Title (4W6471): North Central Montana Off-Station Spring Durum Variety Performance Evaluations

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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 nearly 28 percent of the 2012-2016 statewide cereal production totals (43 percent for winter wheat and 24 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 durum 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 2017 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 12 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.

Results:

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.

Cropping environments in 2017 started out with very good recharge soil moisture, and cooler than typical early spring temperatures followed by a season of high winds and drought conditions across north central Montana. Both Turner and Loring suffered from lack of precipitation throughout the year resulting in thin stands and reduced tillering. The Turner site was hit with an extreme windstorm for several days at the end of May which sandblasted and buried cereal seedlings under drifts of soil, increasing crop stress. Following the summer of drought, ultimately, the research site near Loring was taken out by a late season hail storm. The Chester area also started out with excellent recharge soil moisture, and timely spring precipitation resulted in a very good stand, 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.

At Havre, annual growing season precipitation (9/1/16 through 8/31/17) was 9.48 inches, 2.58 inches lower than the average for all years since 1916. April 1 through July 31 precipitation was 2.41 inches, just 34 percent of the 102-year average. Heat units expressed as "Growing Degree Days" (GDD, base 50) from May through July totaled 1393, or 108 percent of the average for the last 67 years (1951-2017). The last spring frost was on May 19 and the first fall frost of 2017 was on September 25, resulting in 129 frost-free days. The minimum winter temperature was -27 degrees F on December 17, 2016. Overall, the 2016-2017 average crop year temperatures were higher than the long-term average. The April through July growing season saw an average daily temperature of 59 degrees F, 2.5 degrees F higher than historical temperatures. July and August average temperatures were nearly three degrees F higher than long-term averages with the high for 2017 recorded on July 15 at 101 degrees F. There were 30 days with temperatures 90 degrees F or above, with only one day over 100 degrees F.

Following a very dry summer, which was categorized as an extreme drought by the National Oceanic and Atmospheric Administration, the durum trial yields at Turner averaged only 17 bu/ac (Table 1). ‘CDC Dynamic’ was the highest yielding entry at 20 bu/ac. ‘CDC Precision’ and NDSU release ‘Joppa’ produced seed yields equal to that of CDC Dynamic at just over 19 bu/ac. Test weights were very good, ranging from 61.3 lb/bu to 59.0 lb/bu across all entries, while protein averaged 16.5 percent. Sawfly cutting was minimal in the durum trial at Turner. Stand percent, plant height, yield, test weight, protein, falling number and sawfly data for the 2017 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 (2008-2017) 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.

The Loring spring durum trial was hailed out in 2017, however long term averages are still reported. Six-year comparable averages for spring durum seed yield and test weight at Loring are summarized in Table 4, while six-year comparable averages for sawfly cutting are summarized in Table 5.

In 2014, an off-station spring durum trial was established near Chester. Excellent recharge soil moisture, and timely spring precipitation resulted in a very good stand, 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. The extreme conditions during head fill resulted in spring durum yields averaging just under 30 bu/ac (Table 6). ‘Mountrail’ was the highest yielding entry at nearly 34 bu/ac. Both ‘Grenora’ and ‘Alzada’ produced yields statistically equal to that of Mountrail, at 33 and 32 bu/ac, respectively. Sawfly cutting in the small plot scenario was minimal in 2017. Stand percent, plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2017 Chester dryland spring durum trial are summarized in Table 6. Four-year comparable averages for spring durum seed yield and test weight at Chester are summarized in Table 7, while four-year comparable averages for sawfly cutting are summarized in Table 8.

Summary:

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 cooperator 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.

Funding Summary:

Expenditure information for grant index 4W6471 is to be provided by Montana State University, Office of Sponsored Programs. There is no other grant support for this project.

MWBC CY2018 Grant Submission Plans:

This project has been submitted for funding consideration in the next calendar year.

Recognition:

This research would not have been possible without the assistance of the following summertime hourly employees: Marley Manoukian, Nicole Parsons and Emily Simonson.

TABLE 1. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2017. (Exp# 17-9851-DUR)

ID	SOURCE	STAND %	PLNT HT Inches	1/ YIELD Bu/Ac	TEST WT Lbs/Bu	2/ PROTEIN %	3/ FN Seconds	4/ SAWFLY %
ALKABO	NDSU	99.3	17.4	15.9	**60.8**	15.9	314	0.0
ALZADA	WestBred	98.4	16.9	13.7	**60.8**	16.1	**365**	0.3
CARPIO	NDSU	98.7	18.1	16.9	59.0	16.3	284	0.0
DIVIDE	NDSU	97.3	17.6	15.3	60.6	16.4	314	0.7
DYANMIC	CDC	98.7	20.3	**20.0**	59.8	**17.6**	325	0.0
FORTITUDE	CDC	95.0	18.6	17.5	59.3	**17.3**	308	0.3
GRENORA	NDSU	98.0	17.3	17.0	59.4	15.9	319	0.0
JOPPA	NDSU	99.7	18.3	**19.2**	60.0	16.2	311	0.3
MOUNTRAIL	NDSU	98.7	17.3	15.5	59.7	16.2	308	0.3
PRECISION	CDC	99.0	19.8	**19.3**	**60.7**	16.9	330	0.0
TIOGA	NDSU	98.0	19.2	17.7	**61.3**	15.9	291	0.7
VIVID	CDC	97.4	20.1	16.6	60.5	16.9	302	0.7
EXPERIMENTAL MEANS		98.2	18.4	17.0	60.2	16.5	314.2	0.3
LSD (0.05)		3.4	2.3	2.1	0.6	0.4	18.6	ns
C.V.%		2.0	7.3	7.3	0.6	1.3	3.5	158.7
P-VALUE (Varieties)		0.3812	0.0435	<.0001	<.0001	<.0001	<.0001	0.3457

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 (17-9851-DUR)

Seeding Date:	April 26, 2017
Harvest Date:	August 10, 2017
Fertility:	100-20-10 side banded
System:	no till
Herbicide:	none
Insecticide:	none
Previous Crop:	Chemical Fallow - Winter Wheat
Precipitation:	2.26" 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. 2008-2017. (Exp# 9851-DUR)

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre) 2013	2014 4/	2015	2016	2017	AVE. for YEARS TESTED 3/	% of CHECK YIELD 5/	**9-YR COMP. AVE. YIELD 6/**	TEST WEIGHT (Pounds Per Bushel) 2013	2014 4/	2015	2016	2017	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 5/	**9-YR COMP. AVE. TEST WT 6/**
Normanno	NORMANNO	5	50.9					31.6	126.8	**35.6**	63.1					59.6	99.1	**59.3**
DT712	STRONGFIELD (+)	7	54.3		33.4			31.5	112.5	**31.6**	64.1		60.5			59.9	100.0	**59.9**
D03028	CARPIO (+)	4	56.1		33.0	43.1	16.9	37.3	108.5	**30.5**	64.0		61.2	59.8	59.0	61.0	100.3	**60.0**
D97780	GRENORA (+)	9	53.2		28.8	36.8	17.0	29.0	103.0	**29.0**	64.2		62.0	58.3	59.4	59.8	99.9	**59.8**
D00095	TIOGA (+)	7	54.1		31.6	43.7	17.7	29.3	101.4	**28.5**	64.7		62.5	60.3	61.3	60.6	100.9	**60.3**
D901313	MOUNTRAIL (+)	9	49.5		30.8	41.7	15.5	28.1	100.0	**28.1**	63.5		60.9	59.3	59.7	59.8	100.0	**59.8**
D9715-11	DIVIDE (+)	9	50.5		27.8	49.7	15.3	27.8	99.0	**27.8**	64.3		61.7	60.1	60.6	60.2	100.6	**60.2**
YU894-75	ALZADA (P+)	8	47.4			39.3	13.7	27.3	98.4	**27.6**	63.5			58.9	60.8	59.9	100.4	**60.1**
MT03012	SILVER (+)	8	45.7		29.9	38.2		29.1	98.2	**27.6**	63.9		61.5	58.4		59.7	99.8	**59.7**
D96604	ALKABO (+)	9	48.9		30.5	36.3	15.9	27.1	96.4	**27.1**	64.9		62.3	60.2	60.8	60.8	101.6	**60.8**
D04581	JOPPA (+)	3			30.2	31.0	19.2	26.8	91.4	**25.7**			62.5	59.4	60.0	60.7	101.2	**60.5**
MEANS (For Entries Listed)			51.1		30.7	40.0	16.4			**29.0**	64.0		61.7	59.4	60.2			**60.0**
7/ Growing Season Precipitation (in.)			n/a	16.4	n/a	8.6	2.3	8.2										
Soil PAW (in.) to SD @ Planting			7.8	8.9	6.3	6.1	n/a	7.9										
Total Plant Available Water (in.)			n/a	25.2	n/a	14.7	n/a	17.2										
Soil NO3 (lbs.) to SD at Planting			11	65	49	85	n/a	66										
SD (Sampling Depth in Inches)			48	48	48	48	n/a	48										
Fertilizer Applied	(# N)		100	100	100	125	100	88										
	(# P2O5)		20	20	20	20	20	30										
	(# K2O)		10	10	10	10	10	18										
	(# S)		0	0	0	10	0	1										

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 selecton 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. 2008-2017. (Exp# 9851-DUR)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems) 2008	2009	2010	2011	2012	2013	2014 3/	2015	2016	2017	AVE. for YEARS TESTED	% of CHECK SWFLY 4/	**9-YR COMP. AVE. SWFLY 5/**
Normanno	NORMANNO	5		0.7	2.3	1.0	1.0	0.7					1.1	6.2	**0.7**
DT712	STRONGFIELD (+)	7	2.3	10.0	13.3	10.0	15.0	0.3		0.0			7.3	50.0	**5.7**
YU894-75	ALZADA (P+)	8	2.3	8.3	8.3	15.0	16.7	2.3			0.0	0.3	6.7	52.1	**5.9**
D9715-11	DIVIDE (+)	9	3.7	5.0	18.3	16.7	13.3	0.7		0.0	0.0	0.7	6.5	57.0	**6.5**
MT03012	SILVER (+)	8	2.3	5.7	18.3	18.3	18.3	2.3		0.0	0.0		8.2	64.0	**7.3**
D00095	TIOGA (+)	7			21.7	23.3	26.7	2.0		0.0	0.0	0.7	10.6	88.5	**10.1**
D03028	CARPIO (+)	4						3.7		0.0	0.0	0.0	0.9	91.7	**10.4**
D901313	MOUNTRAIL (+)	9	10.0	8.3	21.7	31.7	26.7	3.7		0.0	0.0	0.3	11.4	100.0	**11.4**
D04581	JOPPA (+)	3								0.0	0.0	0.3	0.1	100.1	**11.4**
D97780	GRENORA (+)	9	11.7	15.0	25.0	38.3	21.7	3.7		0.0	0.0	0.0	12.8	112.7	**12.8**
D96604	ALKABO (+)	9	15.0	8.7	21.7	46.7	20.0	7.0		0.0	0.0	0.0	13.2	116.3	**13.2**
MEANS (For Entries Listed)			6.8	7.7	16.7	22.3	17.7	2.6		0.0	0.0	0.3			**8.7**
6/ Growing Season Precipitation (in.)			6.6	6.0	10.3	8.3	7.5	n/a	16.4	n/a	8.6	2.3	8.2		
Soil PAW (in.) to SD @ Planting			8.1	7.8	9.0	7.9	8.9	7.8	8.9	6.3	6.1	n/a	7.9		
Total Plant Available Water (in.)			14.6	13.8	19.2	16.2	16.4	n/a	25.2	n/a	14.7	n/a	17.2		
Soil NO3 (lbs.) to SD at Planting			n/a	94	162	51	15	11	65	49	85	n/a	66		
SD (Sampling Depth in Inches)			48	48	48	48	48	48	48	48	48	n/a	48		
Fertilizer Applied	(# N)		70	70	70	70	70	100	100	100	125	100	88		
	(# P2O5)		40	40	40	40	40	20	20	20	20	20	30		
	(# K2O)		25	25	25	25	25	10	10	10	10	10	18		
	(# S)		0	0	0	0	0	0	0	0	10	0	1		

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 selecton 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 sawfly rating of a given entry for years tested, y = average sawfly rating for Mountrail for the same years, and z = 9-Yr average sawfly rating for the check variety Mountrail.

6/ Seeding to 14 days prior to harvest maturity.

TABLE 4. Six-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. 2011-2017. (Exp# 9855-DUR)

2/ VARIETY or SELECTION		No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre) 2013	2014	2015	2016	2017 4/	AVE. for YEARS TESTED 3/	% of CHECK YIELD 5/	**6-YR COMP. AVE. YIELD 6/**	TEST WEIGHT (Pounds Per Bushel) 2013	2014	2015	2016	2017 4/	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 5/	**6-YR COMP. AVE. TEST WT 6/**
D03028	CARPIO (+)	4	47.8	39.0	44.3	47.6		44.7	110.7	**39.6**	62.1	56.7	61.0	61.0		60.2	101.3	**60.2**
YU894-75	ALZADA (P+)	5	52.7	41.1		39.4		37.1	108.4	**38.8**	60.7	56.8		59.3		59.7	100.4	**59.7**
D00095	TIOGA (+)	6	46.2	37.7	44.9	41.3		37.7	105.4	**37.7**	61.9	56.0	61.1	60.9		60.4	101.4	**60.4**
D04581	JOPPA (++)	3		39.4	43.0	37.6		40.0	104.8	**37.5**		56.9	61.1	60.1		59.4	101.4	**59.7**
DT712	STRONGFIELD (+)	5	44.4	40.5	41.8			36.3	103.1	**36.9**	62.0	56.4	60.5			60.1	100.8	**60.1**
MT 03012	SILVER (+)	6	45.2	38.6	39.7	40.4		36.8	102.9	**36.8**	61.6	56.7	60.2	59.4		59.8	100.2	**59.8**
D96604	ALKABO (+)	6	50.0	39.2	39.9	34.7		36.7	102.7	**36.7**	62.4	56.8	61.3	60.6		60.7	101.9	**60.7**
D9715-11	DIVIDE (+)	6	42.5	39.8	38.6	42.2		35.9	100.3	**35.9**	62.0	57.7	60.6	59.9		60.5	101.4	**60.5**
D901313	MOUNTRAIL (+)	6	44.9	34.8	43.2	38.6		35.8	100.0	**35.8**	61.2	56.7	60.4	59.3		59.6	100.0	**59.6**
D97780	GRENORA (+)	6	43.4	39.0	40.2	36.5		35.4	98.9	**35.4**	60.5	56.2	60.5	59.3		59.6	99.9	**59.6**
MEANS (For Entries Listed)			46.3	38.9	41.8	39.8				**37.1**	61.6	56.7	60.7	60.0				**60.0**
7/ Growing Season Precipitation (in.)			9.5	5.6	8.9	7.2	n/a	7.8										
Soil PAW (in.) to SD @ Planting			8.8	8.9	8.2	3.7	n/a	7.6										
Total Plant Available Water (in.)			18.3	14.5	17.2	10.9	n/a	15.2										
Soil NO3 (lbs.) to SD at Planting			34	64	41	25	n/a	41										
SD (Sampling Depth in Inches)			48	48	48	24	n/a	44										
Fertilizer Applied	(# N)		100	100	100	125	125	99										
	(# P_2O_5)		20	20	20	20	20	26										
	(# K_2O)		10	10	10	10	10	14										
	(# S)		0	0	0	10	10	3										

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 selecton decisions.

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

3/ Only the most recent 5 years shown, 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/ 6-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 = 6-Yr average yield or test weight for the check variety Mountrail.

7/ Seeding to 14 days prior to harvest maturity.

TABLE 5. Six-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. 2011-2017. (Exp# 9855-DUR)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems) 2011	2012	2013	2014	2015	2016	2017 3/	AVE. for YEARS TESTED	% of CHECK SWFLY 4/	**6-YR COMP. AVE. SWFLY 5/**
D03028	CARPIO (+)	4			2.3	0.3	0.0	0.0		0.7	26.1	**2.1**
DT712	STRONGFIELD (+)	5	8.3	3.7	0.7	0.3	0.0			2.6	33.0	**2.6**
YU894-75	ALZADA (P+)	5	10.0	5.0	1.0	1.0		0.0		3.4	34.6	**2.7**
D9715-11	DIVIDE (+)	6	13.3	3.7	5.0	0.7	0.0	0.0		3.8	47.9	**3.8**
MT 03012	SILVER (+)	6	15.0	3.7	3.7	1.0	0.0	0.0		3.9	49.4	**3.9**
D04581	JOPPA (+)	3				0.7	0.0	0.0		0.2	66.7	**5.2**
D97780	GRENORA (+)	6	20.0	8.3	6.7	0.3	0.0	0.0		5.9	74.9	**5.9**
D901313	MOUNTRAIL (+)	6	20.0	11.7	7.0	0.7	0.0	0.0		6.6	83.3	**6.6**
D96604	ALKABO (+)	6	23.3	8.3	8.3	1.0	0.0	0.0		6.8	86.8	**6.8**
D00095	TIOGA (+)	6	25.0	10.0	8.3	2.0	0.0	0.0		7.6	96.0	**7.6**
MEANS (For Entries Listed)			16.9	6.8	4.8	0.8	0.0	0.0				**4.7**
6/ Growing Season Precipitation (in.)			n/a	n/a	9.5	5.6	8.9	7.2	n/a	7.8		
Soil PAW (in.) to SD @ Planting			7.1	8.8	8.8	8.9	8.2	3.7	n/a	7.6		
Total Plant Available Water (in.)			n/a	n/a	18.3	14.5	17.2	10.9	n/a	15.2		
Soil NO3 (lbs.) to SD at Planting			50	34	34	64	41	25	n/a	41		
SD (Sampling Depth in Inches)			48	48	48	48	48	24	n/a	44		
Fertilizer Applied	(# N)		70	70	100	100	100	125	125	99		
	(# P2O5)		40	40	20	20	20	20	20	26		
	(# K2O)		25	25	10	10	10	10	10	14		
	(# S)		0	0	0	0	0	10	10	3		

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 selecton decisions.

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

3/ No harvest in 2017 due to hail.

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

5/ 6-Yr Comparable Average = (x/y) * z where x = average sawfly rating of a given entry for years tested, y = sawfly rating for Mountrail for the same years, and z = 6-Yr sawfly rating for the check variety Mountrail.

6/ Seeding to 14 days prior to harvest maturity.

TABLE 6. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Kammerzell Farm, Chester. Northern Agricultural Research Center. Havre, Montana. 2017. (Exp# 17-9853-DUR)

ENTRY	SOURCE	STAND %	PLNT HT Inches	1/ YIELD Bu/Ac	TEST WT Lbs/Bu	2/ PROTEIN %	3/ FN Seconds	4/ SAWFLY %
ALKABO	NDSU	98.0	26.1	27.5	57.9	17.3	336	1.0
ALZADA	WestBred	99.7	25.1	**31.9**	57.7	17.5	**374**	0.3
CARPIO	NDSU	99.0	24.9	26.6	56.9	17.6	343	0.3
DIVIDE	NDSU	98.7	25.6	29.9	58.7	17.3	343	0.0
DYANMIC	CDC	97.4	25.6	28.1	57.1	**18.3**	313	0.0
FORTITUDE	CDC	100.0	26.0	31.3	57.1	**17.9**	338	0.3
GRENORA	NDSU	99.0	27.0	**33.1**	57.0	17.1	341	0.7
JOPPA	NDSU	99.7	28.0	29.9	58.2	16.8	335	0.7
MOUNTRAIL	NDSU	97.7	27.1	**33.9**	56.6	17.3	335	0.0
PRECISION	CDC	99.0	26.0	29.0	**59.5**	**18.0**	352	0.3
TIOGA	NDSU	99.0	28.5	30.7	**59.5**	17.4	346	0.7
VIVID	CDC	98.0	27.4	26.1	57.6	**17.8**	348	0.0
EXPERIMENTAL MEANS		98.8	26.4	29.8	57.8	17.5	342.1	0.4
LSD (0.05)		3.2	1.7	2.6	0.6	0.6	13.8	ns
C.V.%		1.9	3.8	5.1	0.6	2.0	2.4	-
P-VALUE (Varieties)		0.8328	0.0041	<.0001	<.0001	0.0014	<.0001	0.1743

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 (17-9853-DUR)

Seeding Date:	May 9, 2017
Harvest Date:	August 14, 2017
Fertility:	100-20-10 side banded
System:	no till
Herbicide:	none
Insecticide:	none
Previous Crop:	Chemical Fallow - Winter Wheat
Precipitation:	2.75" seeding to harvest maturity

TABLE 7. Four-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. 2014-2017. (Exp# 9853-DUR)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ YIELD (Bushels Per Acre) 2014	2015	2016	2017	AVE. for YEARS TESTED	% of CHECK YIELD 3/	**4-YR COMP. AVE. YIELD 4/**	TEST WEIGHT (Pounds Per Bushel) 2014	2015	2016	2017	AVE. for YEARS TESTED	% of CHECK TEST WT 3/	**4-YR COMP. AVE. TEST WT 4/**
MT 03012	SILVER (+)	3	33.7	24.1	29.0		29.0	111.4	**31.2**	53.7	56.0	50.3		53.3	98.8	**54.0**
YU894-75	ALZADA (P+)	3	35.8		28.3	31.9	32.0	107.0	**29.9**	53.9		50.2	57.7	54.0	99.7	**54.5**
D00095	TIOGA (+)	4	33.0	21.5	27.4	30.7	28.2	100.6	**28.2**	55.0	57.6	52.0	59.5	56.0	102.5	**56.0**
D901313	MOUNTRAIL (+)	4	31.8	22.2	24.0	33.9	28.0	100.0	**28.0**	54.5	56.2	51.3	56.6	54.6	100.0	**54.6**
D04581	JOPPA (+)	4	33.4	22.7	24.4	29.9	27.6	98.6	**27.6**	53.4	57.9	51.3	58.2	55.2	101.0	**55.2**
D9715-11	DIVIDE (+)	4	34.1	20.0	24.9	29.9	27.2	97.3	**27.2**	53.7	57.8	51.6	58.7	55.5	101.5	**55.5**
D97780	GRENORA (+)	4	27.3	21.9	25.4	33.1	26.9	96.1	**26.9**	54.1	57.6	50.6	57.0	54.8	100.4	**54.8**
D96604	ALKABO (+)	4	37.0	21.7	21.3	27.5	26.9	96.1	**26.9**	55.1	57.8	53.2	57.9	56.0	102.5	**56.0**
D03028	CARPIO (+)	4	34.6	19.4	24.6	26.6	26.3	94.0	**26.3**	55.0	56.6	52.8	56.9	55.3	101.2	**55.3**
MEANS (For Entries Listed)			33.4	21.7	25.5	30.5			**28.0**	54.3	57.2	51.5	57.8			**55.1**
5/ Growing Season Precipitation (in.)			n/a	5.0	8.3	2.8	5.3									
Soil PAW (in.) to SD @ Planting			13.7	9.8	n/a	n/a	11.7									
Total Plant Available Water (in.)			n/a	14.8	n/a	n/a	14.8									
Soil NO3 (lbs.) to SD at Planting			257	251	n/a	n/a	254									
SD (Sampling Depth in Inches)			48	48	48	n/a	48									
Fertilizer Applied	(# N)		100	100	125	100	106									
	(# P_2O_5)		20	20	20	20	20									
	(# K_2O)		10	10	10	10	10									
	(# S)		0	0	10	0	3									

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 selecton decisions.

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

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

4/ 4-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 = 4-Yr yield or test weight rating for the check variety Mountrail.

5/ Seeding to 14 days prior to harvest maturity.

TABLE 8. Four-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. 2014-2017. (Exp# 9853-DUR)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems) 2014	2015	2016	2017	AVE. for YEARS TESTED	% of CHECK SWFLY 3/	**4-YR COMP. AVE. SWFLY 4/**
D97780	GRENORA (+)	4	0.3	0.0	0.3	0.7	0.3	6.5	**0.3**
D03028	CARPIO (+)	4	1.0	0.0	0.0	0.3	0.3	6.5	**0.3**
D9715-11	DIVIDE (+)	4	0.7	0.7	0.3	0.0	0.4	8.1	**0.4**
MT 03012	SILVER (+)	3	1.0	0.7	1.0		0.9	12.9	**0.7**
YU894-75	ALZADA (P+)	3	0.3		2.3	0.3	1.0	14.5	**0.8**
D04581	JOPPA (+)	4	2.3	0.3	1.0	0.7	1.1	21.0	**1.1**
D96604	ALKABO (+)	4	2.3	0.3	1.0	1.0	1.2	22.6	**1.2**
D00095	TIOGA (+)	4	1.0	2.0	5.0	0.7	2.2	41.9	**2.2**
D901313	MOUNTRAIL (+)	4	20.0	0.0	0.7	0.0	5.2	100.0	**5.2**
MEANS (For Entries Listed)			3.2	0.5	1.3	0.5			**1.3**
5/ Growing Season Precipitation (in.)			n/a	5.0	8.3	2.8	5.3		
Soil PAW (in.) to SD @ Planting			13.7	9.8	n/a	n/a	11.7		
Total Plant Available Water (in.)			n/a	14.8	n/a	n/a	14.8		
Soil NO3 (lbs.) to SD at Planting			257	251	n/a	n/a	254		
SD (Sampling Depth in Inches)			48	48	48	n/a	48		
Fertilizer Applied	(# N)		100	100	125	100	106		
	(# P_2O_5)		20	20	20	20	20		
	(# K_2O)		10	10	10	10	10		
	(# S)		0	0	10	0	3		

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 selecton decisions.

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

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

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

5/ Seeding to 14 days prior to harvest maturity.