

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

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 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 2014-2018 statewide cereal production totals (42 percent for winter wheat and 27 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 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 2019 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 | S34-T32N-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:

Durum seed yields at Turner averaged just over 39 bu/ac (Table 1). There was a mechanical issue at seeding which resulted in subpar stand establishment and reduced seed yields at this location. 'Mountrail' was the highest yielding entry at over 44 bu/ac. 'Divide', 'Grano', 'Grenora' and 'CDC Precision' along with three Montana State University breeding lines produced seed yields equal to that of Mountrail. Test weights averaged just over 59 lb/bu, while protein averaged 15.4 percent and sawfly cutting was minimal. Plant height, yield, test weight, protein, falling number and sawfly data for the 2019 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 (2010-2019) 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 52 bu/ac (Table 4). Montana State University breeding line 'MTD16007' was the highest yielding entry at nearly 59 bu/ac with, 'Alkabo', Divide, 'CDC Vivid' and three additional breeding lines yielding the same, statistically. 'CDC Dynamic' and 'CDC Fortitude' produced the highest protein at 14.9 and 14.5 percent, respectively. Sawfly cutting was nearly nonexistent in the durum trial at Loring. Plant height, yield, moisture, test weight, protein, falling number and sawfly cutting data, for the 2019 Loring dryland spring durum trial, are summarized in Table 4. Eight-year comparable averages for spring durum seed yield and test weight at Loring are summarized in Table 5, while eight-year comparable averages for sawfly cutting are summarized in Table 6.

Durum seed yields at Chester averaged just under 52 bu/ac, while test weights averaged just over 57 lb/bu (Table 7). 'Alzada' was the highest yielding entry at nearly 61 bu/ac. Grenora was the only other entry to produce a seed yield statistically equal to that of Alzada. Sawfly cutting in the small plot scenario was minimal in 2019, averaging 7.1 percent. Plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2019 Chester dryland spring durum trial are summarized in Table 7. Six-year comparable averages for spring durum seed yield and test weight at Chester are summarized in Table 8, while six-year comparable averages for sawfly cutting are summarized in Table 9.

Summary:

Cropping environments for 2019 started out with an abundance of fall rain and very good soil moisture recharge. The spring growing season was cooler and dryer than average with many crops showing drought stress during early June. Heavy rainfall was spotty during the latter part of June and into early July. Precipitation coupled with prolonged cooler temperatures in July allowed for a longer period of grain fill, resulting in better than anticipated crop yields in several areas. Both Turner and Loring received above average rainfall for June and July, resulting in above average spring crop yields. 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 Loring location was seeded into chemical fallow ground that had been minimally tilled to eliminate potential weed issues. The Chester area started out with excellent recharge soil moisture and received early season precipitation, resulting in great durum stand establishment to set the trial up for high yield potential. The Chester site was seeded into chemical fallow.

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-fifth 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 2019 marking 36 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, Wylee Brown, Eleri Haney, Abbey Morse and Tracey Reed.

TABLE 1. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2019. (Exp# 19-9851-DUR)

ID	SOURCE	PLNT HT Inches	1/	TEST WT Lbs/Bu	2/	3/	4/
			YIELD Bu/Ac		PROTEIN %	FN Seconds	SAWFLY %
ALKABO	NDSU	28.9	40.2	59.7	14.9	432	0.3
ALZADA	WestBred	25.1	31.4	59.8	14.5	539	0.3
CARPIO	NDSU	29.0	39.4	59.0	14.9	508	0.3
DIVIDE	NDSU	27.0	40.7	59.8	15.0	473	0.0
DYNAMIC	CDC	26.3	38.6	58.7	16.3	434	0.0
FORTITUDE	CDC	28.6	39.7	58.5	16.3	528	0.3
GRANO	NDSU	28.2	42.9	59.3	15.3	524	1.0
GRENORA	NDSU	26.9	41.3	59.2	14.9	446	0.3
JOPPA	NDSU	27.8	38.9	59.9	15.2	487	0.7
MOUNTRAIL	NDSU	27.2	44.1	59.1	15.1	557	0.0
PRECISION	CDC	28.8	43.2	59.8	16.0	546	0.0
RIVELAND	NDSU	27.0	36.9	59.5	15.3	506	0.3
TIOGA	NDSU	30.4	39.5	59.2	15.4	386	1.0
VIVID	CDC	27.3	36.4	59.2	15.8	460	0.3
MTD16001	MSU	25.9	35.8	58.7	14.8	448	0.3
MTD16002	MSU	26.7	38.0	59.8	14.8	466	0.0
MTD16004	MSU	25.8	37.3	60.5	14.8	432	0.0
MTD16005	MSU	27.6	36.2	58.4	15.7	626	0.0
MTD16006	MSU	28.1	40.0	59.9	15.1	456	0.3
MTD16007	MSU	27.2	38.1	59.8	15.7	554	0.3
MTD16008	MSU	28.5	41.2	57.4	16.5	536	0.0
MTD16009	MSU	25.4	38.0	55.8	16.1	423	0.7
MTD16010	MSU	27.2	38.3	60.1	15.0	447	0.0
MTD16011	MSU	29.0	42.3	58.4	15.7	476	1.0
EXPERIMENTAL MEANS		27.5	39.1	59.2	15.4	487	0.3
LSD (0.05)		1.6	3.5	0.9	0.5	26.5	0.7
C.V.%		3.6	5.4	0.9	1.9	3.3	-
P-VALUE (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001	0.0207

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 (19-9851-DUR)

Seeding Date: May 3, 2019
 Harvest Date: August 30, 2019
 Fertility: 100-20-10-10 side banded
 System: Till
 Herbicide: Bromac-16oz/ac, Affinity-1oz/ac
 Insecticide: none
 Previous Crop: Chemical Fallow - Durum
 Precipitation: 2.98" 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 Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2010-2019. (Exp# 9851-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)							TEST WEIGHT (Pounds Per Bushel)								
		2015	2016	2017	2018	2019	AVE. for YEARS TESTED 3/	% of CHECK YIELD 4/	9-YR COMP. AVE YIELD 5/	2015	2016	2017	2018	2019	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 4/	9-YR COMP. AVE TEST WT 5/
CDC Precision CDC PRECISION (P+)	3			19.3	43.3	43.2	35.3	111.6	34.9			60.7	61.9	59.8	60.8	101.7	61.1
D03028 CARPIO (+)	6	33.0	43.1	16.9	38.6	39.4	37.9	104.8	32.8	61.2	59.8	59.0	60.8	59.0	60.6	100.2	60.2
D97780 GRE Nora (+)	9	28.8	36.8	17.0	39.2	41.3	32.3	103.1	32.3	62.0	58.3	59.4	61.1	59.2	60.1	100.2	60.1
CDC Dynamic CDC DYNAMIC (P+)	3			20.0	38.1	38.6	32.2	101.9	31.9			59.8	60.0	58.7	59.5	99.5	59.8
CDC Fortitude CDC FORTITUDE (P+)	3			17.5	39.0	39.7	32.1	101.5	31.7			59.3	61.1	58.5	59.6	99.8	59.9
D00095 TIOGA (+)	9	31.6	43.7	17.7	40.8	39.5	31.7	101.4	31.7	62.5	60.3	61.3	62.0	59.2	60.6	101.0	60.6
D901313 MOUNTRAIL (+)	9	30.8	41.7	15.5	35.2	44.1	31.3	100.0	31.3	60.9	59.3	59.7	60.6	59.1	60.0	100.0	60.0
D9715-11 DIVIDE (+)	9	27.8	49.7	15.3	34.4	40.7	30.9	98.9	30.9	61.7	60.1	60.6	61.4	59.8	60.7	101.0	60.7
D96604 ALKABO (+)	9	30.5	36.3	15.9	35.1	40.2	30.3	96.8	30.3	62.3	60.2	60.8	61.5	59.7	61.1	101.8	61.1
CDC Vivid CDC VIVID (P+)	3			16.6	38.2	36.4	30.4	96.2	30.1			60.5	60.7	59.2	60.1	100.6	60.4
D04581 JOPPA (+)	5	30.2	31.0	19.2	39.3	38.9	31.7	94.8	29.7	62.5	59.4	60.0	61.8	59.9	60.8	101.4	60.9
YU894-75 ALZADA (P+)	8		39.3	13.7	33.0	31.4	29.6	94.4	29.5		58.9	60.8	61.1	59.8	60.3	100.6	60.4
MEANS (For Entries Listed)		30.4	40.2	17.0	37.9	39.4			31.4	61.9	59.6	60.2	61.2	59.3			60.4
6/ Growing Season Precipitation (in.)		n/a	8.6	2.3	4.0	3.0	7.5										
Soil PAW (in.) to SD @ Planting		6.3	6.1	n/a	n/a	6.3	7.6										
Total Plant Available Water (in.)		n/a	14.7	n/a	n/a	9.3	16.8										
Soil NO3 (lbs.) to SD at Planting		49	85	n/a	n/a	n/a	63										
SD (Sampling Depth in Inches)		48	48	n/a	n/a	19	44										
Fertilizer Applied																	
	(# N)	100	125	100	100	100	94										
	(# P2O5)	20	20	20	20	20	26										
	(# K2O)	10	10	10	10	10	15										
	(# S)	0	10	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 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. No harvest in 2014 due to hail.

4/ Percent of Mountrail yield or test weight 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 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.

6/ 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 Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2010-2019. (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/
		2010	2011	2012	2013	2014 3/	2015	2016	2017	2018	2019			
CDC Dynamic CDC DYNAMIC (P+)	3								0.0	0.3	0.0	0.1	33.4	3.1
YU894-75 ALZADA (P+)	8	8.3	15.0	16.7	2.3			0.0	0.3	0.3	0.3	5.4	51.2	4.8
D9715-11 DIVIDE (+)	9	18.3	16.7	13.3	0.7			0.0	0.0	0.7	0.7	0.0	5.6	5.6
CDC Precision CDC PRECISION (P+)	3								0.3	0.3	0.0	0.2	66.7	6.3
D00095 TIOGA (+)	9	21.7	23.3	26.7	2.0			0.0	0.0	0.7	0.7	1.0	8.4	8.4
D03028 CARPIO (+)	6				3.7			0.0	0.0	0.0	0.7	0.3	0.8	9.4
D901313 MOUNTRAIL (+)	9	21.7	31.7	26.7	3.7			0.0	0.0	0.3	0.7	0.0	9.4	9.4
CDC Fortitude CDC FORTITUDE (P+)	3								0.0	0.7	0.3	0.3	100.1	9.4
D97780 GRENORA (+)	9	25.0	38.3	21.7	3.7			0.0	0.0	0.0	0.0	0.3	9.9	9.9
D96604 ALKABO (+)	9	21.7	46.7	20.0	7.0			0.0	0.0	0.0	1.0	0.3	10.7	10.7
D04581 JOPPA (+)	5							0.0	0.0	0.3	0.7	0.7	0.3	15.7
CDC Vivid CDC VIVID (P+)	3								0.7	1.0	0.3	0.7	200.2	18.8
MEANS (For Entries Listed)		19.4	28.6	20.8	3.3			0.0	0.0	0.3	0.6	0.3		9.3
6/ Growing Season Precipitation (in.)		10.3	8.3	7.5	n/a	16.4	n/a	8.6	2.3	4.0	3.0	7.5		
Soil PAW (in.) to SD @ Planting		9.0	7.9	8.9	7.8	8.9	6.3	6.1	n/a	n/a	6.3	7.6		
Total Plant Available Water (in.)		19.2	16.2	16.4	n/a	25.2	n/a	14.7	n/a	n/a	9.3	16.8		
Soil NO3 (lbs.) to SD at Planting		162	51	15	11	65	49	85	n/a	n/a	n/a	63		
SD (Sampling Depth in Inches)		48	48	48	48	48	48	48	n/a	n/a	19	44		
Fertilizer Applied (# N)		70	70	70	100	100	100	125	100	100	100	94		
(# P2O5)		40	40	40	20	20	20	20	20	20	20	26		
(# K2O)		25	25	25	10	10	10	10	10	10	10	15		
(# S)		0	0	0	0	0	0	10	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 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 Flansaa-Lumsden Farm, Loring. Northern Agricultural Research Center. Havre, Montana. 2019. (Exp# 19-9855-DUR)

ID	SOURCE	PLNT HT Inches	1/	TEST WT Lbs/Bu	2/	3/	4/
			YIELD Bu/Ac		PROTEIN %	FN Seconds	SAWFLY %
ALKABO	NDSU	30.9	55.8	59.4	13.3	422	0.0
ALZADA	WestBred	24.8	48.2	59.3	13.4	548	0.0
CARPIO	NDSU	30.7	47.2	58.4	14.3	464	0.0
DIVIDE	NDSU	31.8	55.4	58.3	14.0	481	0.0
DYNAMIC	CDC	32.0	51.1	58.1	14.9	447	0.0
FORTITUDE	CDC	29.7	50.0	58.4	14.5	483	0.0
GRANO	NDSU	31.6	51.3	58.9	13.8	485	0.0
GRENORA	NDSU	28.0	50.2	58.1	14.1	426	0.0
JOPPA	NDSU	28.2	47.3	59.4	13.9	414	0.0
MOUNTRAIL	NDSU	30.0	51.4	59.0	13.6	489	0.0
PRECISION	CDC	32.1	52.3	59.0	13.9	499	0.0
RIVELAND	NDSU	32.0	50.1	58.5	14.2	485	0.0
TIOGA	NDSU	30.5	48.7	58.7	14.4	376	0.0
VIVID	CDC	33.1	54.9	59.3	14.1	472	0.0
MTD16001	MSU	28.3	53.7	58.0	13.5	465	0.0
MTD16002	MSU	31.5	51.9	59.0	13.6	492	0.0
MTD16004	MSU	29.7	55.8	59.4	13.4	436	0.0
MTD16005	MSU	30.3	51.0	58.4	14.0	491	0.0
MTD16006	MSU	32.2	49.7	59.5	13.7	421	0.0
MTD16007	MSU	29.5	58.7	59.6	13.3	494	0.0
MTD16008	MSU	32.3	56.4	57.7	13.3	441	0.0
MTD16009	MSU	31.4	51.3	55.3	14.4	467	0.0
MTD16010	MSU	33.7	57.3	58.7	13.4	491	0.0
MTD16011	MSU	31.2	49.4	58.2	13.4	494	0.0
EXPERIMENTAL MEANS		30.6	52.0	58.6	13.8	466	0.0
LSD (0.05)		1.4	5.0	0.5	0.5	28.1	-
C.V.%		2.8	5.8	0.6	2.1	3.7	-
P-VALUE (Varieties)		<.0001	0.0002	<.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 (19-9855-DUR)

Seeding Date: May 3, 2019
 Harvest Date: September 4, 2019
 Fertility: 100-20-10-10 side banded
 System: Minimum Till
 Herbicide: Wild Card- 20oz/ac, Axial- 16.4 oz/ac
 Insecticide: none
 Previous Crop: Chemical Fallow- Spring Wheat
 Precipitation: 8.78" seeding to harvest maturity

TABLE 5. Eight-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. 2011-2019. (Exp# 9855-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)							TEST WEIGHT (Pounds Per Bushel)								
		2015	2016	2017 4/	2018	2019	AVE for YEARS TESTED 3/	% of CHECK YIELD 5/	8-YR COMP. AVE YIELD 6/	2015	2016	2017 4/	2018	2019	AVE for YEARS TESTED 3/	% of CHECK TEST WT 5/	8-YR COMP. AVE TEST WT 6/
D03028 CARPIO (+)	6	44.3	47.6		31.7	47.2	42.9	103.7	39.1	61.0	61.0		61.2	58.4	60.1	100.9	60.2
YU894-75 ALZADA (P+)	7		39.4		31.3	48.2	37.9	102.7	38.7		59.3		61.3	59.3	59.9	100.6	60.0
D00095 TIOGA (+)	8	44.9	41.3		32.4	48.7	38.4	101.9	38.4	61.1	60.9		61.7	58.7	60.4	101.2	60.4
D96604 ALKABO (+)	8	39.9	34.7		29.1	55.8	38.2	101.3	38.2	61.3	60.6		61.9	59.4	60.7	101.8	60.7
D9715-11 DIVIDE (+)	8	38.6	42.2		32.7	55.4	37.9	100.6	37.9	60.6	59.9		61.1	58.3	60.3	101.0	60.3
D901313 MOUNTRAIL (+)	8	43.2	38.6		35.6	51.4	37.7	100.0	37.7	60.4	59.3		60.6	59.0	59.7	100.0	59.7
D97780 GRENORA (+)	8	40.2	36.5		29.9	50.2	36.6	97.0	36.6	60.5	59.3		61.2	58.1	59.6	99.9	59.6
D04581 JOPPA (++)	5	43.0	37.6		27.1	47.3	38.9	95.4	36.0	61.1	60.1		61.9	59.4	59.9	101.1	60.3
MEANS (For Entries Listed)		42.0	39.7		31.2	50.5			37.8	60.8	60.1		61.4	58.8			60.1
7/ Growing Season Precipitation (in.)		8.9	7.2	n/a	n/a	8.8	8.0										
Soil PAW (in.) to SD @ Planting		8.2	3.7	pndg	n/a	6.21	7.4										
Total Plant Available Water (in.)		17.2	10.9	n/a	n/a	15.0	15.2										
Soil NO3 (lbs.) to SD at Planting		41	25	n/a	n/a	n/a	41										
SD (Sampling Depth in Inches)		48	24	n/a	n/a	33.0	42										
Fertilizer Applied	(# N)	100	125	125	100	100	99										
	(# P ₂ O ₅)	20	20	20	20	20	24										
	(# K ₂ O)	10	10	10	10	10	13										
	(# S)	0	10	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/ 8-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 = 8-Yr average yield or test weight for the check variety Mountrail.

7/ Seeding to 14 days prior to harvest maturity.

TABLE 6. Eight-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. 2011-2019. (Exp# 9855-DUR)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems)										8-YR COMP. AVE. SWFLY 5/
			2011	2012	2013	2014	2015	2016	2017 3/	2018	2019	AVE. for YEARS TESTED 6/	
D901313	MOUNTRAIL (+)	8	20.0	11.7	7.0	0.7	0.0	0.0	0.3	0.0	5.0	100.0	5.0
D9715-11	DIVIDE (+)	8	13.3	3.7	5.0	0.7	0.0	0.0	0.0	0.0	2.8	57.1	2.8
D97780	GRENORA (+)	8	20.0	8.3	6.7	0.3	0.0	0.0	0.7	0.0	4.5	90.8	4.5
D96604	ALKABO (+)	8	23.3	8.3	8.3	1.0	0.0	0.0	0.0	0.0	5.1	103.3	5.1
D00095	TIOGA (+)	8	25.0	10.0	8.3	2.0	0.0	0.0	2.0	0.0	5.9	119.3	5.9
YU894-75	ALZADA (P+)	7	10.0	5.0	1.0	1.0	0.0	0.0	0.3	0.0	2.5	43.7	2.2
D03028	CARPIO (+)	6			2.3	0.3	0.0	0.0	0.3	0.0	0.5	37.5	1.9
D04581	JOPPA (+)	5				0.7	0.0	0.0	0.3	0.0	0.2	100.0	5.0
MEANS (For Entries Listed)			18.6	7.8	5.5	0.8	0.0	0.0	0.5	0.0			4.0
6/ Growing Season Precipitation (in.)			n/a	n/a	9.5	5.6	8.9	7.2	n/a	n/a	8.8	8.0	
Soil PAW (in.) to SD @ Planting			7.1	8.8	8.8	8.9	8.2	3.7	pndg	n/a	6.2	7.4	
Total Plant Available Water (in.)			n/a	n/a	18.3	14.5	17.2	10.9	n/a	n/a	15.0	15.2	
Soil NO3 (lbs.) to SD at Planting			50	34	34	64	41	25	n/a	n/a	n/a	41	
SD (Sampling Depth in Inches)			48	48	48	48	48	24	n/a	n/a	33	42	
Fertilizer Applied													
			(# N)	70	70	100	100	100	125	125	100	100	99
			(# P2O5)	40	40	20	20	20	20	20	20	20	24
			(# K2O)	25	25	10	10	10	10	10	10	10	13
			(# S)	0	0	0	0	0	10	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/ 8-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 = 8-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. 2019. (Exp# 19-9853-DUR)

ENTRY	SOURCE	PLNT HT Inches	1/	TEST WT Lbs/Bu	2/	3/	4/
			YIELD Bu/Ac		PROTEIN %	FN Seconds	SAWFLY %
ALKABO	NDSU	36.0	54.9	59.0	15.7	473	11.7
ALZADA	WestBred	31.5	60.7	58.8	15.7	568	2.3
CARPIO	NDSU	37.0	48.3	57.1	16.6	461	6.7
DIVIDE	NDSU	38.0	52.0	58.4	15.8	460	5.0
DYNAMIC	CDC	37.4	54.0	56.8	18.1	426	1.0
FORTITUDE	CDC	36.1	53.2	56.9	17.1	462	5.3
GRANO	NDSU	37.2	49.8	57.3	16.4	467	6.7
GRENORA	NDSU	33.3	57.1	58.3	15.7	494	7.0
JOPPA	NDSU	37.8	51.0	58.4	16.1	448	13.3
MOUNTRAIL	NDSU	38.2	53.6	57.7	15.8	479	11.7
PRECISION	CDC	37.2	51.1	57.6	17.2	518	5.0
RIVELAND	NDSU	38.4	50.8	57.0	16.7	481	11.7
TIOGA	NDSU	38.6	54.3	57.7	16.7	489	10.0
VIVID	CDC	36.9	49.8	57.0	17.3	442	5.0
MTD16001	MSU	37.5	55.1	57.6	15.7	460	2.3
MTD16002	MSU	38.7	54.0	57.0	16.1	481	1.0
MTD16004	MSU	35.6	53.1	58.7	15.8	439	7.0
MTD16005	MSU	38.1	51.3	56.6	16.9	480	3.7
MTD16006	MSU	39.6	49.5	58.0	16.1	437	6.7
MTD16007	MSU	36.7	52.2	58.0	16.3	455	11.7
MTD16008	MSU	38.3	40.5	54.6	17.2	384	8.3
MTD16009	MSU	38.2	51.0	53.8	16.9	444	6.7
MTD16010	MSU	37.8	45.6	57.8	16.4	469	10.0
MTD16011	MSU	36.9	51.6	57.1	16.3	463	10.0
EXPERIMENTAL MEANS		37.1	51.9	57.4	16.4	466	7.1
LSD (0.05)		1.7	4.7	0.8	0.5	26.0	5.0
C.V.%		2.8	5.5	0.9	2.0	3.4	42.8
P-VALUE (Varieties)		<.0001	<.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 (19-9853-DUR)

Seeding Date: April 26, 2019
 Harvest Date: August 29, 2019
 Fertility: 100-20-10 side banded
 System: no till
 Herbicide: none
 Insecticide: none
 Previous Crop: Chemical Fallow - Spring Wheat
 Precipitation: n/a

TABLE 8. Six-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. 2014-2019. (Exp# 9853-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED	1/ YIELD (Bushels Per Acre)									TEST WEIGHT (Pounds Per Bushel)								
		2014	2015	2016	2017	2018	2019	AVE. for YEARS TESTED	% of CHECK YIELD 3/	6-YR COMP. AVE. YIELD 4/	2014	2015	2016	2017	2018	2019	AVE. for YEARS TESTED	% of CHECK TEST WT 3/	6-YR COMP. TEST WT 4/
YU894-75 ALZADA (P+)	5	35.8		28.3	31.9	33.9	60.7	38.1	109.9	35.8	53.9		50.2	57.7	54.4	58.8	55.0	100.0	55.2
D00095 TIOGA (+)	6	33.0	21.5	27.4	30.7	30.9	54.3	33.0	101.2	33.0	55.0	57.6	52.0	59.5	57.2	57.7	56.5	102.3	56.5
D901313 MOUNTRAIL (+)	6	31.8	22.2	24.0	33.9	30.0	53.6	32.6	100.0	32.6	54.5	56.2	51.3	56.6	55.0	57.7	55.2	100.0	55.2
D97780 GRENORA (+)	6	27.3	21.9	25.4	33.1	29.6	57.1	32.4	99.4	32.4	54.1	57.6	50.6	57.0	56.0	58.3	55.6	100.7	55.6
D96604 ALKABO (+)	6	37.0	21.7	21.3	27.5	30.1	54.9	32.1	98.4	32.1	55.1	57.8	53.2	57.9	57.1	59.0	56.7	102.6	56.7
CDC Precision CDC PRECISION (P+)	3				29.0	34.8	51.1	38.3	97.7	31.8				59.5	58.0	57.6	58.3	103.3	57.1
CDC Fortitude CDC FORTITUDE (P+)	3				31.3	29.6	53.2	38.0	97.0	31.6				57.1	55.8	56.9	56.6	100.3	55.4
D9715-11 DIVIDE (+)	6	34.1	20.0	24.9	29.9	28.4	52.0	31.5	96.8	31.5	53.7	57.8	51.6	58.7	57.8	58.4	56.4	102.0	56.4
D04581 JOPPA (+)	6	33.4	22.7	24.4	29.9	24.7	51.0	31.0	95.2	31.0	53.4	57.9	51.3	58.2	56.4	58.4	55.9	101.3	55.9
CDC Dynamic CDC DYNAMIC (P+)	3				28.1	27.3	54.0	36.5	93.1	30.3				57.1	55.9	56.8	56.6	100.2	55.3
D03028 CARPIO (+)	6	34.6	19.4	24.6	26.6	27.0	48.3	30.1	92.3	30.1	55.0	56.6	52.8	56.9	55.3	57.1	55.6	100.7	55.6
CDC Vivid CDC VIVID (P+)	3				26.1	31.0	49.8	35.6	90.9	29.6				57.6	56.8	57.0	57.2	101.2	55.9
MEANS (For Entries Listed)		33.4	21.3	25.0	29.8	29.8	53.4			31.8	54.3	57.4	51.6	57.8	56.3	57.8			55.9
5/ Growing Season Precipitation (in.)		n/a	5.0	8.3	2.8	n/a	n/a	5.3											
Soil PAW (in.) to SD @ Planting		13.7	9.8	n/a	n/a	n/a	n/a	11.7											
Total Plant Available Water (in.)		n/a	14.8	n/a	n/a	n/a	n/a	14.8											
Soil NO3 (lbs.) to SD at Planting		257	251	n/a	n/a	n/a	n/a	254											
SD (Sampling Depth in Inches)		48	48	48	n/a	n/a	n/a	48											
Fertilizer Applied	(# N)	100	100	125	100	100	100	104											
	(# P ₂ O ₅)	20	20	20	20	20	20	20											
	(# K ₂ O)	10	10	10	10	10	10	10											
	(# S)	0	0	10	0	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 yield or test weight for the same data years as those in which a given entry was tested.

4/ 6-Yr Comparable Average = (x/y) * z where x = average yield or test weight rating for Mountrail for the same years, and z = 6-Yr saw fly rating for the check variety Mountrail.

5/ Seeding to 14 days prior to harvest maturity.

TABLE 9. Six-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. 2014-2019. (Exp# 9853-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems)								6-YR COMP. AVE. SWFLY 4/
		2014	2015	2016	2017	2018	2019	AVE. for YEARS TESTED	% of CHECK SWFLY 3/	
CDC Dynamic CDC DYNAMIC (P+)	3				0.0	0.0	1.0	0.3	8.2	0.4
YU894-75 ALZADA (P+)	5	0.3		2.3	0.3	1.8	2.3	1.4	21.8	1.2
D9715-11 DIVIDE (+)	6	0.7	0.7	0.3	0.0	0.5	5.0	1.2	21.8	1.2
D03028 CARPIO (+)	6	1.0	0.0	0.0	0.3	0.3	6.7	1.4	25.4	1.4
D97780 GRENORA (+)	6	0.3	0.0	0.3	0.7	0.3	7.0	1.4	26.4	1.4
CDC Vivid CDC VIVID (P+)	3				0.0	0.3	5.0	1.8	43.8	2.4
CDC Precision CDC PRECISION (P+)	3				0.3	0.2	5.0	1.8	45.2	2.5
CDC Fortitude CDC FORTITUDE (P+)	3				0.3	0.2	5.3	1.9	47.9	2.6
D96604 ALKABO (+)	6	2.3	0.3	1.0	1.0	0.5	11.7	2.8	51.3	2.8
D04581 JOPPA (+)	6	2.3	0.3	1.0	0.7	0.7	13.3	3.1	55.8	3.1
D00095 TIOGA (+)	6	1.0	2.0	5.0	0.7	0.2	10.0	3.1	57.4	3.1
D901313 MOUNTRAIL (+)	6	20.0	0.0	0.7	0.0	0.5	11.7	5.5	100.0	5.5
MEANS (For Entries Listed)		3.5	0.5	1.3	0.4	0.5	7.0			2.3
5/ Growing Season Precipitation (in.)		n/a	5.0	8.3	2.8	n/a	n/a	5.3		
Soil PAW (in.) to SD @ Planting		13.7	9.8	n/a	n/a	n/a	n/a	11.7		
Total Plant Available Water (in.)		n/a	14.8	n/a	n/a	n/a	n/a	14.8		
Soil NO3 (lbs.) to SD at Planting		257	251	n/a	n/a	n/a	n/a	254		
SD (Sampling Depth in Inches)		48	48	48	n/a	n/a	n/a	48		
Fertilizer Applied	(# N)	100	100	125	100	100	100	104		
	(# P ₂ O ₅)	20	20	20	20	20	20	20		
	(# K ₂ O)	10	10	10	10	10	10	10		
	(# S)	0	0	10	0	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/ 6-Yr Comparable Average = (x/y) * z w here x = average saw fly rating of a given entry for years tested, y = saw fly rating for Mountrail for the same years, and z = 6-Yr saw fly rating for the check variety Mountrail.

5/ Seeding to 14 days prior to harvest maturity.