

Title: Northcentral 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, and durum production together in the five counties (Blaine, Chouteau, Hill, Liberty, and Phillips), represents nearly 29 percent of the 2017-2021 statewide cereal production totals (43 percent for winter wheat, 28 percent for spring wheat, 22 percent for barley and 5 percent for durum). 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 northcentral 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 2022 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-R5E |

All three durum trials consisted of 15 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' small 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 seed 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 34 bu/ac (Table 1). 'CDC Vivid' was the highest yielding entry at just over 38 bu/ac. 'Alzada' (36.9 bu/ac) and two promising MSU breeding lines were the only other entries to produce yields statistically equal to that of CDC Vivid. Test weights averaged just under 60 lb/bu, with the 2022 MSU release, 'MT Raska' being the heaviest at 61.2 lb/bu. Protein averaged 14.8 percent and sawfly cutting was minimal. Plant height, yield, test weight, protein, falling number and sawfly data for the 2022 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 (2013-2022) for durum seed yield and test weight at Turner are summarized in Table 2, while nine-year comparable averages for protein content and wheat stem sawfly cutting are summarized in Table 3. Based on the comparable average calculations, 'Carpio', 'ND-Grano' and 'Tioga' are the highest yielding varieties at Turner.

Loring spring durum yields averaged just under 24 bu/ac (Table 4). North Dakota State University release, Tioga, was the highest yielding entry at just under 28 bu/ac with 'Mountrail' and 2022 Montana State University releases 'MT Blackbeard' and 'MT Raska' yielding the same, statistically. 'Lustre' produced the highest protein at 14.8 percent, while the trial average was just over 14 percent. Sawfly cutting was minimal in the durum trial at Loring. Plant height, yield, moisture, test weight, protein, falling number and sawfly cutting data, for the 2022 Loring dryland spring durum trial, are summarized in Table 4. Nine-year comparable averages for spring durum seed yield and test weight at Loring are summarized in Table 5, while nine-year comparable averages for protein content and wheat stem sawfly cutting are summarized in Table 6. Based on the comparable average calculations, Carpio is the highest yielding variety at Loring.

Durum seed yields at Chester averaged just over 25 bu/ac, while test weights averaged just under 56 lb/bu (Table 7). Montana State University breeding line 'MTD18172' was the highest yielding entry at just under 30 bu/ac, with Mountrail and the 2022 MSU release MT Raska yielding the same, statistically. Sawfly cutting in the small plot scenario was nearly non-existent in 2022. Plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2022 Chester dryland spring durum trial are summarized in Table 7. Nine-year comparable averages for spring durum seed yield and test weight at Chester are summarized in Table 8, while nine-year comparable averages for protein content and sawfly cutting are summarized in Table 9. Based on the comparable average calculations, Alzada is the highest yielding variety at Chester.

Summary:

Cropping environments for 2022 started out cooler and drier than average with very few meaningful rain events from March through May. During the first week of June, over an inch of precipitation was received in many areas across northcentral Montana, resulting in better than anticipated spring crop yields. The month of June through mid-July was cooler than average, giving crops time to head, flower and mature prior to being hit with high temperatures typical of the season. Overall lack of precipitation kept the majority of northcentral Montana in a severe to extreme drought throughout 2022, which resulted in reduced seed yields and low test weights. In comparison to other trial sites, Turner received significantly more rainfall events throughout the season, which is reflected in the spring wheat and durum seed yields. The Turner and Chester sites were all seeded into chemical fallow and the Loring location was seeded into chemical fallow ground that had been minimally tilled to eliminate potential weed issues.

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-eighth 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 2022 marking 39 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:
Tracy Gorecki, Cleta Lamb, Kyla McNamara, Teresa Miller, and Emily Tripp.

TABLE 1. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2022. (Exp# 22-9851-DUR)

ID	SOURCE	PLNT HT Inches	1/	TEST WT Lbs/Bu	2/	3/	4/
			YIELD Bu/Ac		PROTEIN %	FN Seconds	SAWFLY %
Alzada	Westbred	24.0	36.9	59.6	14.5	485.9	1.0
Carpio	NDSU	24.8	32.4	59.5	14.3	419.5	5.0
CDC-Vivid	CDC	24.8	38.1	60.1	15.3	435.6	0.7
Divide	NDSU	25.2	32.8	59.7	14.6	416.3	1.0
Grenora	NDSU	23.7	35.5	59.8	14.6	443.5	3.7
Joppa	NDSU	23.9	30.7	60.5	14.5	422.0	2.3
Lustre	MSU	25.5	30.5	58.5	15.1	437.5	1.0
Mountrail	NDSU	24.6	34.2	58.9	14.8	417.6	5.3
MT Blackbeard	MSU	25.6	34.3	59.9	14.4	448.2	2.3
MT Raska	MSU	19.8	30.6	61.2	15.4	453.8	0.0
ND-Grano	NDSU	25.0	33.8	60.3	14.5	430.6	3.7
ND-Riveland	NDSU	26.9	32.8	59.3	14.6	446.2	3.7
Tioga	NDSU	26.4	34.1	59.6	14.5	430.5	6.7
MTD18148	MSU	20.6	36.5	60.4	14.9	469.7	0.7
MTD18172	MSU	23.0	36.4	60.4	15.3	402.6	2.3
EXPERIMENTAL MEANS		24.2	34.0	59.8	14.8	437.3	2.6
LSD (0.05)		1.5	2.2	0.5	0.4	20.7	3.5
C.V.%		3.7	3.8	0.5	1.8	2.8	79.4
P-VALUE (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001	0.0113

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 (22-9851-DUR)

Seeding Date: May 3, 2022
 Harvest Date: August 18, 2022
 Fertility: 46-9-5-5 side banded
 System: No Till
 Herbicide: Vendetta (20 oz/ac), Discover (12.8 oz/ac)
 Insecticide: none
 Previous Crop: Chemical Fallow - Winter Wheat
 Precipitation: 5.22" seeding to harvest maturity

* Precip from NOAA website

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. 2013-2022. (Exp# 9851-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)								TEST WEIGHT (Pounds Per Bushel)							
		2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK YIELD 4/	9-YR COMP. AVE YIELD 5/	2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK TEST WT 4/	9-YR COMP. AVE TEST WT 5/
D03028 CARPIO (+)	9	38.6	39.4	44.1	14.0	32.4	35.3	105.3	35.3	60.8	59.0	57.7	57.3	59.5	59.8	100.4	59.8
NDSU ND-GRANO (+)	4		42.9	44.4	13.6	33.8	33.7	104.6	35.0		59.3	58.7	59.1	60.3	59.4	102.2	60.9
D00095 TIOGA (+)	9	40.8	39.5	40.8	12.3	34.1	35.0	104.3	35.0	62.0	59.2	58.2	58.8	59.6	60.7	101.9	60.7
NDSU ND-RIVELAND (+)	4		36.9	45.3	15.2	32.8	32.6	101.1	33.9		59.5	58.1	58.6	59.3	58.9	101.4	60.4
CDC Vivid CDC VIVID (P+)	6	38.2	36.4	38.7	12.5	38.1	30.1	100.6	33.7	60.7	59.2	57.8	58.6	60.1	59.5	101.2	60.3
D97780 GRENORA (+)	9	39.2	41.3	44.8	6.2	35.5	33.7	100.5	33.7	61.1	59.2	58.6	55.7	59.8	59.8	100.4	59.8
D9715-11 DIVIDE (+)	9	34.4	40.7	40.4	11.3	32.8	33.6	100.4	33.6	61.4	59.8	58.6	57.1	59.7	60.4	101.3	60.4
D901313 MOUNTRAIL (+)	9	35.2	44.1	43.9	6.7	34.2	33.5	100.0	33.5	60.6	59.1	58.1	56.1	58.9	59.6	100.0	59.6
D04581 JOPPA (+)	8	39.3	38.9	44.2	12.0	30.7	30.7	97.4	32.6	61.8	59.9	58.7	58.3	60.5	60.2	101.8	60.7
MTD16005 LUSTRE (+)	5	37.6	36.2	43.0	9.9	30.5	31.4	95.8	32.1	60.3	58.4	57.0	56.0	58.5	58.0	99.1	59.0
YU894-75 ALZADA (P+)	7	33.0	31.4	45.6		36.9	35.3	93.7	31.4	61.1	59.8	57.5		59.6	60.2	100.5	59.9
MEANS (For Entries Listed)		37.4	38.9	43.2	11.4	33.8			33.6	61.1	59.3	58.1	57.6	59.6			60.1
6/ Growing Season Precipitation (in.)		4.0	3.0	5.5	3.5	5.2	6.1										
Soil PAW (in.) to SD @ Planting		n/a	6.3	n/a	n/a	n/a	7.1										
Total Plant Available Water (in.)		n/a	9.3	n/a	n/a	n/a	16.4										
Soil NO3 (lbs.) to SD at Planting		n/a	n/a	n/a	n/a	n/a	52										
SD (Sampling Depth in Inches)		n/a	19	n/a	n/a	n/a	42										
Fertilizer Applied	(# N)	100	100	100	100	46	97										
	(# P2O5)	20	20	20	20	9	19										
	(# K2O)	10	10	10	10	5	10										
	(# S)	10	10	10	10	5	6										

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.

TABLE 3. Nine-Year Protein and 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. 2013-2022. (Exp# 9851-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ PROTEIN % (Adjusted to 13% grain moisture)					SAWFLY RATING (% of cut and lodged stems)										
		2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK PROTEIN 4/	9-YR COMP. AVE PROTEIN 5/	2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK SAWFLY 4/	9-YR COMP. AVE SAWFLY 5/
D9715-11 DIVIDE (+)	9	16.4	15.0	15.6	16.1	14.6	15.4	99.7	15.4	0.7	0.0	0.7	1.0	1.0	0.5	42.4	0.5
YU894-75 ALZADA (P+)	7	16.1	14.5	15.1		14.5	15.0	98.6	15.2	0.3	0.3	0.3		1.0	0.7	43.7	0.5
MTD16005 LUSTRE (+)	5	16.6	15.7	16.4	16.8	15.1	16.1	102.7	15.8	0.3	0.0	1.0	2.3	1.0	0.9	66.7	0.8
CDC Vivid CDC VIVID (P+)	6	16.6	15.8	16.7	16.4	15.3	16.3	103.1	15.9	1.0	0.3	0.7	2.3	0.7	0.9	77.3	0.9
D97780 GRENORA (+)	9	16.0	14.9	15.2	16.0	14.6	15.2	98.6	15.2	0.0	0.3	0.7	0.7	3.7	1.0	81.8	1.0
D04581 JOPPA (+)	8	16.2	15.2	15.2	15.9	14.5	15.2	98.9	15.2	0.7	0.7	0.3	2.3	2.3	0.8	90.9	1.1
D901313 MOUNTRAIL (+)	9	16.0	15.1	15.1	17.4	14.8	15.4	100.0	15.4	0.7	0.0	0.7	0.3	5.3	1.2	100.0	1.2
NDSU ND-GRANO (+)	4		15.3	15.6	16.0	14.5	15.4	98.2	15.1		1.0	1.0	0.7	3.7	1.6	100.0	1.2
D03028 CARPIO (+)	9	15.6	14.9	15.3	15.8	14.3	15.0	97.4	15.0	0.7	0.3	0.7	1.0	5.0	1.3	103.0	1.3
NDSU ND-RIVELAND (+)	4		15.3	16.0	15.5	14.6	15.4	98.3	15.1		0.3	0.7	2.3	3.7	1.8	110.5	1.4
D00095 TIOGA (+)	9	16.0	15.4	15.5	16.1	14.5	15.4	99.7	15.4	0.7	1.0	0.3	2.3	6.7	1.5	124.3	1.5
MEANS (For Entries Listed)		16.2	15.2	15.6	16.2	14.7			15.3	0.6	0.4	0.6	1.5	3.1			1.0
6/ Growing Season Precipitation (in.)		4.0	3.0	5.5	3.5	5.2	6.1										
Soil PAW (in.) to SD @ Planting		n/a	6.3	n/a	n/a	n/a	7.1										
Total Plant Available Water (in.)		n/a	9.3	n/a	n/a	n/a	16.4										
Soil NO3 (lbs.) to SD at Planting		n/a	n/a	n/a	n/a	n/a	52										
SD (Sampling Depth in Inches)		n/a	19	n/a	n/a	n/a	42										
Fertilizer Applied	(# N)	100	100	100	100	46	97										
	(# P2O5)	20	20	20	20	9	19										
	(# K2O)	10	10	10	10	5	10										
	(# S)	10	10	10	10	5	6										

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 protein or saw fly rating 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 protein or saw fly rating of a given entry for years tested, y = average protein or saw fly rating for Mountrail for the same years, and z = 9-Yr average protein or saw fly rating for the check variety Mountrail.

6/ Seeding to 14 days prior to harvest.

TABLE 4. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Flansaas-Lumsden Farm, Loring. Northern Agricultural Research Center. Havre, Montana. 2022. (Exp# 22-9855-DUR)

ID	SOURCE	PLNT HT Inches	1/	TEST WT Lbs/Bu	2/	3/	4/
			YIELD Bu/Ac		PROTEIN %	FN Seconds	SAWFLY %
Alzada	Westbred	21.1	25.8	59.1	13.8	484.9	1.0
Carpio	NDSU	23.5	22.9	59.1	14.1	427.3	5.0
CDC-Vivid	CDC	24.3	21.0	59.1	14.5	413.1	1.0
Divide	NDSU	25.5	22.8	59.2	14.1	411.3	3.7
Grenora	NDSU	23.7	21.6	59.2	13.9	424.6	3.7
Joppa	NDSU	25.2	22.7	59.8	13.9	416.7	8.3
Lustre	MSU	24.5	21.6	57.6	14.8	431.4	5.0
Mountrail	NDSU	25.0	26.0	58.4	14.1	397.1	3.7
MT Blackbeard	MSU	25.3	26.1	59.6	14.0	459.6	1.0
MT Raska	MSU	20.8	25.0	60.6	14.0	412.4	0.7
ND-Grano	NDSU	24.0	20.5	59.5	14.3	416.6	5.3
ND-Riveland	NDSU	25.4	22.8	59.3	13.8	430.7	3.7
Tioga	NDSU	26.5	22.7	60.0	14.4	421.6	10.0
MTD18148	MSU	19.6	23.9	59.6	13.6	476.0	1.0
MTD18172	MSU	25.2	27.9	60.1	14.6	401.0	5.0
EXPERIMENTAL MEANS		24.0	23.6	59.3	14.1	428.3	3.9
LSD (0.05)		1.4	3.3	0.7	0.3	17.4	3.2
C.V.%		3.5	8.3	0.7	1.2	2.4	48.8
P-VALUE (Varieties)		<.0001	0.0019	<.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 (22-9855-DUR)

Seeding Date:	May 3, 2022
Harvest Date:	August 18, 2022
Fertility:	46-9-5-5 side banded
System:	Minimum Till
Herbicide:	OpenSky (16 oz/ac)
Insecticide:	Roundhouse (4 oz/ac)
Previous Crop:	Chemical Fallow - Spring Wheat
Precipitation:	2.62" seeding to harvest maturity

TABLE 5. Nine-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. 2013-2022. (Exp# 9855-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)							TEST WEIGHT (Pounds Per Bushel)								
		2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK YIELD 4/	9-YR COMP. AVE YIELD 5/	2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK TEST WT 4/	9-YR COMP. AVE TEST WT 5/
D03028 CARPIO (+)	9	31.7	47.2	48.3	27.0	22.9	39.5	102.5	39.5	61.2	58.4	60.4	58.7	59.1	59.8	100.8	59.8
NDSU ND-GRANO (+)	4		51.3	52.5	27.3	20.5	37.9	100.9	38.9		58.9	61.2	59.8	59.5	59.9	101.0	59.6
D901313 MOUNTRAIL (+)	9	35.6	51.4	46.3	26.6	26.0	38.6	100.0	38.6	60.6	59.0	60.4	58.4	58.4	59.4	100.0	59.4
YU894-75 ALZADA (P+)	7	31.3	48.2	38.8		25.8	39.6	100.0	38.6	61.3	59.3	60.3		59.1	59.5	100.1	59.4
NDSU ND-RIVELAND (+)	4		50.1	52.3	24.8	22.8	37.5	99.8	38.5		58.5	60.5	59.1	59.3	59.4	100.2	59.1
D00095 TIOGA (+)	9	32.4	48.7	46.7	25.5	22.7	38.5	99.7	38.5	61.7	58.7	61.1	59.6	60.0	60.1	101.2	60.1
D9715-11 DIVIDE (+)	9	32.7	55.4	41.0	22.9	22.8	37.6	97.3	37.6	61.1	58.3	60.0	59.6	59.2	59.8	100.7	59.8
CDC Vivid CDC VIVID (P+)	5	32.8	54.9	45.8	23.9	21.0	35.7	96.0	37.1	61.5	59.3	60.0	59.5	59.1	59.9	100.9	59.9
D04581 JOPPA (+)	8	27.1	47.3	46.8	24.7	22.7	36.1	95.4	36.8	61.9	59.4	61.2	59.9	59.8	60.1	101.5	60.3
D97780 GRENORA (+)	9	29.9	50.2	43.2	26.3	21.6	36.7	95.1	36.7	61.2	58.1	60.5	58.9	59.2	59.4	100.0	59.4
MTD16005 LUSTRE (+)	5	32.0	51.0	42.6	24.1	21.6	34.3	92.2	35.6	60.4	58.4	59.2	58.0	57.6	58.7	98.9	58.8
MEANS (For Entries Listed)		31.7	50.5	45.9	25.3	22.8			37.8	61.2	58.8	60.4	59.2	59.1			59.6
6/ Growing Season Precipitation (in.)		n/a	8.8	n/a	5.8	2.6	6.9										
Soil PAW (in.) to SD @ Planting		n/a	6.2	8.9	8.63	7.4	7.6										
Total Plant Available Water (in.)		n/a	15.0	n/a	14.4	10.0	14.3										
Soil NO3 (lbs.) to SD at Planting		n/a	n/a	23	36	62	41										
SD (Sampling Depth in Inches)		n/a	33	48	48	44	43										
Fertilizer Applied	(# N)	100	100	100	100	46	100										
	(# P ₂ O ₅)	20	20	20	20	9	19										
	(# K ₂ O)	10	10	10	10	5	10										
	(# S)	10	10	10	10	5	7										

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. No harvest in 2017 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.

TABLE 6. Nine-Year Protein and 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. 2013-2022. (Exp# 9855-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ PROTEIN % (Adjusted to 13% grain moisture)					SAWFLY RATING (% of cut and lodged stems)										
		2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK PROTEIN 4/	9-YR COMP. AVE PROTEIN 5/	2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK SAWFLY 4/	9-YR COMP. AVE SAWFLY 5/
YU894-75 ALZADA (P+)	7	15.6	13.4	15.2		13.8	14.9	99.3	14.9	0.3	0.0	0.7		1.0	0.6	31.6	0.5
D03028 CARPIO (+)	9	15.0	14.3	14.4	15.5	14.1	14.8	98.3	14.8	0.3	0.0	0.7	1.0	5.0	1.1	64.4	1.1
NDSU ND-RIVELAND (+)	4		14.2	14.3	16.0	13.8	14.6	98.7	14.8		0.0	0.7	1.0	3.7	1.3	76.2	1.3
D901313 MOUNTRAIL (+)	9	15.6	13.6	15.1	16.2	14.1	15.0	100.0	15.0	0.3	0.0	1.0	2.3	3.7	1.7	100.0	1.7
NDSU ND-GRANO (+)	4		13.8	14.6	16.3	14.3	14.8	100.1	15.0		0.0	0.3	2.3	5.3	2.0	114.3	1.9
D9715-11 DIVIDE (+)	9	15.7	14.0	15.4	16.0	14.1	15.2	101.3	15.2	0.0	0.0	0.3	8.3	3.7	2.0	120.0	2.0
MTD16005 LUSTRE (+)	5	16.3	14.0	15.3	16.3	14.8	15.4	103.0	15.5	0.3	0.0	0.3	3.7	5.0	1.9	127.2	2.1
D97780 GRE Nora (+)	9	15.9	14.1	15.0	15.6	13.9	15.0	100.1	15.0	0.7	0.0	0.7	8.3	3.7	2.3	135.5	2.3
CDC Vivid CDC VIVID (P+)	5	15.9	14.1	15.2	16.9	14.5	15.3	102.6	15.4	0.7	0.0	0.3	8.3	1.0	2.1	140.9	2.3
D04581 JOPPA (+)	8	16.3	13.9	14.2	15.9	13.9	14.8	99.2	14.9	0.3	0.0	0.7	2.3	8.3	1.5	154.2	2.6
D00095 TIOGA (+)	9	16.2	14.4	14.7	16.1	14.4	15.4	102.9	15.4	2.0	0.0	0.7	2.3	10.0	2.8	168.9	2.8
MEANS (For Entries Listed)		15.8	14.0	14.8	16.1	14.2			15.1	0.6	0.0	0.6	4.0	4.6			1.9
6/ Growing Season Precipitation (in.)		n/a	8.8	n/a	5.8	2.6	6.9										
Soil PAW (in.) to SD @ Planting		n/a	6.2	8.9	8.63	7.4	7.6										
Total Plant Available Water (in.)		n/a	15.0	n/a	14.4	10.0	14.3										
Soil NO3 (lbs.) to SD at Planting		n/a	n/a	23	36	62	41										
SD (Sampling Depth in Inches)		n/a	33	48	48	44	43										
Fertilizer Applied	(# N)	100	100	100	100	46	100										
	(# P ₂ O ₅)	20	20	20	20	9	19										
	(# K ₂ O)	10	10	10	10	5	10										
	(# S)	10	10	10	10	5	7										

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. No harvest in 2017 due to hail.
 4/ Percent of Mountrail protein or saw fly rating 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 protein or saw fly rating of a given entry for years tested, y = average protein or saw fly rating for Mountrail for the same years, and z = 9-Yr average protein or saw fly rating for the check variety Mountrail.
 6/ Seeding to 14 days prior to harvest.

TABLE 7. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Kammerzell Farm, Chester. Northern Agricultural Research Center. Havre, Montana. 2022. (Exp# 22-9853-DUR)

ENTRY	SOURCE	PLNT HT Inches	1/	TEST WT Lbs/Bu	2/	3/	4/
			YIELD Bu/Ac		PROTEIN %	FN Seconds	SAWFLY %
Alzada	Westbred	21.8	25.3	56.9	16.5	515.5	0.7
Carpio	NDSU	24.6	23.2	55.2	17.1	368.8	0.7
CDC-Vivid	CDC	24.8	22.0	55.4	18.3	417.2	1.0
Divide	NDSU	23.9	25.9	56.9	16.9	376.5	0.0
Grenora	NDSU	22.6	24.7	55.7	16.9	415.1	0.7
Joppa	NDSU	25.0	24.8	56.5	16.9	370.6	0.7
Lustre	MSU	24.4	21.8	54.5	18.2	357.2	0.7
Mountrail	NDSU	23.5	27.9	55.7	16.8	435.8	0.7
MT Blackbeard	MSU	26.0	25.7	54.7	16.8	470.6	0.0
MT Raska	MSU	21.1	28.0	57.9	17.3	396.9	0.3
ND-Grano	NDSU	24.0	26.3	55.2	17.8	401.7	1.0
ND-Riveland	NDSU	26.1	27.1	55.5	17.1	454.1	0.3
Tioga	NDSU	26.5	22.1	55.4	17.6	439.5	0.7
MTD18148	MSU	20.8	26.5	55.6	17.2	502.5	0.3
MTD18172	MSU	24.5	29.7	57.0	17.7	426.9	0.3
EXPERIMENTAL MEANS		24.0	25.4	55.9	17.3	423.2	0.5
LSD (0.05)		1.7	2.2	0.7	0.3	24.5	0.8
C.V.%		4.2	5.2	0.8	1.2	3.5	93.3
P-VALUE (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001	0.3874

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 (22-9853-DUR)

Seeding Date: April 27, 2022
 Harvest Date: August 16, 2022
 Fertility: 46-9-5-5 side banded
 System: No Till
 Herbicide: LV-6 (16 oz/ac), Harmony SG (0.5 oz/ac)
 Insecticide: Lambda (4 oz/ac), twice
 Previous Crop: Chemical Fallow - Spring Wheat
 Precipitation: 4.96" seeding to harvest maturity

* Precip from NOAA website

TABLE 8. Nine-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. 2014-2022. (Exp# 9853-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)					TEST WEIGHT (Pounds Per Bushel)					9-YR COMP. AVE. YIELD 5/	9-YR COMP. AVE. TEST WT 5/				
		2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK YIELD 4/	2018	2019	2020			2021	2022	AVE for YEARS TESTED 3/	% of CHECK TEST WT 4/
YU894-75 ALZADA (P+)	7	33.9	60.7	52.3		25.3	38.3	106.2	35.0	54.4	58.8	55.8	56.9	55.4	100.4	55.5	
D901313 MOUNTRAIL (+)	9	30.0	53.6	51.2	22.3	27.9	33.0	100.0	33.0	55.0	57.7	55.3	55.4	55.7	55.3	100.0	55.3
D97780 GRE Nora (+)	9	29.6	57.1	50.7	26.9	24.7	33.0	99.9	33.0	56.0	58.3	56.7	55.0	55.7	55.7	100.7	55.7
D00095 TIOGA (+)	9	30.9	54.3	46.3	20.2	22.1	31.8	96.5	31.8	57.2	57.7	56.4	56.1	55.4	56.3	101.9	56.3
NDSU ND-RIVELAND (+)	4		50.8	47.0	24.0	27.1	37.2	96.1	31.7		57.0	56.1	56.8	55.5	56.4	100.6	55.6
D9715-11 DIVIDE (+)	9	28.4	52.0	45.4	24.6	25.9	31.7	96.0	31.7	57.8	58.4	56.4	56.3	56.9	56.4	102.0	56.4
D04581 JOPPA (+)	9	24.7	51.0	48.5	22.4	24.8	31.3	94.9	31.3	56.4	58.4	56.7	56.4	56.5	56.1	101.5	56.1
NDSU ND-GRANO (+)	4		49.8	45.6	22.1	26.3	35.9	92.7	30.6		57.3	55.7	56.1	55.2	56.1	100.1	55.4
D03028 CARPIO (+)	9	27.0	48.3	42.5	23.2	23.2	29.9	90.8	29.9	55.3	57.1	53.9	54.4	55.2	55.2	99.9	55.2
CDC Vivid CDC VIVID (P+)	6	31.0	49.8	44.1	25.2	22.0	33.0	90.5	29.9	56.8	57.0	55.3	56.7	55.4	56.5	100.9	55.8
MTD16005 LUSTRE (+)	5	25.2	51.3	47.5	21.1	21.8	33.4	90.3	29.8	55.5	56.6	54.6	55.0	54.5	55.3	99.0	54.7
MEANS (For Entries Listed)		29.0	52.6	47.4	23.2	24.6			31.6	56.1	57.7	55.7	55.8	55.7			55.6
6/ Growing Season Precipitation (in.)		n/a	n/a	n/a	n/a	5.0	5.2										
Soil PAW (in.) to SD @ Planting		n/a	n/a	n/a	12.7	9.1	11.3										
Total Plant Available Water (in.)		n/a	n/a	n/a	n/a	14.1	14.4										
Soil NO3 (lbs.) to SD at Planting		n/a	n/a	n/a	197	276	245										
SD (Sampling Depth in Inches)		n/a	n/a	n/a	48	48	48										
Fertilizer Applied	(# N)	100	100	100	100	46	97										
	(# P ₂ O ₅)	20	20	20	20	9	19										
	(# K ₂ O)	10	10	10	10	5	9										
	(# S)	10	10	10	10	5	7										

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/ 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 rating 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.

TABLE 9. Nine-Year Protein and 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. 2014-2022. (Exp# 9853-DUR)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ PROTEIN % (Adjusted to 13% grain moisture)					SAWFLY RATING (% of cut and lodged stems)					9-YR COMP. AVE. PROTEIN 5/	9-YR COMP. AVE. SAWFLY 5/					
		2018	2019	2020	2021	2022	AVE for YEARS TESTED 3/	% of CHECK PROTEIN 4/	2018	2019	2020			2021	2022	AVE for YEARS TESTED 3/	% of CHECK SAWFLY 4/	
D9715-11	DIVIDE (+)	9	16.6	15.8	17.3	16.7	16.9	17.1	97.9	17.1	0.5	5.0	0.7	1.0	0.0	1.0	22.4	1.0
D03028	CARPIO (+)	9	17.4	16.6	17.9	17.1	17.1	17.5	99.9	17.5	0.3	6.7	0.3	0.7	0.7	1.1	25.3	1.1
YU894-75	ALZADA (P+)	7	16.8	15.7	16.9		16.5	17.0	97.6	17.1	1.8	2.3	1.0		0.7	1.3	25.9	1.1
MTD16005	LUSTRE (+)	5	18.0	16.9	18.0	17.6	18.2	17.7	103.7	18.2	0.2	3.7	0.7	1.0	0.7	1.2	32.7	1.4
D97780	GRENORA (+)	9	17.5	15.7	17.1	16.3	16.9	16.9	96.2	16.9	0.3	7.0	2.0	3.7	0.7	1.7	38.0	1.7
CDC Vivid	CDC VIVID (P+)	6	18.1	17.3	19.2	17.0	18.3	17.9	104.8	18.4	0.3	5.0	0.3	2.3	1.0	1.5	47.8	2.1
D04581	JOPPA (+)	9	17.1	16.1	17.1	16.9	16.9	17.2	98.4	17.2	0.7	13.3	1.0	5.3	0.7	2.8	64.1	2.8
D00095	TIOGA (+)	9	18.2	16.7	18.3	17.4	17.6	17.8	101.5	17.8	0.2	10.0	1.0	5.3	0.7	2.9	65.4	2.9
NDSU	ND-RIVELAND (+)	4		16.7	17.8	16.9	17.1	17.1	101.1	17.7		11.7	1.0	1.0	0.3	3.5	76.6	3.4
D901313	MOUNTRAIL (+)	9	17.7	15.8	18.0	17.1	16.8	17.5	100.0	17.5	0.5	11.7	0.7	5.3	0.7	4.4	100.0	4.4
NDSU	ND-GRANO (+)	4		16.4	18.9	16.8	17.8	17.5	103.2	18.1		6.7	1.0	10.0	1.0	4.7	101.8	4.5
MEANS (For Entries Listed)			17.5	16.3	17.9	17.0	17.3			17.6	0.5	7.5	0.9	3.6				2.4
6/ Growing Season Precipitation (in.)			n/a	n/a	n/a	n/a	5.0	5.2										
Soil PAW (in.) to SD @ Planting			n/a	n/a	n/a	12.7	9.1	11.3										
Total Plant Available Water (in.)			n/a	n/a	n/a	14.1	14.4											
Soil NO3 (lbs.) to SD at Planting			n/a	n/a	n/a	197	276	245										
SD (Sampling Depth in Inches)			n/a	n/a	n/a	48	48	48										
Fertilizer Applied		(# N)	100	100	100	100	46	97										
		(# P ₂ O ₅)	20	20	20	20	9	19										
		(# K ₂ O)	10	10	10	10	5	9										
		(# S)	10	10	10	10	5	7										

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/ Percent of Mountrail protein or saw fly rating 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 protein or saw fly rating for Mountrail for the same years, and z = 9-Yr average protein or saw fly rating for the check variety Mountrail.
 6/ Seeding to 14 days prior to harvest.