Protein %²	Plant height inch	Heading date Julian
Mountrail	118.8*	60.6	15.3	42.5	189.3
Divide	111.9	60.6	15.4	42.5	189.9
Alkabo	119.8*	61.1	14.6	41.2	188.6
Grenora	116.8*	60.1	15.0	39.2	188.6
Tioga	115.3*	60.3	15.3	43.5	189.3
Carpio	115.6*	61.2	15.1	42.6	190.9
Joppa	113.8*	61.1	14.9	42.4	188.6
ND-Riveland	118.7*	60.9	15.1	43.4	189.8
ND-Grano	124.6**	61.6	15.1	42.4	190.9
Alzada	97.9	59.3	14.8	30.9	185.1
CDC-Dynamic	115.2*	60.8	16.0	42.5	191.0
CDC-Fortitude	110.2	60.1	15.7	38.6	189.7
CDC-Precision	120.9*	60.3	15.6	41.0	189.0
CDC-Vivid	116.7*	60.9	15.7	40.6	189.9
MTD16001	117.0*	59.4	14.6	41.3	190.9
MTD16002	107.0	60.0	15.4	44.1	191.1
MTD16004	115.7*	60.6	14.7	41.2	188.7
MTD16005	119.2*	60.2	15.5	42.4	190.7
MTD16006	110.2	60.3	15.3	42.5	189.2
MTD16007	114.0*	60.7	15.2	41.0	190.4
MTD16008	121.5*	59.3	15.1	42.0	188.6
MTD16009	113.4	57.8	15.9	43.3	190.7
MTD16010	111.5	61.4	15.4	43.7	189.6
MTD16011	115.1*	60.0	15.0	43.0	190.3
Average	115.1	60.3	15.3	41.6	189.6
LSD (0.05)	11.06	1.4	0.7	2.1	1.0
Prob > F	0.045	0.004	0.012	<0.001	<0.001
CV (%)	4.6	1.1	2.1	2.4	0.3

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 4. Agronomic means from 2019 dryland intrastate durum trials (n=5).

Cultivar	Yield bu/ac¹	Test weight lb/bu	Protein %²	Plant height inch	Heading date Julian
Mountrail	63.7	60.4	13.9	35.9	184.4
Divide	63.0	60.5	13.7	36.0	184.0
Alkabo	64.8*	61.3	13.8	35.3	183.9
Grenora	67.1*	60.7	14.0	33.2	183.9
Tioga	61.9	60.6	14.6	37.0	184.5
Carpio	59.2	60.4	13.7	35.3	185.8
Joppa	62.3	60.7	14.0	37.2	183.4
ND-Riveland	61.4	60.1	14.4	36.9	185.2
ND-Grano	64.0	61.1	14.1	34.8	186.1
Alzada	60.2	60.8	14.1	29.1	181.0
CDC-Dynamic	65.8*	60.7	14.4	35.9	186.5
CDC-Fortitude	62.7	60.7	14.4	33.6	184.8
CDC-Precision	64.9*	60.9	14.4	35.4	183.7
CDC-Vivid	68.9*	61.2	14.6	36.2	184.8
MTD16001	64.9*	59.6	13.3	36.0	184.7
MTD16002	65.3*	60.0	13.9	37.8	186.4
MTD16004	65.1*	61.7	13.7	35.1	184.4
MTD16005	70.3**	60.2	13.9	36.7	185.2
MTD16006	64.1	60.8	13.8	37.0	184.3
MTD16007	65.8*	61.3	14.0	35.9	184.0
MTD16008	62.6	59.2	14.1	35.7	183.9
MTD16009	56.0	56.7	14.6	35.8	184.8
MTD16010	61.1	61.0	14.4	36.6	184.8
MTD16011	64.6*	60.1	13.7	36.0	185.4
Average	63.7	60.4	14.1	35.6	184.6
LSD (0.05)	5.8	0.7	0.5	1.3	0.9
Prob > F	0.005	<0.001	<0.001	<0.001	<0.001
CV (%)	7.2	1.0	3.0	3.0	0.3

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 5. Agronomic means from 2019 irrigated intrastate durum trial conducted by Giroux/Hogg at the Post Agronomy Farm in Bozeman, MT.

Cultivar	Yield bu/ac ¹	Test weight lb/bu	Protein % ²	Stand % ³	Plant height inch	Leaf spot 1-5 ⁴	Heading date Julian	Maturity date Julian
Mountrail	144.3*	60.2	14.3	83.6	46.5	0.4	194.8	234.7
Divide	138.7	59.9	14.5	85.2	47.6	0.0	195.0	235.4
Alkabo	148.7*	61.0	13.5	83.4	45.3	0.0	193.8	236.1
Grenora	146.8*	59.8	14.1	88.7	43.6	0.0	194.2	236.3
Tioga	144.7*	60.0	14.1	81.9	47.7	0.0	195.3	235.3
Carpio	135.5	60.5	14.2	78.5	46.5	0.0	196.1	235.5
Joppa	145.4*	60.9	13.9	83.5	46.7	0.6	193.5	235.6
ND-Riveland	141.8*	59.9	14.6	76.6	46.9	0.0	195.3	236.2
ND-Grano	152.4**	60.9	14.4	78.3	46.6	0.0	196.1	236.3
Alzada	124.4	58.3	14.0	85.5	32.4	4.3	190.1	232.6
CDC-Dynamic	136.6	59.5	15.3	87.5	46.3	0.0	196.2	235.4
CDC-Fortitude	130.6	59.9	15.0	89.9	42.6	3.3	195.4	237.1
CDC-Precision	149.7*	59.7	15.1	86.1	45.2	1.3	195.2	236.6
CDC-Vivid	139.5	60.0	14.9	83.7	45.0	2.7	195.4	235.2
MT112219	130.7	59.9	13.2	82.9	30.9	1.3	190.0	236.1
MTD16001	151.1*	58.5	13.5	83.8	45.6	0.0	195.7	236.0
MTD16002	132.8	59.4	14.4	89.6	47.7	1.9	196.1	236.4
MTD16003	143.4*	60.2	12.7	91.7	42.8	0.0	193.4	235.3
MTD16004	147.0*	60.9	13.9	79.1	43.9	4.1	194.1	235.9
MTD16005	147.3*	59.3	14.7	89.4	46.7	2.1	195.6	235.5
MTD16006	136.1	60.7	14.3	83.4	45.9	0.0	194.1	235.1
MTD16007	139.1	60.3	14.4	86.3	44.2	4.8	195.5	235.3
MTD16008	146.9*	58.6	14.4	82.2	46.2	0.2	193.8	235.5
MTD16009	134.5	56.4	15.7	88.1	46.9	0.0	196.0	235.0
MTD16010	137.5	61.4	14.4	83.8	48.3	0.5	194.5	236.5
MTD16011	136.8	59.1	14.5	87.9	46.7	1.8	195.9	234.3
Average	140.4	59.8	14.2	84.5	44.0	0.7	194.7	235.7
LSD (0.05)	12.4	0.7	0.5	1.0	1.4	0.4	0.8	1.9
Prob > F	0.002	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	0.014
CV (%)	4.8	0.7	2.2	4.8	1.8	90.6	0.2	0.4
Lattice RE (%) ⁵	123.5	127.6	103.6	119.9	107.0	102.4	139.4	172.4

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

³Percent stand 2 weeks after planting.

⁴Leaf spot disease assessed using a severity scale of 0-5, with 0 have no visible leaf spot symptoms and 5 having 100% of upper leaves having symptoms.

⁵Adjusted means provided for Lattice RE% values equal to or greater than 100%.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 6. Agronomic means from 2019 dryland intrastate durum trial conducted by Giroux/Hogg at the Post Agronomy Farm in Bozeman, MT.

Cultivar	Yield bu/ac ¹	Test weight lb/bu	Protein % ²	Stand % ³	Plant height inch	Leaf spot 1-5 ⁴	Heading date Julian	Maturity date Julian
Mountrail	101.2*	63.1	14.7	83.6	43.4	0.0	194.8	232.8
Divide	100.2*	63.4	15.1	84.9	44.0	0.0	194.2	233.7
Alkabo	102.9*	63.9	14.3	87.7	42.4	0.0	193.1	233.1
Grenora	102.5*	63.2	14.8	88.5	40.5	0.0	194.3	233.3
Tioga	97.6*	63.2	14.9	88.3	45.5	0.0	194.6	234.2
Carpio	96.4	62.9	14.4	84.5	43.7	0.3	195.4	234.2
Joppa	102.3*	63.2	14.4	88.6	44.1	0.0	193.2	233.5
ND-Riveland	95.0	61.9	15.0	81.6	44.3	0.0	195.6	235.4
ND-Grano	103.9*	63.0	14.8	83.4	42.1	0.0	196.0	233.7
Alzada	81.3	62.5	14.9	87.9	32.3	4.0	189.9	231.6
CDC-Dynamic	100.9*	62.6	15.5	89.8	43.7	0.0	196.6	232.4
CDC-Fortitude	94.7	62.3	15.7	88.7	41.4	3.0	195.1	233.7
CDC-Precision	98.3*	62.6	15.5	84.9	42.9	0.7	194.2	234.9
CDC-Vivid	97.3*	62.4	15.8	87.0	42.9	1.0	194.0	233.1
MT112219	91.1	63.8	14.2	85.0	30.1	4.0	189.3	232.7
MTD16001	104.2*	62.1	14.2	85.6	43.6	0.0	195.0	233.7
MTD16002	98.4*	62.2	14.9	89.6	45.3	1.7	196.7	234.2
MTD16003	101.7*	63.6	13.3	88.2	41.0	0.0	193.0	232.3
MTD16004	105.3**	64.4	14.5	86.0	42.1	4.0	193.0	232.5
MTD16005	103.7*	62.6	15.0	89.3	43.9	1.7	194.8	233.4
MTD16006	104.3*	63.2	14.6	85.1	45.3	0.7	193.6	234.2
MTD16007	101.2*	63.9	15.0	87.2	44.2	4.0	194.6	233.3
MTD16008	97.9*	61.4	15.3	84.8	42.9	1.3	194.0	233.5
MTD16009	89.9	59.9	16.2	83.7	43.3	0.3	195.2	233.3
MTD16010	94.4	63.9	14.8	86.8	45.1	0.3	194.6	233.7
MTD16011	97.4*	62.7	15.2	86.8	43.4	2.0	195.5	231.9
Average	98.3	62.9	14.8	86.2	41.8	1.1	194.3	233.5
LSD (0.05)	8.0	0.6	0.3	0.5	1.1	0.9	1.1	1.2
Prob > F	<0.001	<0.001	<0.001	0.020	<0.001	<0.001	<0.001	<0.001
CV (%)	4.4	0.5	1.4	3.5	1.3	50.6	0.3	0.3
Lattice RE (%) ⁵	130.4	113.7	100.4	108.3	169.0	100.0	109.8	342.2

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

³Percent stand 2 weeks after planting.

⁴Leaf spot disease assessed using a severity scale of 0-5, with 0 have no visible leaf spot symptoms and 5 having 100% of upper leaves having symptoms.

⁵Adjusted means provided for Lattice RE% values equal to or greater than 100%.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 7. Agronomic means from 2019 dryland intrastate durum trial conducted at Southern Agricultural Research Center Huntley, MT. Plots were destroyed by hail on August 11th before harvest.

Cultivar	Plant height	Lodging¹	Heading Date	
	inch	%	Julian	Calendar
Mountrail	48.7	46.7	178.7	Jun 28
Divide	48.8	24.4	178.7	Jun 28
Alkabo	47.9	32.2	178.0	Jun 27
Grenora	44.0	4.4	178.7	Jun 28
Tioga	49.2	35.6	178.7	Jun 28
Carpio	48.5	7.8	180.7	Jun 30
Joppa	49.0	68.9	178.0	Jun 27
ND-Riveland	49.0	64.4	179.7	Jun 29
ND-Grano	47.8	26.7	179.0	Jun 28
Alzada	35.5	57.8	175.0	Jun 24
CDC-Dynamic	46.4	24.4	179.7	Jun 29
CDC-Fortitude	46.1	23.3	179.0	Jun 28
CDC-Precision	46.1	37.8	178.0	Jun 27
CDC-Vivid	47.2	61.1	178.7	Jun 28
MTD16001	47.9	18.9	178.3	Jun 27
MTD16002	49.0	80.0	180.3	Jun 29
MTD16004	46.7	14.4	178.7	Jun 28
MTD16005	47.0	62.2	180.0	Jun 29
MTD16006	51.0	36.7	178.3	Jun 27
MTD16007	45.8	43.3	179.3	Jun 28
MTD16008	48.6	33.3	178.3	Jun 27
MTD16009	49.0	65.5	179.7	Jun 29
MTD16010	49.9	41.1	179.3	Jun 28
MTD16011	48.2	65.5	180.3	Jun 29
Average	47.4	41.1	178.9	Jun 28
LSD (0.05)	1.7	12.5	1.0	-
Prob > F	<0.0001	0.004	<0.0001	-
CV (%)	2.2	1.3	0.3	-
Lattice RE(%) ²	100.0	154.1	100.0	-

¹Estimated to the nearest 10 percent prior to harvest. Lodging estimates transformed by natural logarithm prior to analysis. Displayed means and PLSD are convert back to percent lodging.

²Adjusted means provided for Lattice RE% values equal to or greater than 100%.

Table 8. Agronomic means from 2019 irrigated intrastate durum trial conducted at Eastern Agricultural Research Center Sidney, MT.

Cultivar	Yield bu/ac¹	Test weight lb/bu	Moisture %	Protein %²	Plant height inch	Heading date Julian
Mountrail	93.3*	60.9	10.2	16.3	38.6	183.7
Divide	85.1	61.2	10.3	16.4	37.4	184.7
Alkabo	91.0*	61.1	10.3	15.8	37.1	183.3
Grenora	86.9*	60.4	10.3	16.0	34.9	183.0
Tioga	85.9	60.6	10.2	16.5	39.4	183.3
Carpio	95.7*	61.8	10.5	16.1	38.8	185.7
Joppa	82.3	61.2	10.3	16.0	38.1	183.7
ND-Riveland	95.7*	61.9	10.4	15.6	40.0	184.3
ND-Grano	96.8**	62.3	10.6	15.9	38.2	185.7
Alzada	71.4	60.2	10.5	15.6	29.5	180.0
CDC-Dynamic	93.9*	62.0	10.2	16.8	38.7	185.7
CDC-Fortitude	89.9*	60.3	10.3	16.4	34.6	184.0
CDC-Precision	92.2*	60.8	10.1	16.2	36.9	182.7
CDC-Vivid	93.9*	61.8	10.3	16.5	36.2	184.3
MTD16001	82.9	60.2	10.2	15.7	37.1	186.0
MTD16002	81.3	60.5	10.1	16.5	40.6	186.0
MTD16004	84.4	60.2	10.3	15.6	38.5	183.3
MTD16005	91.1*	61.0	10.1	16.3	38.2	185.7
MTD16006	84.4	59.8	10.3	16.3	39.2	184.3
MTD16007	88.9*	61.1	10.4	16.1	37.9	185.3
MTD16008	96.2*	60.0	10.4	15.9	37.8	183.3
MTD16009	92.3*	59.2	10.3	16.1	39.8	185.3
MTD16010	85.5	61.3	10.3	16.4	39.1	184.7
MTD16011	93.4*	60.8	10.2	15.6	39.4	184.7
Average	88.9	60.9	10.3	16.1	37.8	184.3
LSD (0.05)	10.5	0.6	0.3	0.8	1.5	1.2
Prob > F	0.004	<0.001	0.032	0.132	<0.001	<0.001
CV (%)	7.1	0.6	1.5	3.1	2.4	0.4
Lattice RE (%) ³	100.0	100.0	102.7	100.0	100.0	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%.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 9. Agronomic means from 2019 dryland intrastate durum trial conducted at Eastern Agricultural Research Center Sidney, MT.

Cultivar	Yield bu/ac¹	Test weight lb/bu	Moisture %	Protein %²	Plant height inch	Heading Date Julian
Mountrail	81.5	64.0	10.4	11.7	33.1	177.3
Divide	81.3	63.9	10.5	11.1	33.9	177.0
Alkabo	92.6	63.9	10.4	12.8	34.5	177.0
Grenora	85.5	63.0	10.4	13.1	32.3	176.7
Tioga	79.7	63.7	10.5	14.0	32.2	178.0
Carpio	68.8	64.6	10.6	12.0	31.4	179.3
Joppa	74.4	64.0	10.5	12.4	33.5	176.0
ND-Riveland	74.3	63.9	10.4	12.8	34.4	178.3
ND-Grano	85.7	65.1	10.6	12.8	33.1	178.3
Alzada	71.8	62.9	10.4	13.4	27.7	175.0
CDC-Dynamic	83.0	63.9	10.5	12.1	34.5	179.7
CDC-Fortitude	84.3	64.2	10.4	12.0	30.1	177.3
CDC-Precision	80.5	63.9	10.3	13.1	33.2	177.0
CDC-Vivid	94.9	64.5	10.5	13.6	35.3	178.0
MTD16001	69.2	63.0	10.4	10.9	33.7	177.7
MTD16002	89.5	63.8	10.4	13.0	36.4	179.3
MTD16004	78.9	64.5	10.2	12.6	33.3	178.3
MTD16005	93.8	63.7	10.3	12.5	34.3	178.0
MTD16006	78.7	63.9	10.6	12.7	34.0	177.3
MTD16007	81.5	64.1	10.4	12.6	33.6	177.3
MTD16008	82.5	62.8	10.4	12.4	34.0	176.7
MTD16009	76.6	61.5	10.4	12.4	33.1	177.7
MTD16010	75.7	64.7	10.5	13.1	34.8	178.3
MTD16011	86.7	63.5	10.5	12.4	32.5	178.3
Average	81.3	63.8	10.4	12.6	33.3	177.7
LSD (0.05)	16.6	0.5	0.2	1.3	3.0	1.5
Prob > F	0.120	<0.001	0.029	0.010	0.001	<0.001
CV (%)	12.4	0.5	1.1	6.4	5.4	0.5

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

Table 10. Agronomic means from 2019 dryland intrastate durum trial at Central Agricultural Research Center in Moccasin, MT.

Cultivar	Yield bu/ac¹	Test weight lb/bu	Moisture %	Protein %²	Plant height inch	Heading date Julian
Mountrail	44.0	58.3	8.3	13.2	36.6	187.7
Divide	51.4	57.7	8.5	13.1	37.3	187.0
Alkabo	43.3	59.1	8.4	13.2	35.3	188.7
Grenora	46.8	57.5	8.3	13.1	33.4	187.3
Tioga	44.1	57.8	8.1	13.3	39.1	188.3
Carpio	42.6	57.9	8.4	12.9	36.3	190.0
Joppa	47.8	58.4	8.2	13.3	39.3	187.0
ND-Riveland	47.6	57.9	8.1	13.7	38.6	188.7
ND-Grano	43.5	58.4	8.3	13.3	36.0	191.0
Alzada	47.7	58.5	8.5	12.9	29.3	184.3
CDC-Dynamic	45.3	58.3	8.6	13.6	35.7	190.7
CDC-Fortitude	45.6	58.5	8.5	13.8	35.4	189.0
CDC-Precision	45.7	58.8	8.6	13.2	36.3	186.7
CDC-Vivid	46.1	58.8	8.4	13.5	35.7	189.3
MTD16001	49.4	56.2	8.3	13.4	38.0	188.3
MTD16002	43.6	57.9	8.5	12.9	38.3	190.0
MTD16004	42.6	59.2	8.8	13.4	36.3	188.3
MTD16005	49.0	56.7	8.4	13.1	38.0	190.0
MTD16006	43.6	58.1	8.6	12.7	37.7	188.3
MTD16007	44.6	58.2	8.4	13.2	36.0	186.3
MTD16008	43.4	56.6	8.3	13.4	36.8	187.7
MTD16009	39.3	53.4	7.7	14.0	36.0	188.3
MTD16010	43.7	58.5	8.8	13.5	36.6	188.3
MTD16011	45.2	56.7	8.4	12.9	37.0	188.3
Average	45.2	57.8	8.4	13.3	36.5	188.3
LSD (0.05)	8.2	0.9	0.4	0.8	1.8	2.0
Prob > F	0.645	<0.001	0.015	0.169	<0.001	<0.001
CV (%)	10.1	0.8	3.0	3.1	2.8	0.6
Lattice RE (%) ³	112.3	111.9	100.0	144.4	100.7	100.0

¹Grain yield reported on a 13% moisture basis.

² Grain yield reported on a 12% moisture basis.

³Adjusted means provided for Lattice RE% values equal to or greater than 100%.

Table 11. Agronomic means from 2019 dryland intrastate durum trial at Northern Agricultural Research Center in Havre, MT.

Cultivar	Yield bu/ac¹	Test weight lb/bu	Moisture %	Protein %²	Plant height inch	Heading date Julian	Sawfly damage %³	Falling number sec⁴
Mountrail	45.2	58.4	11.2	14.2	31.2	178.0	0.5	491.7
Divide	44.7	58.1	11.4	13.9	31.2	178.0	0.3	501.6
Alkabo	47.7	58.9	11.9	13.7	31.2	176.8	0.8	509.4
Grenora	49.2	58.4	11.7	14.0	29.8	177.2	0.8	555.8
Tioga	47.2	59.0	11.7	14.1	34.3	177.2	0.6	529.2
Carpio	47.7	58.3	12.1	13.7	32.8	178.6	0.3	526.4
Joppa	42.6	58.1	11.7	14.3	34.3	177.4	0.6	505.3
ND-Riveland	44.3	57.5	11.5	14.4	32.0	178.3	0.5	532.5
ND-Grano	46.9	59.2	11.9	14.2	30.3	179.0	0.8	544.3
Alzada	49.5	58.8	11.4	14.2	26.3	175.0	0.3	600.6
CDC-Dynamic	53.1*	59.2	11.5	14.7	32.8	178.9	0.6	502.8
CDC-Fortitude	50.6	58.7	11.8	14.4	30.5	178.0	0.6	554.9
CDC-Precision	48.9	58.6	11.5	14.4	29.5	177.0	0.3	597.6
CDC-Vivid	54.6**	59.6	11.0	14.1	31.3	177.8	0.5	521.1
MTD16001	52.2*	57.9	11.4	13.0	30.5	177.9	0.3	499.7
MTD16002	43.0	57.3	11.1	13.6	33.1	179.6	0.3	535.7
MTD16004	48.8	59.6	11.3	13.5	30.3	178.1	0.5	466.0
MTD16005	50.7*	58.4	11.6	13.7	32.0	178.0	0.3	507.7
MTD16006	49.8	58.5	11.3	13.8	32.4	178.1	0.3	485.8
MTD16007	50.7	59.6	11.1	13.5	31.8	177.9	0.1	505.7
MTD16008	47.3	57.1	11.2	14.0	31.7	177.1	0.5	499.4
MTD16009	42.6	54.0	11.0	14.4	32.5	177.9	0.5	492.6
MTD16010	45.0	57.7	11.5	14.6	32.5	178.0	0.3	531.9
MTD16011	49.4	58.3	11.1	13.1	32.4	179.6	0.5	533.8
Average	48.0	58.3	11.5	14.0	31.5	177.9	0.5	522.1
LSD (0.05)	3.8	0.6	0.5	0.4	2.4	1.4	0.3	25.8
Prob > F	<0.001	<0.001	0.007	<0.001	<0.001	<0.001	0.004	<0.001
CV (%)	4.4	0.6	2.8	1.5	4.6	0.4	37.0	3.0
Lattice RE(%) ⁵	109.6	183.5	100.6	316.5	100.0	103.0	100.0	100.0

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

³Sawfly damage reported on percent cut stems.

⁴Falling number reported on a 14% moisture basis.

⁵Adjusted means provided for Lattice RE% values equal to or greater than 100%.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 12. Agronomic means from 2019 dryland intrastate durum trial at Western Triangle Agricultural Research Center in Conrad, MT.

Cultivar	Yield bu/ac¹	Test weight lb/bu	Moisture %	Protein %²	Sawfly damage %³	Plant height inch
Mountrail	46.6	58.4	10.7	15.8	9.3	35.3
Divide	37.3	59.4	10.9	15.4	6.5	33.8
Alkabo	37.4	60.7	11.0	14.8	6.7	33.0
Grenora	51.4	61.2	11.1	15.1	5.0	30.0
Tioga	41.1	59.4	10.9	16.6	9.3	34.0
Carpio	40.6	58.5	10.9	15.3	3.9	32.2
Joppa	44.6	60.0	11.0	15.6	8.7	35.0
ND-Riveland	45.7	59.4	10.9	16.0	9.3	35.0
ND-Grano	40.1	59.8	10.8	15.2	10.0	32.5
Alzada	50.6	61.1	11.0	15.0	6.5	29.7
CDC-Dynamic	46.8	59.6	10.9	16.3	6.5	33.0
CDC-Fortitude	38.4	59.9	10.8	16.3	6.5	30.7
CDC-Precision	51.3	60.4	10.8	15.9	7.5	35.0
CDC-Vivid	51.8	60.6	11.0	15.9	7.5	35.7
MTD16001	49.7	59.0	10.8	14.8	6.5	34.2
MTD16002	51.8	58.6	10.9	15.1	9.3	36.0
MTD16004	49.7	60.8	10.8	14.6	6.5	33.5
MTD16005	54.1	59.4	10.8	15.4	9.3	35.3
MTD16006	44.3	60.4	10.9	15.1	7.5	35.7
MTD16007	50.9	60.6	10.8	15.8	7.5	33.8
MTD16008	42.1	58.0	10.7	15.6	10.0	33.2
MTD16009	31.6	54.9	10.6	16.2	9.3	34.3
MTD16010	46.7	60.3	10.8	15.8	9.3	34.2
MTD16011	44.2	59.5	10.8	15.0	9.3	34.7
Average	45.4	59.6	10.8	15.5	8.2	33.7
LSD (0.05)	14.4	1.8	0.2	0.7	2.8	3.0
Prob > F	0.200	<0.001	<0.001	<0.001	0.147	0.002
CV (%)	19.3	1.9	1.1	2.8	29.6	5.4

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

³Sawfly damage reported on percent cut stems.

Table 13. USDA-ARS seed quality means from all locations (n=7) for 2019 intrastate durum trial.

Cultivar	Test weight lb/bu	Large seeds %	Small seeds %	Hardness index	Individual seed weight mg	Individual seed diameter mm	Grain protein %¹	Grain ash %²	Falling number sec²
Mountrail	60.2	53.6	10.6	73.4	43.9	2.91	14.1	1.53	424.2
Divide	60.6	69.4	6.4	72.4	45.6	2.97	13.9	1.45	417.1
Alkabo	61.4	70.4	6.3	73.4	45.7	2.99	13.8	1.50	391.9
Grenora	60.8	71.9	5.4	77.7	45.9	3.02	14.0	1.55	426.8
Tioga	60.8	74.4	5.6	71.8	48.0	3.08	14.3	1.51	394.4
Carpio	60.6	70.9	7.4	74.5	45.0	2.99	14.0	1.51	426.9
Joppa	61.1	67.6	7.9	76.1	45.5	2.96	13.9	1.51	405.6
ND-Riveland	60.4	71.3	6.6	73.8	46.5	2.97	14.2	1.57	452.2
ND-Grano	61.4	61.1	9.3	77.5	43.7	2.92	14.1	1.51	442.7
Alzada	60.2	84.9	3.4	74.7	48.8	3.18	14.2	1.57	445.5
CDC-Dynamic	60.6	60.0	8.6	81.6	41.3	2.90	14.6	1.57	429.0
CDC-Fortitude	60.5	67.9	7.9	81.8	41.2	2.95	14.5	1.58	425.6
CDC-Precision	60.8	68.4	6.1	82.4	41.8	2.91	14.4	1.59	459.4
CDC-Vivid	61.1	70.4	6.7	77.6	43.7	2.94	14.9	1.54	423.1
MTD16001	59.6	59.4	9.6	77.2	43.4	2.91	13.3	1.48	440.0
MTD16002	59.8	47.6	12.3	81.3	39.4	2.81	14.2	1.48	466.4
MTD16004	61.3	74.4	5.0	78.9	43.9	3.01	13.7	1.48	431.9
MTD16005	60.1	59.7	7.6	74.8	44.7	2.93	13.9	1.44	455.3
MTD16006	60.8	76.1	4.4	74.1	47.5	3.04	13.9	1.50	421.0
MTD16007	61.1	65.7	6.7	77.9	43.4	2.96	13.8	1.47	420.6
MTD16008	59.4	74.3	5.1	73.9	46.7	3.01	14.1	1.50	442.5
MTD16009	56.9	55.1	9.6	74.7	40.6	2.84	15.2	1.55	415.0
MTD16010	61.3	56.1	10.1	83.0	40.7	2.89	14.4	1.50	454.2
MTD16011	60.1	56.7	7.7	76.8	44.1	2.90	13.8	1.45	435.9
Average	60.5	66.1	7.3	76.7	44.2	2.96	14.1	1.51	431.1
LSD (0.05)	0.7	7.0	2.4	2.5	1.7	0.06	0.5	0.05	31.8
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV (%)	1.1	10.1	30.7	3.1	3.6	1.7	3.3	3.0	7.0

¹Reported on a 12% moisture basis

²Reported on a 14% moisture basis

Table 14. USDA-ARS semolina quality means from all locations (n=7) for 2019 intrastate durum trial.

Cultivar	Bran %	Shorts %	Semolina %	Semolina protein %¹	Semolina ash %¹	L²	b*²	a*²	Mixograph pattern
Mountrail	26.6	11.1	62.3	13.2	0.64	85.5	25.9	-2.78	3.4
Divide	26.4	11.1	62.5	12.5	0.60	85.5	27.9	-3.03	5.3
Alkabo	26.4	11.6	62.0	12.6	0.58	85.6	29.5	-3.22	4.7
Grenora	27.4	11.9	60.8	12.9	0.62	85.6	29.0	-3.22	5.1
Tioga	26.5	11.3	62.2	13.1	0.61	85.2	29.5	-3.14	5.7
Carpio	26.9	11.7	61.5	12.7	0.64	85.2	31.2	-3.51	7.1
Joppa	26.8	11.5	61.7	12.8	0.62	85.4	29.5	-3.14	6.0
ND-Riveland	29.0	12.3	58.7	12.9	0.63	85.5	30.3	-3.38	6.4
ND-Grano	26.8	11.2	62.0	12.8	0.60	85.3	31.0	-3.44	5.1
Alzada	25.1	13.1	61.8	13.0	0.67	84.6	30.7	-3.01	6.4
CDC-Dynamic	27.3	11.2	61.6	13.3	0.63	85.0	32.4	-3.29	5.3
CDC-Fortitude	28.4	11.8	59.8	13.2	0.65	85.1	32.1	-3.35	5.9
CDC-Precision	28.8	11.6	59.6	13.2	0.67	84.8	32.6	-3.35	6.1
CDC-Vivid	26.4	12.0	61.6	13.4	0.66	84.7	32.4	-3.26	6.0
MTD16001	26.6	11.1	62.2	12.1	0.59	85.6	28.4	-3.08	5.0
MTD16002	28.1	11.8	60.1	13.0	0.61	85.3	27.8	-3.00	4.4
MTD16004	27.2	11.5	61.3	12.4	0.63	85.1	25.4	-2.54	4.7
MTD16005	26.2	11.5	62.3	12.8	0.61	85.1	29.1	-2.96	5.1
MTD16006	26.8	11.5	61.7	12.7	0.61	85.6	25.5	-2.71	5.0
MTD16007	27.6	11.3	61.2	12.6	0.63	85.9	22.4	-2.37	5.0
MTD16008	26.4	11.6	62.0	12.8	0.63	84.2	27.0	-2.24	4.6
MTD16009	29.0	11.3	59.6	13.9	0.65	84.8	26.3	-2.55	4.9
MTD16010	27.0	11.5	61.5	13.2	0.60	85.4	26.7	-2.78	5.3
MTD16011	26.2	11.4	62.4	12.5	0.61	85.3	29.7	-3.01	5.3
Average	27.1	11.6	61.4	12.9	0.62	85.2	28.8	-3.01	5.3
LSD (0.05)	0.9	0.5	1.1	0.5	0.03	0.3	0.8	0.1	0.6
Prob > F	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV (%)	3.1	3.9	1.7	3.4	4.0	0.3	2.5	-4.0	10.0

¹Reported on a 14% moisture basis

²Semolina color- L= whiteness, b*= yellowness, a*=redness

Table 15. USDA-ARS seed quality means for Bozeman dryland for 2019 intrastate durum trial.

Cultivar	Test weight lb/bu	Large seeds %	Small seeds %	Hardness index	Individual seed weight mg	Individual seed diameter mm	Grain protein %¹	Grain ash %²	Falling number sec²
Mountrail	62.6	59.0	8.0	74.8	43.5	2.90	14.4	1.42	416.1
Divide	63.5	77.0	5.0	71.2	46.1	3.00	15.2	1.41	431.8
Alkabo	64.5	78.0	4.0	71.6	46.6	3.02	14.3	1.42	422.0
Grenora	63.8	79.0	4.0	78.1	45.9	3.01	14.6	1.48	440.7
Tioga	63.8	83.0	4.0	74.1	50.7	3.17	14.6	1.48	383.2
Carpio	62.7	79.0	4.0	75.8	47.5	3.06	14.5	1.47	427.4
Joppa	63.9	80.0	4.0	78.5	47.4	3.03	14.3	1.47	389.1
ND-Riveland	62.2	82.0	4.0	74.6	47.8	3.02	14.5	1.51	441.1
ND-Grano	63.4	78.0	5.0	82.0	45.5	2.99	14.6	1.42	419.5
Alzada	62.1	90.0	2.0	79.1	51.3	3.25	14.8	1.60	453.9
CDC-Dynamic	62.7	67.0	6.0	84.9	42.2	2.90	15.7	1.47	413.6
CDC-Fortitude	62.6	78.0	6.0	81.9	43.2	3.01	15.5	1.51	429.3
CDC-Precision	63.3	76.0	4.0	84.5	44.6	2.99	15.2	1.52	456.8
CDC-Vivid	62.9	80.0	4.0	79.6	45.7	2.98	15.8	1.46	427.4
MTD16001	62.3	72.0	6.0	86.4	43.7	2.93	14.2	1.47	413.6
MTD16002	62.0	57.0	6.0	86.9	41.4	2.87	15.0	1.47	426.4
MTD16004	64.3	80.0	4.0	82.6	44.3	3.01	14.6	1.44	427.4
MTD16005	62.6	63.0	5.0	78.9	44.7	2.92	14.8	1.41	432.3
MTD16006	63.4	83.0	4.0	74.8	49.5	3.10	14.4	1.46	387.1
MTD16007	63.8	66.0	5.0	82.1	43.6	2.96	14.9	1.47	392.0
MTD16008	61.4	79.0	3.0	71.4	44.6	3.00	15.0	1.48	412.6
MTD16009	60.2	67.0	4.0	78.3	42.9	2.89	16.1	1.58	403.8
MTD16010	63.9	62.0	7.0	85.7	41.3	2.92	15.0	1.52	456.7
MTD16011	62.5	60.0	6.0	81.8	46.4	2.93	15.7	1.44	422.4
Average	62.9	74.0	4.8	79.2	45.4	2.99	14.9	1.47	421.9

¹Reported on a 12% moisture basis

²Reported on a 14% moisture basis

Table 16. USDA-ARS semolina quality means from Bozeman dryland for 2019 intrastate durum trial.

Cultivar	Bran %	Shorts %	Semolina %	Semolina protein %¹	Semolina ash %¹	L²	b*²	a*²	Mixograph pattern
Mountrail	24.9	11.5	63.6	13.6	0.64	85.5	27.0	-2.93	3
Divide	24.6	12.4	63.0	13.6	0.65	85.1	29.4	-2.98	5
Alkabo	25.4	12.3	62.3	13.0	0.56	85.6	31.4	-3.44	3
Grenora	26.0	12.8	61.2	13.7	0.61	85.5	31.0	-3.28	4
Tioga	25.0	12.1	62.9	13.4	0.58	85.2	30.7	-3.22	5
Carpio	24.8	12.5	62.6	13.0	0.60	85.2	32.7	-3.59	7
Joppa	26.0	12.7	61.3	12.9	0.58	85.7	30.8	-3.43	5
ND-Riveland	28.2	13.3	58.5	13.3	0.61	85.8	31.7	-3.55	6
ND-Grano	25.9	12.7	61.5	13.3	0.55	85.2	32.1	-3.52	4
Alzada	25.4	14.4	60.2	13.7	0.67	84.7	32.0	-3.22	6
CDC-Dynamic	26.5	12.3	61.3	14.1	0.62	84.9	33.9	-3.35	5
CDC-Fortitude	27.6	13.1	59.4	14.1	0.64	85.2	32.8	-3.44	5
CDC-Precision	28.1	12.8	59.1	13.9	0.67	84.8	33.4	-3.39	6
CDC-Vivid	26.0	13.4	60.6	14.5	0.67	84.6	33.8	-3.30	6
MTD16001	26.3	12.7	61.1	12.9	0.58	85.3	30.3	-3.19	4
MTD16002	27.7	13.8	58.6	13.7	0.61	85.3	29.8	-3.21	4
MTD16004	26.0	12.9	61.1	13.4	0.65	84.8	27.0	-2.64	4
MTD16005	26.0	12.7	61.4	13.8	0.59	84.9	30.7	-3.05	4
MTD16006	26.4	12.8	60.8	13.3	0.58	85.6	27.0	-2.84	4
MTD16007	27.0	12.5	60.6	13.3	0.63	85.7	24.8	-2.59	4
MTD16008	25.9	13.1	61.0	13.9	0.66	84.0	28.4	-2.21	4
MTD16009	28.4	11.8	59.8	15.1	0.68	84.6	27.2	-2.55	4
MTD16010	26.0	13.0	60.9	13.7	0.60	85.2	29.2	-2.99	4
MTD16011	26.3	13.2	60.4	14.5	0.63	85.0	31.4	-3.10	4
Average	26.3	12.8	61.0	13.7	0.62	85.1	30.4	-3.13	4.6

¹Reported on a 14% moisture basis

²Semolina color- L= whiteness, b*= yellowness, a*=redness

Table 17. USDA-ARS seed quality means for Bozeman irrigated for 2019 intrastate durum trial.

Cultivar	Test weight lb/bu	Large seeds %	Small seeds %	Hardness index	Individual seed weight mg	Individual seed diameter mm	Grain protein %¹	Grain ash %²	Falling number sec²
Mountrail	60.9	61.0	9.0	67.1	42.8	2.95	14.2	1.41	372.4
Divide	61.0	84.0	3.0	65.4	45.8	3.10	13.7	1.32	360.7
Alkabo	62.1	83.0	4.0	64.4	46.8	3.10	12.9	1.37	269.6
Grenora	61.2	86.0	2.0	69.2	45.7	3.13	13.5	1.45	313.7
Tioga	61.3	82.0	3.0	66.4	45.6	3.12	13.4	1.46	281.4
Carpio	61.4	77.0	5.0	67.0	42.9	3.01	13.5	1.47	359.7
Joppa	61.9	80.0	4.0	67.7	45.4	3.06	13.1	1.40	334.2
ND-Riveland	60.6	82.0	3.0	64.4	44.9	3.02	13.5	1.47	411.6
ND-Grano	62.2	67.0	6.0	69.6	42.5	2.93	13.9	1.37	383.2
Alzada	59.0	83.0	3.0	65.1	44.3	3.13	13.3	1.49	247.1
CDC-Dynamic	60.6	66.0	6.0	75.2	39.5	2.88	14.4	1.52	395.9
CDC-Fortitude	61.0	76.0	5.0	74.5	39.8	2.93	14.6	1.51	339.1
CDC-Precision	61.1	79.0	3.0	73.6	42.5	3.01	13.8	1.52	377.3
CDC-Vivid	61.2	79.0	4.0	68.6	43.6	3.01	14.7	1.52	374.4
MTD16001	59.9	78.0	4.0	64.5	45.2	3.08	12.9	1.44	352.8
MTD16002	60.5	69.0	4.0	75.1	39.2	2.89	13.8	1.40	359.7
MTD16004	62.1	83.0	3.0	68.0	43.5	3.11	13.4	1.37	348.9
MTD16005	60.2	70.0	4.0	67.6	45.0	3.02	13.6	1.32	369.5
MTD16006	61.4	81.0	3.0	65.5	46.6	3.08	13.7	1.42	379.3
MTD16007	61.3	71.0	5.0	69.9	41.9	2.98	13.6	1.41	355.8
MTD16008	60.1	81.0	3.0	68.0	45.8	3.08	13.4	1.45	382.9
MTD16009	57.3	68.0	5.0	72.6	40.0	2.94	15.9	1.49	300.0
MTD16010	62.8	62.0	8.0	74.5	40.0	2.93	13.7	1.44	376.1
MTD16011	60.1	64.0	5.0	67.4	42.5	2.91	13.6	1.35	381.0
Average	60.9	75.5	4.3	68.8	43.4	3.02	13.8	1.43	351.1

¹Reported on a 12% moisture basis.

²Reported on a 14% moisture basis

Table 18. USDA-ARS semolina quality means from Bozeman irrigated for 2019 intrastate durum trial.

Cultivar	Bran %	Shorts %	Semolina %	Semolina protein %¹	Semolina ash %¹	L²	b*²	a*²	Mixograph pattern
Mountrail	28.0	9.5	62.5	13.2	0.55	86.1	25.8	-2.95	3
Divide	26.2	9.4	64.4	12.3	0.53	86.2	28.5	-3.34	4
Alkabo	26.3	10.2	63.6	11.5	0.51	86.4	29.2	-3.47	4
Grenora	27.0	11.0	62.0	12.1	0.56	86.3	28.9	-3.42	5
Tioga	26.6	9.8	63.6	12.0	0.56	86.2	29.8	-3.50	6
Carpio	25.4	9.8	64.8	12.2	0.62	86.1	31.5	-3.69	7
Joppa	26.1	10.0	63.9	11.7	0.57	86.7	28.8	-3.45	5
ND-Riveland	28.1	10.8	61.2	12.4	0.57	86.3	30.0	-3.59	6
ND-Grano	26.4	9.8	63.7	12.6	0.56	86.0	31.8	-3.69	5
Alzada	25.5	11.7	62.8	12.5	0.65	85.4	31.4	-3.27	6
CDC-Dynamic	27.0	9.9	63.1	13.3	0.62	85.7	33.7	-3.56	5
CDC-Fortitude	27.2	10.6	62.3	13.1	0.63	85.6	31.9	-3.48	5
CDC-Precision	28.5	9.9	61.6	12.9	0.61	85.6	32.3	-3.55	6
CDC-Vivid	25.6	10.2	64.1	13.0	0.64	85.7	32.7	-3.52	6
MTD16001	25.5	9.4	65.1	11.3	0.53	86.6	28.6	-3.39	4
MTD16002	26.9	10.6	62.5	12.7	0.54	86.0	28.3	-3.20	3
MTD16004	26.6	9.2	64.2	11.7	0.54	86.4	24.8	-2.81	3
MTD16005	25.5	10.3	64.2	12.8	0.54	85.9	29.1	-3.16	4
MTD16006	25.9	9.4	64.6	12.3	0.52	86.3	26.8	-3.05	4
MTD16007	27.2	9.2	63.6	12.2	0.55	86.6	22.6	-2.61	4
MTD16008	26.3	9.9	63.8	12.4	0.54	84.8	27.4	-2.49	3
MTD16009	28.6	10.0	61.4	14.4	0.58	85.5	27.0	-2.83	3
MTD16010	26.2	9.3	64.4	12.4	0.56	86.4	27.5	-3.14	4
MTD16011	25.7	10.0	64.3	12.3	0.54	86.1	29.8	-3.28	4
Average	26.6	10.0	63.4	12.5	0.57	86.0	29.1	-3.27	4.5

¹Reported on a 14% moisture basis

²Semolina color- L= whiteness, b*= yellowness, a*=redness

Table 19. USDA-ARS seed quality means from WTARC for 2019 intrastate durum trial.

Cultivar	Test weight lb/bu	Large seeds %	Small seeds %	Hardness index	Individual seed weight mg	Individual seed diameter mm	Grain protein %¹	Grain ash %²	Falling number sec²
Mountrail	58.2	43.0	13.0	81.9	41.7	2.76	16.1	1.46	450.4
Divide	59.0	66.0	7.0	83.3	44.4	2.80	15.5	1.26	407.0
Alkabo	60.6	66.0	7.0	85.7	44.2	2.85	14.9	1.31	425.3
Grenora	61.4	76.0	4.0	90.7	47.4	2.99	14.9	1.36	435.9
Tioga	59.7	68.0	7.0	83.0	45.9	2.89	16.4	1.32	412.8
Carpio	58.4	71.0	8.0	82.8	42.5	2.75	15.5	1.29	456.1
Joppa	60.3	62.0	11.0	86.1	44.5	2.84	15.5	1.29	426.3
ND-Riveland	59.5	64.0	8.0	82.7	44.0	2.76	15.5	1.36	491.8
ND-Grano	59.6	50.0	10.0	84.0	40.4	2.71	15.5	1.27	412.8
Alzada	61.0	90.0	2.0	87.5	52.2	3.18	15.3	1.24	480.2
CDC-Dynamic	60.3	62.0	8.0	89.5	42.2	2.85	16.5	1.30	414.7
CDC-Fortitude	60.3	64.0	8.0	91.5	40.0	2.82	16.4	1.25	444.6
CDC-Precision	60.6	61.0	7.0	91.6	41.4	2.82	15.6	1.32	489.9
CDC-Vivid	60.7	72.0	6.0	86.4	44.5	2.83	16.3	1.29	414.7
MTD16001	59.5	52.0	10.0	86.1	43.0	2.79	15.0	1.18	466.7
MTD16002	59.1	29.0	16.0	87.6	37.4	2.60	15.0	1.26	528.4
MTD16004	61.0	77.0	5.0	88.7	44.8	2.95	14.6	1.17	422.8
MTD16005	59.8	51.0	10.0	84.4	42.6	2.76	15.3	1.20	487.3
MTD16006	61.0	75.0	3.0	86.9	45.5	2.87	14.8	1.19	452.7
MTD16007	60.8	70.0	6.0	86.1	43.4	2.90	15.2	1.16	412.2
MTD16008	58.4	77.0	4.0	79.4	46.5	2.87	15.4	1.21	391.1
MTD16009	55.1	39.0	16.0	77.6	37.3	2.63	16.7	1.24	444.0
MTD16010	61.0	61.0	7.0	92.8	41.0	2.81	15.8	1.18	492.5
MTD16011	59.8	60.0	8.0	87.2	43.8	2.79	14.9	1.17	429.0
Average	59.8	62.8	8.0	86.0	43.4	2.83	15.5	1.26	445.4

¹Reported on a 12% moisture basis

²Reported on a 14% moisture basis

Table 20. USDA-ARS semolina quality means from WTARC for 2019 intrastate durum trial.

Cultivar	Bran %	Shorts %	Semolina %	Semolina protein %¹	Semolina ash %¹	L²	b*²	a*²	Mixograph pattern
Mountrail	29.2	10.3	60.5	15.0	0.64	85.5	27.2	-2.73	4
Divide	29.0	11.2	59.8	13.9	0.55	85.3	30.1	-2.98	6
Alkabo	28.2	10.9	61.0	13.4	0.53	85.7	31.1	-3.12	6
Grenora	28.1	11.2	60.7	13.7	0.53	86.2	29.5	-3.33	6
Tioga	29.4	11.2	59.4	15.2	0.59	85.4	31.7	-3.18	7
Carpio	28.9	11.6	59.5	14.0	0.58	85.0	33.0	-3.45	8
Joppa	28.3	10.9	60.8	14.3	0.59	85.5	31.8	-3.17	8
ND-Riveland	30.5	11.6	57.8	14.4	0.58	85.5	32.1	-3.39	7
ND-Grano	28.0	10.4	61.5	13.7	0.57	85.7	33.1	-3.54	6
Alzada	25.4	13.2	61.4	13.7	0.55	84.7	32.0	-2.83	8
CDC-Dynamic	28.6	11.1	60.4	14.7	0.52	84.9	33.2	-3.16	6
CDC-Fortitude	29.6	11.9	58.5	14.9	0.54	84.8	35.0	-3.30	7
CDC-Precision	30.1	11.2	58.6	14.4	0.60	84.6	35.4	-3.29	7
CDC-Vivid	26.8	12.3	61.0	14.4	0.59	84.5	34.3	-3.27	7
MTD16001	26.3	11.0	62.8	13.4	0.54	85.1	30.7	-3.05	6
MTD16002	28.8	11.1	60.0	13.7	0.57	84.8	30.1	-2.98	5
MTD16004	28.0	11.5	60.5	13.3	0.55	85.0	26.1	-2.43	5
MTD16005	26.5	11.7	61.7	13.9	0.60	84.6	31.8	-2.81	6
MTD16006	27.3	10.9	61.8	13.7	0.58	85.3	27.3	-2.65	6
MTD16007	27.9	11.0	61.1	14.2	0.56	85.5	24.5	-2.39	6
MTD16008	27.1	11.0	61.9	13.9	0.56	83.9	28.0	-2.05	5
MTD16009	29.3	11.6	59.1	15.4	0.60	84.2	28.5	-2.37	6
MTD16010	26.3	10.6	63.0	14.5	0.52	85.4	27.5	-2.58	6
MTD16011	26.4	11.4	62.2	13.5	0.52	84.8	32.3	-2.80	6
Average	28.1	11.3	60.6	14.1	0.57	85.1	30.7	-2.95	6.3

¹Reported on a 14% moisture basis

²Semolina color- L= whiteness, b*= yellowness, a*=redness

Table 21. USDA-ARS seed quality means from NARC for 2019 intrastate durum trial.

Cultivar	Test weight lb/bu	Large seeds %	Small seeds %	Hardness index	Individual seed weight mg	Individual seed diameter mm	Grain protein %¹	Grain ash %²	Falling number sec²
Mountrail	59.4	37.0	12.0	78.8	40.4	2.75	14.0	1.54	490.6
Divide	59.4	57.0	7.0	76.7	43.1	2.81	13.1	1.44	480.0
Alkabo	60.2	61.0	7.0	80.3	44.2	2.89	13.5	1.52	488.0
Grenora	59.7	56.0	7.0	84.5	43.6	2.90	14.0	1.53	526.3
Tioga	60.2	73.0	4.0	75.6	46.9	2.99	13.8	1.44	491.9
Carpio	59.6	63.0	9.0	79.1	43.6	2.86	13.9	1.45	477.5
Joppa	59.8	57.0	8.0	79.8	42.9	2.81	14.3	1.49	515.7
ND-Riveland	59.0	62.0	7.0	79.1	44.6	2.88	14.7	1.54	511.9
ND-Grano	60.6	54.0	9.0	81.6	41.7	2.83	14.2	1.49	533.2
Alzada	59.5	88.0	2.0	77.4	50.2	3.11	14.3	1.56	603.8
CDC-Dynamic	59.7	47.0	10.0	85.3	38.5	2.73	14.3	1.58	493.1
CDC-Fortitude	59.5	61.0	8.0	85.9	40.0	2.84	14.2	1.59	516.0
CDC-Precision	59.3	58.0	7.0	87.5	38.9	2.73	15.4	1.57	522.7
CDC-Vivid	60.5	60.0	9.0	82.1	41.8	2.79	14.3	1.48	497.0
MTD16001	58.6	39.0	13.0	81.8	38.6	2.71	12.5	1.43	511.3
MTD16002	57.8	14.0	24.0	81.4	34.7	2.55	13.1	1.48	545.6
MTD16004	61.1	74.0	4.0	83.5	44.0	2.93	13.5	1.41	521.2
MTD16005	59.5	53.0	8.0	78.9	44.9	2.87	13.3	1.38	504.7
MTD16006	59.9	78.0	4.0	77.3	48.7	2.97	13.9	1.49	497.9
MTD16007	60.6	63.0	6.0	82.9	42.4	2.86	13.4	1.40	506.6
MTD16008	57.8	70.0	6.0	75.6	46.2	2.89	14.2	1.41	509.5
MTD16009	54.5	33.0	13.0	73.4	37.0	2.64	14.4	1.53	466.8
MTD16010	59.0	37.0	14.0	86.3	36.3	2.67	14.5	1.45	522.4
MTD16011	59.2	41.0	10.0	80.0	42.2	2.78	13.1	1.40	490.4
Average	59.3	55.7	8.7	80.6	42.3	2.82	13.9	1.48	509.3

¹Reported on a 12% moisture basis

²Reported on a 14% moisture basis

Table 22. USDA-ARS semolina quality means from NARC for 2019 intrastate durum trial.

Cultivar	Bran %	Shorts %	Semolina %	Semolina protein %¹	Semolina ash %¹	L²	b*²	a*²	Mixograph pattern
Mountrail	28.2	11.8	59.9	13.2	0.66	85.5	27.2	-2.77	3
Divide	27.8	11.9	60.3	12.4	0.61	85.7	28.1	-2.86	5
Alkabo	28.4	12.5	59.1	12.8	0.59	85.7	29.7	-2.96	5
Grenora	29.5	13.7	56.8	12.8	0.64	85.5	29.8	-2.93	5
Tioga	26.6	12.1	61.3	12.7	0.58	85.1	30.2	-2.86	6
Carpio	27.3	12.5	60.2	12.9	0.63	85.3	31.7	-3.39	7
Joppa	27.1	11.9	61.0	13.1	0.63	85.3	30.2	-2.86	6
ND-Riveland	30.2	13.5	56.3	13.4	0.63	85.5	31.5	-3.21	6
ND-Grano	27.9	11.9	60.2	12.9	0.59	85.3	31.8	-3.31	5
Alzada	24.8	13.8	61.4	13.2	0.67	84.8	32.0	-2.90	6
CDC-Dynamic	27.9	11.9	60.2	13.2	0.64	85.0	33.2	-3.15	5
CDC-Fortitude	29.5	12.1	58.4	13.2	0.68	85.0	33.1	-3.19	5
CDC-Precision	29.9	12.5	57.6	13.7	0.67	85.1	33.0	-3.16	6
CDC-Vivid	27.3	13.0	59.7	13.1	0.65	84.4	33.2	-2.97	6
MTD16001	27.3	11.9	60.8	11.7	0.59	85.4	29.0	-2.90	5
MTD16002	29.4	12.1	58.6	12.4	0.62	85.3	25.6	-2.41	5
MTD16004	27.2	11.7	61.1	12.3	0.62	84.9	29.8	-2.81	5
MTD16005	26.5	12.2	61.3	12.5	0.60	85.4	29.6	-2.88	5
MTD16006	27.1	11.5	61.4	12.5	0.60	86.2	25.8	-2.69	5
MTD16007	27.7	12.0	60.3	12.2	0.63	86.5	22.2	-2.35	5
MTD16008	26.5	12.4	61.1	12.8	0.66	84.3	28.0	-2.23	5
MTD16009	30.4	11.9	57.8	13.7	0.68	84.7	27.2	-2.40	6
MTD16010	28.2	12.3	59.5	13.6	0.63	85.2	27.2	-2.61	6
MTD16011	27.0	12.2	60.8	11.8	0.61	85.2	30.3	-2.80	6
Average	27.9	12.3	59.8	12.8	0.63	85.3	29.6	-2.86	5.4

¹Reported on a 14% moisture basis

²Semolina color- L= whiteness, b*= yellowness, a*=redness

Table 23. USDA-ARS seed quality means from CARC for 2019 intrastate durum trial.

Cultivar	Test weight lb/bu	Large seeds %	Small seeds %	Hardness index	Individual seed weight mg	Individual seed diameter mm	Grain protein %¹	Grain ash %²	Falling number sec²
Mountrail	58.7	9.0	22.0	75.5	36.1	2.61	13.3	1.66	561.2
Divide	58.5	32.0	14.0	70.1	35.7	2.68	12.4	1.61	474.0
Alkabo	60.0	35.0	12.0	73.8	37.3	2.68	13.2	1.64	500.1
Grenora	58.2	32.0	15.0	75.2	35.7	2.65	12.7	1.73	549.6
Tioga	58.4	39.0	14.0	71.7	36.3	2.68	12.7	1.64	508.2
Carpio	58.6	29.0	19.0	72.1	34.4	2.62	12.4	1.63	499.5
Joppa	58.7	22.0	20.0	77.3	34.4	2.57	13.0	1.66	504.7
ND-Riveland	58.9	42.0	15.0	73.9	36.4	2.59	13.3	1.69	527.9
ND-Grano	59.2	12.0	25.0	78.3	33.4	2.54	12.7	1.75	541.4
Alzada	59.0	65.0	7.0	71.4	39.1	2.86	12.3	1.68	553.0
CDC-Dynamic	58.4	14.0	20.0	82.2	34.0	2.61	13.1	1.75	496.0
CDC-Fortitude	58.6	26.0	19.0	83.2	32.6	2.61	13.6	1.76	518.2
CDC-Precision	59.4	30.0	16.0	81.2	33.4	2.57	12.7	1.74	592.4
CDC-Vivid	59.0	32.0	15.0	77.2	34.4	2.58	13.6	1.71	480.0
MTD16001	56.5	13.0	24.0	74.9	33.3	2.54	12.3	1.69	538.9
MTD16002	58.0	7.0	24.0	80.0	32.6	2.56	13.8	1.64	556.1
MTD16004	59.4	32.0	11.0	76.8	34.9	2.66	12.3	1.70	569.6
MTD16005	57.1	19.0	15.0	72.3	35.9	2.65	12.2	1.70	521.6
MTD16006	58.6	39.0	10.0	75.8	36.2	2.67	12.3	1.75	508.1
MTD16007	59.0	22.0	18.0	76.0	34.7	2.60	12.3	1.71	504.3
MTD16008	57.3	38.0	12.0	74.9	37.0	2.68	13.3	1.74	578.2
MTD16009	53.4	15.0	20.0	74.4	32.3	2.54	14.2	1.80	495.7
MTD16010	59.3	13.0	23.0	78.9	33.2	2.60	12.5	1.71	557.3
MTD16011	57.5	16.0	15.0	71.1	36.6	2.67	12.1	1.67	518.0
Average	58.3	26.4	16.9	75.7	35.0	2.63	12.8	1.70	527.2

¹Reported on a 12% moisture basis

²Reported on a 14% moisture basis

Table 24. USDA-ARS semolina quality means from CARC for 2019 intrastate durum trial.

Cultivar	Bran %	Shorts %	Semolina %	Semolina protein %¹	Semolina ash %¹	L²	b*²	a*²	Mixograph pattern
Mountrail	26.8	11.8	61.4	12.5	0.75	86.1	28.4	-3.32	5
Divide	26.8	10.7	62.5	11.2	0.69	86.3	28.3	-3.38	6
Alkabo	26.8	11.7	61.6	11.7	0.69	86.1	30.9	-3.51	6
Grenora	30.8	11.2	58.0	11.7	0.73	86.0	30.2	-3.57	6
Tioga	30.6	10.9	58.6	11.4	0.70	85.9	30.7	-3.53	6
Carpio	31.6	10.9	57.5	11.2	0.74	85.8	31.1	-3.65	7
Joppa	30.1	11.2	58.7	12.0	0.75	85.6	31.1	-3.37	7
ND-Riveland	31.6	11.9	56.6	12.0	0.75	85.5	31.5	-3.48	7
ND-Grano	30.7	10.8	58.4	11.7	0.76	85.6	31.8	-3.67	6
Alzada	27.0	12.3	60.7	11.2	0.75	85.8	31.9	-3.53	7
CDC-Dynamic	31.0	11.7	57.3	11.9	0.79	85.2	32.4	-3.37	5
CDC-Fortitude	32.2	12.0	55.7	12.0	0.77	85.8	32.5	-3.61	6
CDC-Precision	31.2	11.4	57.4	11.7	0.80	85.1	34.3	-3.62	6
CDC-Vivid	30.1	11.5	58.4	11.9	0.79	85.2	33.1	-3.57	5
MTD16001	31.4	10.9	57.7	11.5	0.71	86.0	29.5	-3.37	5
MTD16002	31.8	11.8	56.4	12.1	0.72	86.0	28.5	-3.34	5
MTD16004	30.4	11.8	57.8	11.4	0.80	85.9	25.4	-2.83	5
MTD16005	30.2	11.1	58.7	11.4	0.73	86.0	29.0	-3.25	6
MTD16006	30.4	11.4	58.2	11.1	0.77	86.4	26.3	-3.08	6
MTD16007	30.9	11.0	58.1	11.3	0.79	86.5	23.8	-2.77	6
MTD16008	29.5	12.2	58.3	12.1	0.75	84.7	27.7	-2.54	6
MTD16009	33.2	11.8	55.0	13.0	0.76	85.4	26.3	-2.76	6
MTD16010	31.0	10.8	58.1	11.8	0.69	86.2	27.3	-3.16	6
MTD16011	29.5	10.9	59.6	11.1	0.73	86.2	29.2	-3.32	6
Average	30.2	11.4	58.4	11.7	0.75	85.8	29.6	-3.32	5.9

¹Reported on a 14% moisture basis

²Semolina color- L= whiteness, b*= yellowness, a*=redness

Table 25. USDA-ARS seed quality means from EARC dryland for 2019 intrastate durum trial.

Cultivar	Test weight lb/bu	Large seeds %	Small seeds %	Hardness index	Individual seed weight mg	Individual seed diameter mm	Grain protein %¹	Grain ash %²	Falling number sec²
Mountrail	62.5	83.0	5.0	66.6	50.5	3.16	11.3	1.55	443.3
Divide	62.5	83.0	4.0	70.6	50.9	3.16	11.3	1.46	460.5
Alkabo	62.3	82.0	6.0	68.2	49.7	3.15	12.7	1.48	430.8
Grenora	61.6	86.0	3.0	74.9	49.8	3.19	13.1	1.58	473.0
Tioga	62.4	87.0	3.0	68.7	53.7	3.30	13.7	1.50	459.6
Carpio	63.1	86.0	4.0	73.7	49.9	3.24	12.5	1.53	445.2
Joppa	62.6	86.0	4.0	74.1	50.2	3.16	11.9	1.53	423.2
ND-Riveland	62.2	82.0	4.0	72.9	52.2	3.21	12.5	1.58	483.5
ND-Grano	63.3	81.0	5.0	74.3	48.4	3.16	12.5	1.48	504.0
Alzada	61.6	88.0	5.0	69.6	51.7	3.30	13.8	1.61	520.2
CDC-Dynamic	62.2	77.0	6.0	79.0	43.4	3.08	12.0	1.60	477.2
CDC-Fortitude	62.5	83.0	5.0	80.5	44.3	3.12	11.8	1.61	492.5
CDC-Precision	62.2	86.0	3.0	80.0	45.5	3.11	12.8	1.59	509.7
CDC-Vivid	62.6	83.0	5.0	77.9	45.6	3.09	13.5	1.54	473.3
MTD16001	61.6	80.0	5.0	72.4	47.5	3.08	11.2	1.44	503.0
MTD16002	62.2	77.0	6.0	79.6	43.9	3.05	12.7	1.42	484.8
MTD16004	62.8	88.0	4.0	74.7	48.7	3.19	12.4	1.46	477.6
MTD16005	62.4	78.0	6.0	72.6	47.2	3.06	12.2	1.44	509.0
MTD16006	62.5	87.0	4.0	71.8	52.2	3.23	12.5	1.46	485.8
MTD16007	62.6	81.0	4.0	72.8	47.3	3.12	12.1	1.44	479.2
MTD16008	61.4	87.0	4.0	72.8	53.0	3.22	12.6	1.48	483.9
MTD16009	59.9	83.0	4.0	71.8	46.4	3.08	12.4	1.45	423.9
MTD16010	63.4	77.0	6.0	80.8	45.6	3.10	13.3	1.49	510.6
MTD16011	62.2	74.0	5.0	75.5	47.1	3.05	12.2	1.44	487.7
Average	62.3	82.7	4.6	74.0	48.5	3.15	12.5	1.51	476.7

¹Reported on a 12% moisture basis

²Reported on a 14% moisture basis

Table 26. USDA-ARS semolina quality means from EARC dryland for 2019 intrastate durum trial.

Cultivar	Bran %	Shorts %	Semolina %	Semolina protein %¹	Semolina ash %¹	L²	b*²	a*²	Mixograph pattern
Mountrail	24.6	11.0	64.3	10.6	0.56	86.2	23.2	-2.76	3
Divide	25.7	10.8	63.5	9.9	0.55	86.2	26.5	-3.18	5
Alkabo	24.6	11.6	63.8	11.7	0.54	85.5	28.4	-3.26	4
Grenora	25.3	11.6	63.0	12.0	0.60	85.7	27.9	-3.29	5
Tioga	23.7	11.7	64.6	12.8	0.60	85.2	27.8	-3.09	5
Carpio	25.1	12.2	62.7	11.2	0.60	85.4	30.6	-3.69	7
Joppa	24.6	12.1	63.3	11.2	0.57	85.5	27.4	-3.06	5
ND-Riveland	27.1	13.2	59.7	11.5	0.59	85.4	28.8	-3.37	6
ND-Grano	24.3	11.3	64.4	11.5	0.54	85.3	29.3	-3.41	5
Alzada	24.2	12.8	63.0	12.5	0.64	84.3	29.5	-3.01	6
CDC-Dynamic	25.4	10.4	64.2	11.0	0.57	85.4	31.6	-3.42	5
CDC-Fortitude	27.0	11.6	61.4	10.8	0.59	85.4	30.9	-3.51	6
CDC-Precision	27.0	11.6	61.4	11.5	0.61	84.9	31.0	-3.47	5
CDC-Vivid	25.0	12.2	62.8	12.1	0.63	84.7	30.8	-3.21	5
MTD16001	25.0	10.7	64.3	10.0	0.54	86.1	25.9	-3.06	5
MTD16002	25.6	11.8	62.6	11.8	0.56	85.4	27.3	-3.08	4
MTD16004	25.2	10.8	64.0	11.3	0.58	85.0	23.3	-2.36	5
MTD16005	24.0	10.8	65.2	11.2	0.57	85.1	28.0	-2.97	5
MTD16006	24.4	11.6	64.0	11.6	0.58	85.0	23.7	-2.51	5
MTD16007	25.7	10.9	63.4	11.0	0.58	85.8	19.5	-2.12	5
MTD16008	25.0	11.3	63.6	11.0	0.59	84.5	25.6	-2.31	4
MTD16009	27.1	10.9	61.9	11.3	0.59	85.3	24.2	-2.58	4
MTD16010	25.4	11.9	62.7	12.0	0.55	85.3	25.3	-2.73	5
MTD16011	24.3	11.0	64.6	11.1	0.59	85.2	28.8	-3.01	5
Average	25.2	11.5	63.3	11.4	0.58	85.3	27.3	-3.02	5.0

¹Reported on a 14% moisture basis

²Semolina color- L= whiteness, b*= yellowness, a*=redness

Table 27. USDA-ARS seed quality means from EARC irrigated for 2019 intrastate durum trial.

Cultivar	Test weight lb/bu	Large seeds %	Small seeds %	Hardness index	Individual seed weight mg	Individual seed diameter mm	Grain protein %¹	Grain ash %²	Falling number sec²
Mountrail	59.1	83.0	5.0	69.1	52.5	3.26	15.3	1.67	235.3
Divide	60.3	87.0	5.0	69.7	53.1	3.28	15.8	1.66	305.8
Alkabo	60.1	88.0	4.0	69.6	51.3	3.22	15.2	1.74	207.7
Grenora	59.5	88.0	3.0	71.6	53.3	3.31	15.1	1.72	248.6
Tioga	59.7	89.0	4.0	63.0	57.1	3.42	15.7	1.76	223.9
Carpio	60.5	91.0	3.0	71.3	54.4	3.37	15.4	1.76	322.9
Joppa	60.2	86.0	4.0	69.1	53.5	3.27	15.3	1.73	245.8
ND-Riveland	60.6	85.0	5.0	69.3	55.3	3.31	15.0	1.83	297.2
ND-Grano	61.4	86.0	5.0	72.7	54.3	3.30	15.5	1.80	305.2
Alzada	59.4	90.0	3.0	72.6	53.3	3.40	15.4	1.82	260.3
CDC-Dynamic	60.5	87.0	4.0	74.8	49.4	3.22	16.1	1.74	312.8
CDC-Fortitude	59.1	87.0	4.0	75.3	48.5	3.28	15.6	1.83	239.4
CDC-Precision	59.5	89.0	3.0	78.2	46.4	3.15	15.6	1.84	267.0
CDC-Vivid	60.6	87.0	4.0	71.2	50.5	3.26	16.2	1.79	294.7
MTD16001	59.1	82.0	5.0	74.3	52.1	3.22	14.9	1.69	293.7
MTD16002	59.2	80.0	6.0	78.4	46.8	3.14	15.7	1.66	363.4
MTD16004	58.7	87.0	4.0	77.6	47.0	3.24	15.0	1.78	255.9
MTD16005	59.4	84.0	5.0	69.2	52.5	3.24	15.7	1.62	362.9
MTD16006	59.0	90.0	3.0	66.9	54.1	3.33	15.9	1.74	235.8
MTD16007	59.8	87.0	3.0	75.8	50.7	3.29	15.3	1.72	294.1
MTD16008	59.2	88.0	4.0	75.3	53.9	3.30	14.9	1.70	339.0
MTD16009	57.9	81.0	5.0	75.1	48.2	3.17	16.3	1.78	370.5
MTD16010	60.1	81.0	6.0	82.4	47.4	3.17	16.1	1.73	263.5
MTD16011	59.4	82.0	5.0	74.6	50.1	3.14	15.1	1.68	322.7
Average	59.7	86.0	4.3	72.8	51.5	3.26	15.5	1.74	286.2

¹Reported on a 12% moisture basis

²Reported on a 14% moisture basis

Table 28. USDA-ARS semolina quality means from EARC irrigated for 2019 intrastate durum trial.

Cultivar	Bran %	Shorts %	Semolina %	Semolina protein %¹	Semolina ash %¹	L²	b*²	a*²	Mixograph pattern
Mountrail	24.7	11.6	63.7	14.4	0.67	83.7	22.4	-2.02	3
Divide	24.9	11.3	63.8	14.3	0.63	84.1	24.6	-2.49	6
Alkabo	25.0	12.1	62.9	13.9	0.63	83.9	26.2	-2.81	5
Grenora	24.9	11.5	63.6	14.2	0.65	84.2	25.4	-2.73	5
Tioga	23.6	11.5	64.9	14.5	0.64	83.6	25.5	-2.61	5
Carpio	24.9	12.2	62.9	14.2	0.68	83.9	27.6	-3.09	7
Joppa	25.2	12.1	62.8	14.1	0.64	83.7	26.3	-2.64	6
ND-Riveland	27.1	12.1	60.8	13.5	0.67	84.3	26.8	-3.07	7
ND-Grano	24.4	11.5	64.0	14.2	0.66	83.9	27.1	-2.96	5
Alzada	23.7	13.6	62.8	14.0	0.74	82.8	26.2	-2.29	6
CDC-Dynamic	24.4	11.1	64.5	14.8	0.63	84.0	29.2	-3.01	6
CDC-Fortitude	25.7	11.1	63.2	14.4	0.69	83.9	28.6	-2.90	7
CDC-Precision	26.5	11.7	61.8	14.0	0.72	83.6	28.5	-2.96	7
CDC-Vivid	24.1	11.2	64.7	14.7	0.67	84.0	28.7	-2.96	7
MTD16001	24.8	11.3	63.9	13.7	0.61	84.6	24.6	-2.60	6
MTD16002	26.3	11.4	62.3	14.5	0.61	84.6	25.2	-2.77	5
MTD16004	27.4	12.3	60.3	13.5	0.69	83.5	21.6	-1.89	6
MTD16005	24.6	11.4	64.0	14.2	0.62	84.0	25.7	-2.60	6
MTD16006	26.0	12.8	61.2	14.1	0.65	84.0	21.8	-2.14	5
MTD16007	26.6	12.3	61.1	13.8	0.64	84.6	19.2	-1.77	5
MTD16008	24.4	11.2	64.4	13.8	0.63	83.2	24.3	-1.85	5
MTD16009	26.3	11.1	62.6	14.6	0.64	84.3	23.5	-2.33	5
MTD16010	25.9	12.5	61.6	14.5	0.62	84.2	23.2	-2.28	6
MTD16011	24.0	11.2	64.9	13.4	0.63	84.5	26.1	-2.74	6
Average	25.2	11.8	63.0	14.1	0.65	84.0	25.3	-2.56	5.7

¹Reported on a 14% moisture basis

²Semolina color- L= whiteness, b*= yellowness, a*=redness

Table 29. Agronomic means from 2019 dryland off-station durum trial Roosevelt Co., MT.

Cultivar	Yield bu/ac¹	Test Weight lb/bu	Moisture %	Protein %²	Plant Height inch	Lodging %
Mountrail	83.0*	63.4	10.5	13.0	31.9	54.2
Divide	76.9	63.1	10.4	13.9	31.2	2.3
Alkabo	75.2	63.7	10.5	12.7	32.7	4.3
Grenora	70.2	62.1	10.3	12.1	28.9	12.8
Tioga	81.1*	63.4	10.7	13.0	36.7	0.0
Carpio	87.8**	63.8	10.8	13.3	35.0	6.3
Joppa	79.6	64.0	10.6	12.9	33.2	66.2
ND-Riveland	87.6*	63.0	10.5	13.4	35.7	0.0
ND-Grano	81.2*	64.1	10.8	13.1	34.5	2.9
Alzada	56.0	61.1	10.4	13.0	24.7	100.0
CDC-Dynamic	87.2*	62.7	10.7	13.8	34.0	0.0
CDC-Fortitude	78.7	61.7	10.8	13.7	30.2	0.0
CDC-Precision	83.4*	62.9	10.7	13.8	33.0	3.3
CDC-Vivid	87.5*	63.0	10.6	14.0	35.0	2.5
MTD16001	79.5	61.2	10.4	13.0	32.8	52.6
MTD16002	84.2*	63.0	10.4	13.5	34.9	4.4
MTD16004	76.7	63.9	10.5	13.2	31.4	5.4
MTD16005	76.1	62.1	10.5	13.6	33.4	26.0
MTD16006	67.4	63.3	10.6	13.3	33.7	39.1
MTD16007	73.4	63.1	10.6	13.2	32.2	27.5
MTD16008	79.9	61.4	10.3	14.1	32.5	15.7
MTD16009	75.5	58.4	10.3	14.8	32.3	5.2
MTD16010	78.7	63.7	10.5	13.5	34.1	31.5
MTD16011	74.1	61.7	10.4	13.8	32.1	14.5
Average	78.4	62.7	10.5	13.4	32.8	19.6
LSD (0.05)	7.4	0.8	0.3	0.6	2.4	32.2
Prob > F	<0.001	<0.001	0.018	<0.001	<0.001	<0.001
CV (%)	5.0	0.7	1.6	2.3	3.9	93.7
Lattice RE % ³	187.3	136.9	102.0	111.3	129.7	104.0

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%.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 30. Agronomic means from 2019 dryland off-station durum trial Sheridan, MT.

Cultivar	Yield bu/ac¹	Test Weight lb/bu	Moisture %	Protein %²	Plant Height inch
Mountrail	59.9	62.1	10.3	14.0	34.9
Divide	57.6	62.3	10.4	14.1	34.4
Alkabo	65.5*	63.2	10.5	13.4	37.4
Grenora	58.2	61.5	10.1	14.6	33.2
Tioga	65.1*	62.9	10.7	14.2	38.8
Carpio	65.9*	63.2	10.7	13.0	36.1
Joppa	62.3*	62.7	10.4	13.4	37.3
ND-Riveland	61.9*	63.0	10.4	13.3	36.2
ND-Grano	62.9*	63.1	10.5	13.7	36.6
Alzada	38.3	60.3	10.2	13.1	26.4
CDC-Dynamic	66.3*	62.7	10.6	15.3	37.7
CDC-Fortitude	64.7*	62.0	10.8	14.6	36.1
CDC-Precision	66.8*	62.7	10.5	15.1	35.6
CDC-Vivid	68.6**	62.9	10.8	14.7	37.9
MTD16001	52.4	61.0	10.4	13.8	33.0
MTD16002	67.5*	62.6	10.7	14.0	38.1
MTD16004	60.9*	63.3	10.2	13.7	31.4
MTD16005	63.3*	62.1	10.3	14.1	35.3
MTD16006	51.5	62.3	10.7	12.8	36.5
MTD16007	64.0*	63.4	10.6	14.0	34.5
MTD16008	65.7*	61.6	10.4	14.4	37.7
MTD16009	49.8	58.5	10.2	15.1	33.6
MTD16010	51.0	63.0	10.5	13.8	33.7
MTD16011	60.0	62.4	10.4	14.1	36.7
Average	60.4	62.3	10.5	14.0	35.4
LSD (0.05)	8.0	0.9	0.5	0.5	2.7
Prob > F	<0.001	<0.001	0.3	<0.001	<0.001
CV (%)	7.7	0.8	2.9	2.2	4.5

¹Reported on a 13% moisture basis

²Reported on a 12% moisture basis

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 31. Agronomic means from 2019 dryland off-station durum trial Turner, MT.

Cultivar	Yield bu/ac ¹	Test weight lb/bu	Moisture %	Protein % ²	Sawfly damage % ³	Plant height inch	Falling number sec ⁴
Mountrail	44.1**	59.1	6.5	15.1	0.0	27.2	556.9
Divide	40.7*	59.8	6.7	15.0	0.0	27.0	473.2
Alkabo	40.2	59.7	6.7	14.9	0.1	28.9	432.3
Grenora	41.3*	59.2	6.5	14.9	0.1	26.9	446.1
Tioga	39.5	59.2	6.8	15.4	1.0	30.4	386.0
Carpio	39.4	59.0	6.6	14.9	0.1	29.0	508.4
Joppa	38.9	59.9	6.6	15.2	0.5	27.8	486.6
ND-Riveland	36.9	59.5	6.5	15.3	0.1	27.0	506.1
ND-Grano	42.9*	59.3	6.6	15.3	1.0	28.2	523.6
Alzada	31.4	59.8	6.9	14.5	0.1	25.1	539.3
CDC-Dynamic	38.6	58.7	6.9	16.3	0.0	26.3	434.1
CDC-Fortitude	39.7	58.5	6.5	16.3	0.1	28.6	528.4
CDC-Precision	43.2*	59.8	6.8	16.0	0.0	28.8	545.8
CDC-Vivid	36.4	59.2	6.7	15.8	0.1	27.3	459.8
MTD16001	35.8	58.7	6.7	14.8	0.1	25.9	448.3
MTD16002	38.0	59.8	6.5	14.8	0.0	26.7	466.3
MTD16004	37.3	60.5	6.5	14.8	0.0	25.8	432.1
MTD16005	36.2	58.4	6.6	15.7	0.0	27.6	626.1
MTD16006	40.0	59.9	6.8	15.1	0.1	28.1	455.7
MTD16007	38.1	59.8	6.7	15.7	0.1	27.2	554.2
MTD16008	41.2*	57.4	6.5	16.5	0.0	28.5	535.6
MTD16009	38.0	55.8	6.4	16.1	0.5	25.4	423.4
MTD16010	38.3	60.1	6.6	15.0	0.0	27.2	447.4
MTD16011	42.3*	58.4	6.5	15.7	1.0	29.0	476.2
Average	39.1	59.2	6.6	15.4	0.1	27.5	487.2
LSD (0.05)	3.5	0.9	0.3	0.5	0.2	1.6	26.5
Prob > F	<0.001	<0.001	0.046	<0.001	0.021	<0.001	<0.001
CV (%)	5.4	0.9	2.5	1.9	130.4	3.5	3.3

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

³Sawfly damage reported on percent cut stems.

⁴Falling number reported on a 14% moisture basis.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 32. Agronomic means from 2019 dryland off-station durum trial Chester, MT.

Cultivar	Yield bu/ac¹	Test Weight lb/bu	Moisture %	Protein %²	Sawfly damage %³	Plant Height inch	Falling number sec⁴
Mountrail	53.6	57.7	9.5	15.8	10.0	38.2	478.6
Divide	52.0	58.4	9.6	15.8	5.0	38.0	460.0
Alkabo	54.9	59.0	9.7	15.7	10.0	36.0	473.2
Grenora	57.1*	58.3	9.6	15.7	8.4	33.3	493.8
Tioga	54.3	57.7	9.6	16.7	10.0	38.6	488.6
Carpio	48.3	57.1	9.6	16.6	7.5	37.0	460.8
Joppa	51.0	58.4	9.7	16.1	10.0	37.8	448.4
ND-Riveland	50.8	57.0	9.6	16.7	10.0	38.4	481.0
ND-Grano	49.8	57.3	9.5	16.4	7.5	37.2	467.4
Alzada	60.7**	58.8	9.5	15.7	2.1	31.5	567.9
CDC-Dynamic	54.0	56.8	9.7	18.1	1.0	37.4	425.6
CDC-Fortitude	53.2	56.9	9.6	17.1	6.1	36.1	461.7
CDC-Precision	51.1	57.6	9.5	17.2	5.0	37.2	517.8
CDC-Vivid	49.8	57.0	9.6	17.3	5.0	36.9	441.9
MTD16001	55.1	57.6	9.5	15.7	2.1	37.5	460.1
MTD16002	54.0	57.0	9.5	16.1	1.0	38.7	480.9
MTD16004	53.1	58.7	9.5	15.8	2.8	35.6	439.4
MTD16005	51.3	56.6	9.5	16.9	3.5	38.1	480.4
MTD16006	49.5	58.0	9.6	16.1	7.5	39.6	436.7
MTD16007	52.2	58.0	9.6	16.3	10.0	36.7	455.3
MTD16008	40.5	54.6	9.4	17.2	9.3	38.3	384.0
MTD16009	51.0	53.8	9.4	16.9	7.5	38.2	444.3
MTD16010	45.6	57.8	9.6	16.4	8.5	37.8	468.9
MTD16011	51.6	57.1	9.5	16.3	10.0	36.9	463.0
Average	51.9	57.4	9.6	16.4	7.4	37.1	465.8
LSD (0.05)	4.7	0.8	0.1	0.5	0.6	1.7	26.0
Prob > F	<0.001	<0.001	0.046	<0.001	0.021	<0.001	<0.001
CV (%)	5.5	0.9	0.6	2.0	4.7	2.7	3.4

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

³Sawfly damage reported on percent cut stems.

⁴Falling number reported on a 14% moisture basis.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 33. Agronomic means from 2019 dryland off-station durum trial Loring, MT.

Cultivar	Yield bu/ac¹	Test Weight lb/bu	Moisture %	Protein %²	Plant Height inch	Falling number sec³
Mountrail	51.4	59.0	11.8	13.6	30.0	489.5
Divide	55.4*	58.3	12.0	14.0	31.8	480.9
Alkabo	55.8*	59.4	12.0	13.3	30.9	422.0
Grenora	50.2	58.1	12.0	14.1	28.0	426.2
Tioga	48.7	58.7	12.1	14.4	30.5	376.3
Carpio	47.2	58.4	12.1	14.3	30.7	464.1
Joppa	47.3	59.4	12.2	13.9	28.2	414.0
ND-Riveland	50.1	58.5	12.1	14.2	32.0	485.1
ND-Grano	51.3	58.9	11.9	13.8	31.6	485.4
Alzada	48.2	59.3	11.8	13.4	24.8	548.5
CDC-Dynamic	51.1	58.1	12.2	14.9	32.0	446.7
CDC-Fortitude	50.0	58.4	12.0	14.5	29.7	483.3
CDC-Precision	52.3	59.0	11.9	13.9	32.1	499.5
CDC-Vivid	54.9*	59.3	12.0	14.1	33.1	471.9
MTD16001	53.7	58.0	12.0	13.5	28.3	465.0
MTD16002	51.9	59.0	12.1	13.6	31.5	492.4
MTD16004	55.8*	59.4	11.9	13.4	29.7	436.5
MTD16005	51.0	58.4	12.0	14.0	30.3	490.7
MTD16006	49.7	59.5	12.1	13.7	32.2	420.8
MTD16007	58.7**	59.6	11.8	13.3	29.5	493.8
MTD16008	56.4*	57.7	11.9	13.3	32.3	441.1
MTD16009	51.3	55.3	11.5	14.4	31.4	466.6
MTD16010	57.3*	58.7	11.8	13.4	33.7	491.4
MTD16011	49.4	58.2	12.0	13.4	31.2	494.4
Average	52.0	58.6	12.0	13.8	30.6	466.1
LSD (0.05)	5.0	0.5	0.3	0.5	1.4	28.1
Prob > F	<0.001	<0.001	0.008	<0.001	0.021	<0.001
CV (%)	5.9	0.6	1.5	2.1	2.8	3.7

¹Grain yield reported on a 13% moisture basis.

²Grain protein reported on a 12% moisture basis.

³Falling number reported on a 14% moisture basis.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Table 34: Fusarium head blight evaluation 2019 (Dr. Frankie Crutcher, EARC).

Cultivar	Yield (bu/ac)	Severity (%) ¹	Incidence (%) ²	Severity (%) ¹	Incidence (%) ²	FDK (%) ³	DON (ppm) ⁴
		Jul 21	Jul 21	Jul 30	Jul 30		
Mountrail	40.2	12.2	86.7	55.3	98.3	15.0	14.6
Divide	50.4*	11.1	86.7	46.8	98.3	15.0	12.0
Alkabo	36.8	10.4	86.7	64.0	100.0	12.5	9.0
Grenora	41.0	13.8	93.3	47.2	100.0	15.0	12.2
Tioga	49.2*	15.2	95.0	49.5	98.3	22.5	11.7
Carpio	52.0**	9.1	71.7	43.2	100.0	20.0	13.1
Joppa	45.1*	10.5	86.7	45.2	96.7	15.0	13.0
ND-Riveland	46.4*	11.0	85.0	34.0	98.3	9.0	14.0
ND-Grano	40.0	20.8	100.0	55.2	100.0	15.0	20.6
Alzada	15.2	36.8	98.3	70.3	100.0	22.5	16.2
CDC-Dynamic	41.4	22.1	93.3	53.8	100.0	15.0	19.9
CDC-Fortitude	31.3	15.4	91.7	61.2	100.0	12.5	17.5
CDC-Precision	43.8*	15.0	95.0	50.3	100.0	8.0	9.7
CDC-Vivid	37.6	12.7	83.3	42.8	96.7	11.5	12.9
MTD16001	49.4*	12.9	90.0	42.7	98.3	17.5	13.9
MTD16002	38.3	17.3	98.3	60.0	100.0	12.5	13.4
MTD16004	36.0	17.7	100.0	64.0	100.0	15.0	14.8
MTD16005	39.5	17.7	96.7	64.3	98.3	20.0	17.7
MTD16006	34.4	18.7	98.3	68.3	100.0	17.5	21.8
MTD16007	41.3	21.7	100.0	57.3	100.0	20.0	21.4
MTD16008	29.7	19.3	96.7	64.8	100.0	35.0	16.4
MTD16009	27.9	20.8	98.3	69.8	100.0	22.5	16.3
MTD16010	33.0	19.5	93.3	57.5	98.3	17.5	16.7
MTD16011	36.1	18.1	98.3	61.6	100.0	17.5	19.5
Average	39.0	16.7	92.6	55.4	99.2	16.8	15.4
LSD (0.05)	9.9	12.9	16.9	14.9	3.2	7.4	9.9
Prob > F	<0.001	0.094	0.198	0.001	0.500	<0.001	0.417
CV (%)	12.3	37.3	8.8	13.0	1.6	21.4	31.2

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

¹Pest Severity- Average percent area of head covered by disease. Thirty heads were evaluated for each plot.

²Pest Incidence- Percent of thirty plants per plot that had visible FHB symptoms.

³Fusarium diseased kernels.

⁴Concentration of DON (vomitoxin) in ppm.