

Title: North Central Montana Off-Station Spring Durum Variety Performance Evaluations

Principal Investigator: Peggy F. Lamb, Research Scientist, Havre

Project Personnel: Mike Giroux, Breeder/Geneticist, Durum, Bozeman
 Andy Hogg, Research Associate, Durum, Bozeman
 Kasee Clark, Research Associate, Havre
 Kyla McNamara, Research Associate, Havre
 Jesse Fulbright, Liberty County Extension
 Marko Manoukian, Phillips County Extension
 Julianne Snedigar, Blaine County Extension

Cooperators: Max Cederberg, Landowner, Turner
 Pete Lumsden & John Flansaas, Landowners, Loring
 Kurt Kammerzell, Landowner, Chester

Objectives:

Diverse cropping environments exist within the five-county area most closely served by Northern Agricultural Research Center. Winter wheat, spring wheat, barley, durum and oat production together in the five counties (Blaine, Chouteau, Hill, Liberty and Phillips), represents just over 28 percent of the 2013-2017 statewide cereal production totals (43 percent for winter wheat and 25 percent for spring wheat). Producers are keenly interested in variety performance data generated under local conditions. It is our objective, within budget and other resource limitations, to evaluate small grain variety performance, over time, under conditions representative of specific areas of northern Montana, yet differing from that of the Research Center. Growers are provided reliable, unbiased, up-to-date information to make comparisons among improved spring wheat varieties. This report provides producers in north central Montana the information necessary to select varieties best suited for their specific area and growing conditions.

Methods:

Standard off-station durum variety performance trials were conducted on chemical fallow or minimal tillage during 2018 in three northern Montana counties.

Dryland Spring Durum Trials:

- | | |
|---|---------------|
| 1. Cederberg Farm, Blaine County | S13-T36N-R25E |
| 2. Flansaas/Lumsden Farm, Phillips County | S24-T35N-R29E |
| 3. Kammerzell Farm, Liberty County | S11-T31N-R05E |

All three durum trials consisted of 24 entries and were seeded in replicated, 3-row, 22-foot plots on a 12-inch row spacing, utilizing a self-propelled cone seeder with Atom Jet paired row openers. All rows of each plot were trimmed to a harvest length of approximately 17 feet with a three-point rototiller. Plant height was measured from the soil surface to the top of the head, excluding awns, and percent sawfly cutting was visually estimated for each plot immediately prior to harvest. A 'Wintersteiger Classic' plot combine, funded in part by Montana Wheat and Barley Committee, was used to harvest each 3-row plot. Seed was cleaned prior to measuring plot weight. Protein, test weight and moisture content were determined using a Foss Infratec 1241 near infrared analyzer. Falling number was determined using a Perten FN1700 according to the FGIS Directive 9180.38. Other variables specific to each individual trial are listed with the current year data tables.

Please note that research trial yield results recorded under wheat stem sawfly pressure are likely much higher than a producer should expect. Small plot variety trials are managed to assess maximum yield potential and are harvested in such a way that all stems and heads are picked up by the combine, regardless of lodging or cutting due to sawfly. Pickup guards coupled with an extremely slow ground speed and exceptionally low cutting height help researchers collect all heads in order to assess seed yield potential. If you are a producer in a wheat stem sawfly environment, although hollow stemmed varieties may be high yielding in research trials in your area, we strongly recommend against growing those hollow stemmed varieties. Please be aware that if you seed hollow stemmed varieties with sawfly present, you are only creating a breeding ground for future generations of sawfly in your area and not helping combat the pest population.

Results:

Following late seeding and early high temperatures, the durum trial yields at Turner averaged nearly 38 bu/ac (Table 1). 'CDC Precision' was the highest yielding entry at over 43 bu/ac. 'Tioga' along with three Montana State University breeding lines produced seed yields equal to that of CDC Precision. Test weights were excellent, averaging 61 lb/bu, while protein averaged 16.2 percent and sawfly cutting was minimal. Stand percent, plant height, yield, test weight, protein, falling number and sawfly data for the 2018 Turner dryland durum trial are summarized in Table 1.

Comparable averages are calculated using a standard check variety when not all entries are present in a specific trial for all years. Variety means are adjusted by multiplying the actual check mean by the ratio of the individual variety mean compared to the check mean for the same years as tested. All varieties are then directly comparable to each other when in the same nursery. A minimum of three years of data is necessary to be included in the comparable average calculation. Nine-year comparable averages (2009-2018) for durum seed yield and test weight at Turner are summarized in Table 2, while nine-year comparable averages for sawfly cutting are summarized in Table 3.

Loring spring durum yields averaged nearly 31 bu/ac (Table 4). 'Mountrail' was the highest yielding entry at over 35 bu/ac with 'Divide', 'CDC Fortitude', 'CDC Vivid', and three experimental lines from Montana State University yielding the same, statistically. 'CDC Dynamic' and 'MTD16008' produced the highest protein at 17.5 and 17.6 percent, respectively. Sawfly cutting was nearly nonexistent in the durum trial at Loring. Stand percent, plant height, yield, moisture, test weight, protein, falling number and sawfly cutting data, for the 2018 Loring dryland spring durum trial, are summarized in Table 4. Seven-year comparable averages for spring durum seed yield and test weight at Loring are summarized in Table 5, while seven-year comparable averages for sawfly cutting are summarized in Table 6.

The Chester area received early season moisture, resulting in great spring wheat establishment and prolific tillering to set the trial up for high yield potential. However, lack of timely rainfall coupled with high temperatures from flowering through seed set, had an adverse effect on the spring durum. Seed yields averaged just over 28 bu/ac, while test weights averaged just over 56 lb/bu (Table 7). 'CDC Precision' was the highest yielding entry at nearly 35 bu/ac. 'Alzada' along with two MT breeding lines produced yields statistically equal to that of CDC Precision. Sawfly cutting in the small plot scenario was minimal again in 2018. Stand percent, plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2018 Chester dryland spring durum trial are summarized in Table 7. Five-year comparable averages for spring durum seed yield and test weight at Chester are summarized in Table 8, while five-year comparable averages for sawfly cutting are summarized in Table 9.

Summary:

Cropping environments for 2018 started out with an abundance of early snow and very good soil moisture recharge, however, all spring cereal trial sites were seeded later than anticipated due to prolonged snow cover and wet soil conditions throughout April. Although winter months were wetter than normal, spring and summer months during the growing season were slightly warmer than average with drought conditions persisting across north central Montana. Both Turner and Loring received near average rainfall for the year, however the precipitation events were not always timely. The Turner site was seeded into a mechanical fallow field, as the producer is still dealing with soil drifts from a windstorm in 2017. The Loma location was seeded into chemical fallow ground that had been minimally tilled to eliminate potential weed issues. The Chester area also started out with excellent recharge soil moisture, and timely spring precipitation resulted in a very good stand, and producing a high number of tillers. However, prolonged heat and lack of moisture from flowering through grain fill, limited the seed yield and test weight of the spring cereals.

This work has been strongly supported by producers near each of the off-station locations, and by the Northern Agricultural Research Center Advisory Council. With budget and other resources allowing, it is planned to continue off-station cereal variety investigations in the five-county area. The Loring location is entering its twenty-third year, and the cooperators and area producer interest and support has been outstanding. The Turner location is only 32 miles from the Loring site, but growing conditions are quite different. Cooperator and producer support in the Big Flat area has been outstanding through the years with 2017 marking 34 years at the present Turner site. The Chester location was reestablished in 2014 following a prolonged absence of uniform off-station spring cereal testing in Liberty County.

Recognition:

This research would not have been possible without the assistance of the following seasonal employees: Tawnya Brown, Daisen Fox, Marca Herron and Cordell King.

TABLE 1. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2018. (Exp# 18-9851-DUR)

ID	SOURCE	STAND %	PLNT HT Inches	1/	2/	3/	4/	
				YIELD Bu/Ac	TEST WT Lbs/Bu	PROTEIN %	FN Seconds	SAWFLY %
Alkabo	NDSU	88.8	25.7	35.1	61.5	15.9	335	1.0
Alzada	WestBred	96.1	23.7	33.0	61.1	16.1	372	0.3
Carpio	NDSU	92.8	24.8	38.6	60.8	15.6	357	0.7
Divide	NDSU	93.4	28.3	34.4	61.4	16.4	335	0.7
Dynamic	CDC	94.4	26.1	38.1	60.0	17.6	342	0.3
Fortitude	CDC	83.8	26.6	39.0	61.1	16.9	355	0.7
Grenora	NDSU	92.7	26.2	39.2	61.1	16.0	368	0.0
Joppa	NDSU	80.1	27.3	39.3	61.8	16.2	337	0.7
Mountrail	NDSU	92.3	25.5	35.2	60.6	16.0	345	0.7
Precision	CDC	77.1	27.3	43.3	61.9	17.0	366	0.3
Tioga	NDSU	86.4	28.5	40.8	62.0	16.0	345	0.7
Vivid	CDC	95.3	27.8	38.2	60.7	16.6	349	1.0
MT112219	MSU	98.0	22.1	35.1	62.2	15.4	350	0.3
MTD16001	MSU	87.8	26.2	40.5	60.9	15.2	342	0.0
MTD16002	MSU	88.7	28.8	40.4	61.2	15.9	347	1.0
MTD16003	MSU	95.7	25.9	33.5	61.6	14.6	348	0.0
MTD16004	MSU	95.3	25.7	35.7	61.5	16.2	329	0.3
MTD16005	MSU	91.4	28.8	37.6	60.3	16.6	352	0.3
MTD16006	MSU	80.4	29.2	39.1	61.2	15.9	328	0.3
MTD16007	MSU	85.7	26.7	40.7	61.3	16.3	350	0.7
MTD16008	MSU	92.0	28.3	38.5	60.5	16.8	343	0.7
MTD16009	MSU	84.4	25.4	36.8	58.6	16.9	332	0.0
MTD16010	MSU	92.0	28.5	38.6	61.1	16.2	357	0.0
MTD16011	MSU	83.7	26.7	39.5	60.6	16.4	350	0.7
EXPERIMENTAL MEANS		89.5	26.7	37.9	61.0	16.2	347.3	0.5
LSD (0.05)		17.1	2.4	3.6	0.5	0.3	7.7	0.8
C.V.%		11.6	5.5	5.8	0.5	1.1	1.3	-
P-VALUE (Varieties)		0.5936	<.0001	<.0001	<.0001	<.0001	<.0001	-

1/ Volumetric yields are based on plot weights adjusted to uniform 13 percent grain moisture and 60 lbs/bu as the standard test weight for durum.

2/ Protein values are adjusted to 13 percent grain moisture.

3/ FN is the falling number value reported in seconds adjusted to 14 percent flour moisture.

4/ Sawfly rating is reported as the percentage of cut stems.

Bold indicates highest value within a column.

Bold indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05).

Management Information (18-9851-DUR)

Seeding Date: May 7, 2018
 Harvest Date: August 22, 2018
 Fertility: 100-20-10-10 side banded
 System: Till
 Herbicide: Bromac-16oz/ac, Affinity-1oz/ac
 Insecticide: none
 Previous Crop: Chemical Fallow - Winter Wheat
 Precipitation: 4.0" seeding to harvest maturity

TABLE 2. Nine-Year Yield and Test Weight Summary on Selected Entries from Dryland Fallow Spring Durum Variety Nurseries Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2009-2018. (Exp# 9851-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)							TEST WEIGHT (Pounds Per Bushel)								
		2014 4/	2015	2016	2017	2018	AVE. for YEARS TESTED 3/	% of CHECK YIELD 5/	9-YR COMP. AVE. YIELD 6/	2014 4/	2015	2016	2017	2018	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 5/	9-YR COMP. AVE. TEST WT 6/
D03028 CARPIO (+)	5		33.0	43.1	16.9	38.6	37.5	108.7	33.0		61.2	59.8	59.0	60.8	61.0	100.3	60.3
D97780 GRENORA (+)	9		28.8	36.8	17.0	39.2	31.6	104.2	31.6		62.0	58.3	59.4	61.1	60.3	100.2	60.3
D00095 TIOGA (+)	8		31.6	43.7	17.7	40.8	30.7	103.6	31.4		62.5	60.3	61.3	62.0	60.8	101.1	60.8
D901313 MOUNTRAIL (+)	9		30.8	41.7	15.5	35.2	30.3	100.0	30.3		60.9	59.3	59.7	60.6	60.2	100.0	60.2
D9715-11 DIVIDE (+)	9		27.8	49.7	15.3	34.4	29.7	98.1	29.7		61.7	60.1	60.6	61.4	60.7	100.9	60.7
MT03012 SILVER (+)	7		29.9	38.2			30.9	97.5	29.6		61.5	58.4			60.1	100.0	60.1
D04581 JOPPA (+)	4		30.2	31.0	19.2	39.3	29.9	97.2	29.5		62.5	59.4	60.0	61.8	61.0	101.4	61.0
YU894-75 ALZADA (P+)	8			39.3	13.7	33.0	29.3	96.9	29.4			58.9	60.8	61.1	60.4	100.6	60.5
D96604 ALKABO (+)	9		30.5	36.3	15.9	35.1	29.3	96.8	29.3		62.3	60.2	60.8	61.5	61.2	101.8	61.2
MEANS (For Entries Listed)				40.0	16.4	37.0			30.4			59.4	60.2	61.3			60.6
7/ Growing Season Precipitation (in.)		16.4	n/a	8.6	2.3	4.0	7.9										
Soil PAW (in.) to SD @ Planting		8.9	6.3	6.1	n/a	n/a	7.8										
Total Plant Available Water (in.)		25.2	n/a	14.7	n/a	n/a	17.6										
Soil NO3 (lbs.) to SD at Planting		65	49	85	n/a	n/a	66										
SD (Sampling Depth in Inches)		48	48	48	n/a	n/a	48										
Fertilizer Applied	(# N)	100	100	125	100	100	91										
	(# P2O5)	20	20	20	20	20	28										
	(# K2O)	10	10	10	10	10	16										
	(# S)	0	0	10	0	10	2										

Check variety is Mountrail.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending.

3/ Only the most recent 5 years are shown, but summary calculations include all years noted.

4/ No harvest in 2014 due to hail.

5/ Percent of Mountrail yield or test weight for the same data years as those in which a given entry was tested.

6/ 9-Yr Comparable Average = (x/y) * z where x = average yield or test weight of a given entry for years tested, y = average yield or test weight for Mountrail for the same years, and z = 9-Yr average yield or test weight for the check variety Mountrail.

7/ Seeding to 14 days prior to harvest maturity.

TABLE 3. Nine-Year Sawfly Summary on Selected Entries from Dryland Fallow Spring Durum Variety Nurseries Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2009-2018. (Exp# 9851-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems)										AVE. for YEARS TESTED	% of CHECK SWFLY 4/	9-YR COMP. AVE. SWFLY 5/
		2009	2010	2011	2012	2013	2014 3/	2015	2016	2017	2018			
YU894-75 ALZADA (P+)	8	8.3	8.3	15.0	16.7	2.3		0.0	0.3	0.3	6.4	55.2	5.7	
D9715-11 DIVIDE (+)	9	5.0	18.3	16.7	13.3	0.7		0.0	0.0	0.7	6.1	59.5	6.1	
MT03012 SILVER (+)	7	5.7	18.3	18.3	18.3	2.3		0.0	0.0		9.0	68.4	7.1	
D00095 TIOGA (+)	8		21.7	23.3	26.7	2.0		0.0	0.0	0.7	9.4	88.6	9.2	
D03028 CARPIO (+)	5					3.7		0.0	0.0	0.7	0.9	92.9	9.6	
D04581 JOPPA (+)	4							0.0	0.0	0.3	0.3	100.0	10.3	
D901313 MOUNTRAIL (+)	9	8.3	21.7	31.7	26.7	3.7		0.0	0.0	0.3	10.3	100.0	10.3	
D97780 GRE Nora (+)	9	15.0	25.0	38.3	21.7	3.7		0.0	0.0	0.0	11.5	111.5	11.5	
D96604 ALKABO (+)	9	8.7	21.7	46.7	20.0	7.0		0.0	0.0	1.0	11.7	112.9	11.7	
MEANS (For Entries Listed)		8.5	19.3	27.1	20.5	3.2		0.0	0.3	0.6			9.1	
6/ Growing Season Precipitation (in.)		6.0	10.3	8.3	7.5	n/a	16.4	n/a	8.6	2.3	4.0	7.9		
Soil PAW (in.) to SD @ Planting		7.8	9.0	7.9	8.9	7.8	8.9	6.3	6.1	n/a	n/a	7.8		
Total Plant Available Water (in.)		13.8	19.2	16.2	16.4	n/a	25.2	n/a	14.7	n/a	n/a	17.6		
Soil NO3 (lbs.) to SD at Planting		94	162	51	15	11	65	49	85	n/a	n/a	66		
SD (Sampling Depth in Inches)		48	48	48	48	48	48	48	48	n/a	n/a	48		
Fertilizer Applied	(# N)	70	70	70	70	100	100	100	125	100	100	91		
	(# P2O5)	40	40	40	40	20	20	20	20	20	20	28		
	(# K2O)	25	25	25	25	10	10	10	10	10	10	16		
	(# S)	0	0	0	0	0	0	0	10	0	10	2		

Check variety is Mountrail.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending.

3/ No harvest in 2014 due to hail.

4/ Percent of Mountrail cut for the same data years as those in which a given entry was tested.

5/ 9-Yr Comparable Average = $(x/y) * z$ where x = average saw fly rating of a given entry for years tested, y = average saw fly rating for Mountrail for the same years, and z = 9-Yr average saw fly rating for the check variety Mountrail.

6/ Seeding to 14 days prior to harvest maturity.

TABLE 4. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Flansaas-Lumsden Farm, Loring. Northern Agricultural Research Center. Havre, Montana. 2018. (Exp# 18-9855-DUR)

ID	SOURCE	STAND %	PLNT HT Inches	1/	TEST WT Lbs/Bu	2/	3/	4/
				YIELD Bu/Ac		PROTEIN %	FN Seconds	SAWFLY %
Mountrail	NDSU	95.1	28.4	35.6	60.6	15.6	336	0.3
Divide	NDSU	96.1	28.1	32.7	61.1	15.7	323	0.0
Alkabo	NDSU	92.1	24.5	29.1	61.9	15.2	320	0.0
Grenora	NDSU	90.1	27.1	29.9	61.2	15.9	340	0.7
Tioga	NDSU	94.1	27.7	32.4	61.7	16.2	307	2.0
Carpio	NDSU	91.5	25.7	31.7	61.2	15.0	343	0.3
Joppa	NDSU	85.2	26.2	27.1	61.9	16.3	326	0.3
Alzada	WestBred	94.1	21.0	31.3	61.3	15.6	380	0.3
Dynamic	CDC	97.0	25.7	23.3	60.4	17.5	336	0.7
Fortitude	CDC	97.0	24.8	35.2	60.8	16.7	345	0.3
Precision	CDC	90.7	25.0	30.4	61.9	16.6	345	0.0
Vivid	CDC	93.1	25.9	32.8	61.5	15.9	326	0.7
MT112219	MSU	96.0	21.4	26.9	61.7	16.2	315	0.0
MTD16001	MSU	90.5	27.4	33.0	60.8	15.2	328	0.0
MTD16002	MSU	93.4	24.3	34.4	61.2	15.4	331	0.0
MTD16003	MSU	94.4	23.3	28.7	61.4	14.8	333	0.3
MTD16004	MSU	96.7	27.1	28.3	61.7	15.7	310	0.7
MTD16005	MSU	96.7	26.7	32.0	60.4	16.3	324	0.3
MTD16006	MSU	92.4	24.1	31.9	61.2	16.0	317	0.0
MTD16007	MSU	90.4	24.9	31.2	61.3	16.3	339	0.0
MTD16008	MSU	93.4	20.9	26.2	59.3	17.6	293	0.0
MTD16009	MSU	94.1	23.2	30.7	58.9	16.2	309	0.0
MTD16010	MSU	89.4	26.0	29.4	60.7	16.2	334	0.7
MTD16011	MSU	97.1	25.6	34.0	60.1	15.8	328	0.0
EXPERIMENTAL MEANS		93.4	25.2	30.8	61.0	16.0	328.7	0.3
LSD (0.05)		8.7	1.6	3.0	0.6	0.6	21.3	-
C.V.%		5.7	3.9	6.0	0.6	2.4	3.9	-
P-VALUE (Varieties)		0.5343	<.0001	<.0001	<.0001	<.0001	<.0001	-

1/ Volumetric yields are based on plot weights adjusted to uniform 13 percent grain moisture and 60 lbs/bu as the standard test weight for durum.

2/ Protein values are adjusted to 13 percent grain moisture.

3/ FN is the falling number value reported in seconds adjusted to 14 percent flour moisture.

4/ Sawfly rating is reported as the percentage of cut stems.

Bold indicates highest value within a column.

Bold indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05).

Management Information (18-9855-DUR)

Seeding Date: May 6, 2018
 Harvest Date: August 21, 2018
 Fertility: 100-20-10-10 side banded
 System: Till
 Herbicide: TrumpCard- 20oz/ac
 Insecticide: none
 Previous Crop: Chemical Fallow- Spring Wheat
 Precipitation: n/a

TABLE 5. Seven-Year Yield and Test Weight Summary on Selected Entries from Dryland Fallow Spring Durum Variety Nurseries Grown Off-Station at the Flansaas-Lumsden Farm, Loring. Northern Agricultural Research Center. Havre, Montana. 2011-2018. (Exp# 9855-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)							TEST WEIGHT (Pounds Per Bushel)								
		2014	2015	2016	2017	2018	AVE. YEARS TESTED 3/	% of CHECK YIELD 5/	7-YR COMP. AVE. YIELD 6/	2014	2015	2016	2017	2018	AVE. YEARS TESTED 3/	% of CHECK TEST WT 5/	7-YR COMP. AVE. TEST WT 6/
D03028 CARPIO (+)	5	39.0	44.3	47.6		31.7	42.1	106.8	38.2	56.7	61.0	61.0		61.2	60.4	101.3	60.5
YU894-75 ALZADA (P+)	6	41.1		39.4		31.3	36.2	104.9	37.5	56.8		59.3		61.3	60.0	100.6	60.1
D00095 TIOGA (+)	7	37.7	44.9	41.3		32.4	36.9	103.4	36.9	56.0	61.1	60.9		61.7	60.6	101.4	60.6
MT 03012 SILVER (+)	6	38.6	39.7	40.4			36.8	102.9	36.8	56.7	60.2	59.4			59.8	100.2	59.9
D901313 MOUNTRAIL (+)	7	34.8	43.2	38.6		35.6	35.7	100.0	35.7	56.7	60.4	59.3		60.6	59.8	100.0	59.8
D96604 ALKABO (+)	7	39.2	39.9	34.7		29.1	35.7	99.8	35.7	56.8	61.3	60.6		61.9	60.9	101.9	60.9
D9715-11 DIVIDE (+)	7	39.8	38.6	42.2		32.7	35.4	99.1	35.4	57.7	60.6	59.9		61.1	60.6	101.3	60.6
D97780 GRE Nora (+)	7	39.0	40.2	36.5		29.9	34.6	96.8	34.6	56.2	60.5	59.3		61.2	59.8	100.0	59.8
D04581 JOPPA (++)	4	39.4	43.0	37.6		27.1	36.8	96.6	34.5	56.9	61.1	60.1		61.9	60.0	101.3	60.5
MEANS (For Entries Listed)		38.7	41.7	39.8		31.2			36.1	56.7	60.8	60.0		61.4			60.3
7/ Growing Season Precipitation (in.)		5.6	8.9	7.2	n/a	n/a	7.8										
Soil PAW (in.) to SD @ Planting		8.9	8.2	3.7	n/a	n/a	7.6										
Total Plant Available Water (in.)		14.5	17.2	10.9	n/a	n/a	15.2										
Soil NO3 (lbs.) to SD at Planting		64	41	25	n/a	n/a	41										
SD (Sampling Depth in Inches)		48	48	24	n/a	n/a	44										
Fertilizer Applied	(# N)	100	100	125	125	100	99										
	(# P ₂ O ₅)	20	20	20	20	20	25										
	(# K ₂ O)	10	10	10	10	10	14										
	(# S)	0	0	10	10	10	4										

Check variety is Mountrail.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending.

3/ Only the most recent 5 years show n, but summary calculations include all years noted.

4/ No Harvest in 2017 due to hail.

5/ Percent of Mountrail yield or test weight for the same data years as those in which a given entry was tested.

6/ 7-Yr Comparable Average = (x/y) * z where x = average yield or test weight of a given entry for years tested, y = average yield or test weight for Mountrail for the same years, and z = 7-Yr average yield or test weight for the check variety Mountrail.

7/ Seeding to 14 days prior to harvest maturity.

TABLE 6. Seven-Year Sawfly Summary on Selected Entries from Dryland Fallow Spring Durum Variety Nurseries Grown Off-Station at the Flansaas-Lumsden Farm, Loring, Northern Agricultural Research Center, Havre, Montana, 2011-2018. (Exp# 9855-DUR)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems)								AVE. for YEARS TESTED	% of CHECK SWFLY	7-YR COMP. AVE. SWFLY
			2011	2012	2013	2014	2015	2016	2017	2018			
D03028	CARPIO (+)	5			2.3	0.3	0.0	0.0	0.3	0.6	37.5	2.1	
YU894-75	ALZADA (P+)	6	10.0	5.0	1.0	1.0		0.0	0.3	2.9	43.7	2.5	
D9715-11	DIVIDE (+)	7	13.3	3.7	5.0	0.7	0.0	0.0	0.0	3.2	57.1	3.2	
MT 03012	SILVER (+)	6	15.0	3.7	3.7	1.0	0.0	0.0		3.9	59.3	3.4	
D97780	GRENORA (+)	7	20.0	8.3	6.7	0.3	0.0	0.0	0.7	5.1	90.8	5.1	
D901313	MOUNTRAIL (+)	7	20.0	11.7	7.0	0.7	0.0	0.0	0.3	5.7	100.0	5.7	
D04581	JOPPA (+)	4				0.7	0.0	0.0	0.3	0.3	100.0	5.7	
D96604	ALKABO (+)	7	23.3	8.3	8.3	1.0	0.0	0.0	0.0	5.9	103.3	5.9	
D00095	TIOGA (+)	7	25.0	10.0	8.3	2.0	0.0	0.0	2.0	6.8	119.3	6.8	
MEANS (For Entries Listed)			18.1	7.2	5.3	0.9	0.0	0.0	0.5			4.5	
6/ Growing Season Precipitation (in.)			n/a	n/a	9.5	5.6	8.9	7.2	n/a	n/a	7.8		
Soil PAW (in.) to SD @ Planting			7.1	8.8	8.8	8.9	8.2	3.7	n/a	n/a	7.6		
Total Plant Available Water (in.)			n/a	n/a	18.3	14.5	17.2	10.9	n/a	n/a	15.2		
Soil NO3 (lbs.) to SD at Planting			50	34	34	64	41	25	n/a	n/a	41		
SD (Sampling Depth in Inches)			48	48	48	48	48	24	n/a	n/a	44		
Fertilizer Applied													
			(# N)	70	70	100	100	100	125	125	100	99	
			(# P2O5)	40	40	20	20	20	20	20	20	25	
			(# K2O)	25	25	10	10	10	10	10	10	14	
			(# S)	0	0	0	0	0	10	10	10	4	

Check variety is Mountrail.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending.

3/ No harvest in 2017 due to hail.

4/ Percent of Mountrail saw fly rating for the same data years as those in which a given entry was tested.

5/ 7-Yr Comparable Average = (x/y) * z where x = average saw fly rating of a given entry for years tested, y = saw fly rating for Mountrail for the same years, and z = 7-Yr saw fly rating for the check variety Mountrail.

6/ Seeding to 14 days prior to harvest maturity.

TABLE 7. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Kammerzell Farm, Chester. Northern Agricultural Research Center. Havre, Montana. 2018. (Exp# 18-9853-DUR)

ENTRY	SOURCE	STAND %	PLNT HT Inches	1/	TEST WT Lbs/Bu	2/	3/	4/
				YIELD Bu/Ac		PROTEIN %	FN Seconds	SAWFLY %
Alkabo	NDSU	99.0	32.6	30.1	57.1	17.1	336	0.5
Alzada	WestBred	99.7	28.0	33.9	54.4	16.8	367	1.8
Carpio	NDSU	98.4	31.5	27.0	55.3	17.4	337	0.3
Divide	NDSU	99.3	33.1	28.4	57.8	16.6	348	0.5
Dynamic	CDC	100.0	31.8	27.3	55.9	18.6	305	0.0
Fortitude	CDC	99.3	32.0	29.6	55.8	18.0	353	0.2
Grenora	NDSU	98.4	32.3	29.6	56.0	17.5	343	0.3
Joppa	NDSU	98.0	35.0	24.7	56.4	17.1	318	0.7
Mountrail	NDSU	99.7	31.3	30.0	55.0	17.7	334	0.5
Precision	CDC	99.3	33.3	34.8	58.0	18.0	361	0.2
Tioga	NDSU	99.7	35.1	30.9	57.2	18.2	358	0.2
Vivid	CDC	98.7	34.1	31.0	56.8	18.1	337	0.3
MT112219	MSU	99.0	28.0	31.4	55.9	16.1	343	0.3
MTD16001	MSU	99.0	33.0	28.6	56.9	17.1	348	0.5
MTD16002	MSU	99.3	31.5	25.7	57.0	17.0	331	0.0
MTD16003	MSU	98.7	31.7	29.9	56.2	17.4	345	0.7
MTD16004	MSU	98.7	32.9	33.7	58.1	17.5	341	0.3
MTD16005	MSU	99.0	34.3	25.2	55.5	18.0	349	0.2
MTD16006	MSU	99.3	36.2	28.0	57.7	17.4	335	0.3
MTD16007	MSU	99.0	33.0	27.8	56.4	18.0	337	0.3
MTD16008	MSU	99.7	34.1	22.4	55.9	17.1	353	1.7
MTD16009	MSU	98.4	32.1	24.0	53.2	17.7	333	0.3
MTD16010	MSU	98.4	33.1	26.0	56.8	17.0	347	0.0
MTD16011	MSU	98.4	33.6	27.0	55.6	17.4	344	0.5
EXPERIMENTAL MEANS		99.0	32.6	28.6	56.3	17.5	341.8	0.4
LSD (0.05)		2.1	2.2	3.5	0.6	0.7	10.6	-
C.V.%		1.3	4.2	7.5	0.7	2.5	1.9	-
P-VALUE (Varieties)		0.9350	<.0001	<.0001	<.0001	<.0001	<.0001	-

1/ Volumetric yields are based on plot weights adjusted to uniform 13 percent grain moisture and 60 lbs/bu as the standard test weight for durum.

2/ Protein values are adjusted to 13 percent grain moisture.

3/ FN is the falling number value reported in seconds adjusted to 14 percent flour moisture.

4/ Sawfly rating is reported as the percentage of cut stems.

Bold indicates highest value within a column.

Bold indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05).

Management Information (18-9853-DUR)

Seeding Date: May 8, 2018
 Harvest Date: August 24, 2018
 Fertility: 100-20-10 side banded
 System: no till
 Herbicide: none
 Insecticide: none
 Previous Crop: Chemical Fallow - Spring Wheat
 Precipitation: n/a

TABLE 8. Five-Year Yield and Test Weight Summary on Selected Entries from Dryland Fallow Spring Durum Variety Nurseries Grown Off-Station at the Kammerzell Farm, Chester. Northern Agricultural Research Center. Havre, Montana. 2014-2018. (Exp# 9853-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED	1/ YIELD (Bushels Per Acre)					TEST WEIGHT (Pounds Per Bushel)					5-YR COMP. AVE YIELD 4/	5-YR COMP. AVE TEST WT 4/				
		2014	2015	2016	2017	2018	AVE. for YEARS TESTED	% of CHECK YIELD 3/	2014	2015	2016			2017	2018	AVE. for YEARS TESTED	% of CHECK TEST WT 3/
MT 03012 SILVER (+)	3	33.7	24.1	29.0			29.0	111.4	31.6	53.7	56.0	50.3			53.3	98.8	54.1
YU894-75 ALZADA (P+)	4	35.8		28.3	31.9	33.9	32.5	108.4	30.8	53.9	56.0	50.2	57.7	54.4	54.1	99.5	54.4
D00095 TIOGA (+)	5	33.0	21.5	27.4	30.7	30.9	28.7	101.1	28.7	55.0	57.6	52.0	59.5	57.2	56.3	102.8	56.3
D901313 MOUNTRAIL (+)	5	31.8	22.2	24.0	33.9	30.0	28.4	100.0	28.4	54.5	56.2	51.3	56.6	55.0	54.7	100.0	54.7
D96604 ALKABO (+)	5	37.0	21.7	21.3	27.5	30.1	27.5	96.9	27.5	55.1	57.8	53.2	57.9	57.1	56.2	102.7	56.2
D9715-11 DIVIDE (+)	5	34.1	20.0	24.9	29.9	28.4	27.4	96.7	27.4	53.7	57.8	51.6	58.7	57.8	55.9	102.2	55.9
D97780 GRE Nora (+)	5	27.3	21.9	25.4	33.1	29.6	27.4	96.6	27.4	54.1	57.6	50.6	57.0	56.0	55.1	100.6	55.1
D04581 JOPPA (+)	5	33.4	22.7	24.4	29.9	24.7	27.0	95.2	27.0	53.4	57.9	51.3	58.2	56.4	55.4	101.3	55.4
D03028 CARPIO (+)	5	34.6	19.4	24.6	26.6	27.0	26.5	93.2	26.5	55.0	56.6	52.8	56.9	55.3	55.3	101.1	55.3
MEANS (For Entries Listed)		33.4	21.7	25.5	30.5	29.3			28.4	54.3	57.2	51.5	57.8	56.2			55.3
5/ Growing Season Precipitation (in.)		n/a	5.0	8.3	2.8	n/a	5.3										
Soil PAW (in.) to SD @ Planting		13.7	9.8	n/a	n/a	n/a	11.7										
Total Plant Available Water (in.)		n/a	14.8	n/a	n/a	n/a	14.8										
Soil NO3 (lbs.) to SD at Planting		257	251	n/a	n/a	n/a	254										
SD (Sampling Depth in Inches)		48	48	48	n/a	n/a	48										
Fertilizer Applied	(# N)	100	100	125	100	100	105										
	(# P ₂ O ₅)	20	20	20	20	20	20										
	(# K ₂ O)	10	10	10	10	10	10										
	(# S)	0	0	10	0	0	2										

Check variety is Mountrail.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending.

3/ Percent of Mountrail saw fly rating for the same data years as those in which a given entry was tested.

4/ 5-Yr Comparable Average = (x/y) * z where x = average yield or test weight rating of a given entry for years tested, y = yield or test weight rating for Mountrail for the same years, and z = 5-Yr yield or test weight rating for the check variety Mountrail.

5/ Seeding to 14 days prior to harvest maturity.

TABLE 9. Five-Year Sawfly Summary on Selected Entries from Dryland Fallow Spring Durum Variety Nurseries Grown Off-Station at the Kammerzell Farm, Chester. Northern Agricultural Research Center. Havre, Montana. 2014-2018. (Exp# 9853-DUR)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems)					AVE. for YEARS TESTED	% of CHECK SWFLY 3/	5-YR COMP. AVE. SWFLY 4/
			2014	2015	2016	2017	2018			
D97780	GRENORA (+)	5	0.3	0.0	0.3	0.7	0.3	0.3	7.9	0.3
D03028	CARPIO (+)	5	1.0	0.0	0.0	0.3	0.3	0.3	7.9	0.3
D9715-11	DIVIDE (+)	5	0.7	0.7	0.3	0.0	0.5	0.4	10.2	0.4
MT 03012	SILVER (+)	3	1.0	0.7	1.0			0.9	12.9	0.5
YU894-75	ALZADA (P+)	4	0.3		2.3	0.3	1.8	1.2	22.8	1.0
D04581	JOPPA (+)	5	2.3	0.3	1.0	0.7	0.7	1.0	23.6	1.0
D96604	ALKABO (+)	5	2.3	0.3	1.0	1.0	0.5	1.0	24.4	1.0
D00095	TIOGA (+)	5	1.0	2.0	5.0	0.7	0.2	1.8	41.7	1.8
D901313	MOUNTRAIL (+)	5	20.0	0.0	0.7	0.0	0.5	4.2	100.0	4.2
MEANS (For Entries Listed)			3.2	0.5	1.3	0.5				1.2
5/ Growing Season Precipitation (in.)			n/a	5.0	8.3	2.8	n/a	5.3		
Soil PAW (in.) to SD @ Planting			13.7	9.8	n/a	n/a	n/a	11.7		
Total Plant Available Water (in.)			n/a	14.8	n/a	n/a	n/a	14.8		
Soil NO3 (lbs.) to SD at Planting			257	251	n/a	n/a	n/a	254		
SD (Sampling Depth in Inches)			48	48	48	n/a	n/a	48		
Fertilizer Applied										
			(# N)	100	100	125	100	100	105	
			(# P ₂ O ₅)	20	20	20	20	20	20	
			(# K ₂ O)	10	10	10	10	10	10	
			(# S)	0	0	10	0	0	2	

Check variety is Mountrail.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending.

3/ Percent of Mountrail saw fly rating for the same data years as those in which a given entry was tested.

4/ 5-Yr Comparable Average = (x/y) * z where x = average saw fly rating of a given entry for years tested, y = saw fly rating for Mountrail for the same years, and z = 5-Yr saw fly rating for the check variety Mountrail.

5/ Seeding to 14 days prior to harvest maturity.