



**On-Farm Cereal Variety and Advanced Breeding Line
Testing across Montana for Environment Specific
Cultivar Recommendations:**



Durum Wheat Off-Station Variety Performance, Turner, MT

Principal Investigator:

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Project Personnel:

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Cooperator:

Max Cederberg, Landowner, Turner

Objectives:

Commercially available spring wheat varieties and advanced breeding lines were evaluated for agronomic performance and fit at on-farm locations across the state of Montana. Sites chosen for the research considered the environment, growing conditions and soil types, and represent the major land areas for producers in those regions served by Northern Agricultural Research Center. The Blaine County location near Turner entered its forty-first year of crop testing collaborations 2024.

Methods:

The uniform off-station durum variety performance trial was seeded into chemical fallow ground during 2024. The trial consisted of 12 entries seeded in replicated, three-row, 22-foot plots on a 12-inch row spacing, utilizing a self-propelled cone seeder with Atom Jet paired row openers. All plots 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 the Montana Wheat and Barley Committee, was used to harvest each three-row plot. Prior to measuring plot weight for yield determination, seed was either cleaned or weighed in-dirt as per protocols. Protein, test weight and moisture content were determined on a clean sample 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 wheat stem sawfly. Pickup guards coupled with an extremely slow ground speed and an 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 wheat stem 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:

This report contains both single-year and long-term data summaries limited to the most recent ten years. It should be noted that the 2024 data table in this report represents varietal performance for a single crop year at a single location, therefore cannot be considered representative of performance expected when differing conditions due to location, year and management are imposed. By itself, 2024 data shall not constitute in any form a recommendation for or against any variety or breeding line included.

Durum seed yields at Turner averaged nearly 37 bu/ac (Table 1). 'MT Blackbeard', 2023 Montana State University release, produced the highest seed yield at nearly 39 bu/ac while 'Mountrail' and 'Lustre' were statistically equal to the highest yielding entry at 38 bu/ac. Test weights of all durum entries for this site averaged just over 60 lb/bu with 'MT Raska' producing a test weight of 62.3 lb/bu. Wheat stem sawfly infestation averaged 4 percent cutting in the durum trial at Turner. Yield, test weight, protein, falling number, plant height and sawfly cutting data for the 2024 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. Ten-year comparable averages (2015-2024) for durum seed yield and test weight at Turner are summarized in Table 2, while ten-year comparable averages for protein content and wheat stem sawfly cutting are summarized in Table 3. Based on the comparable average calculations, MT Blackbeard is the highest yielding varieties at Turner.

Summary:

Upon establishment, the durum at the Turner site had good stand uniformity. The quantity and timeliness of precipitation throughout the growing season in the Turner area was very good, which was reflected in the increased seed yields at the site.

This work has been strongly supported by producers in the Turner-Hogeland area, and by the Northern Agricultural Research Center Advisory Board. With budget and other resources allowing, it is planned to continue the off-station spring wheat variety and breeding line testing in this area. The Blaine County location near Turner has been a long-term site for various cereal and variety testing trials since 1984, marking 2024 as the Cederberg Family's forty-first year of collaboration.

Recognition:

This research would not have been possible without the assistance of the following seasonal employees: Callie Bebee, David Bischoff, Clara Haslem, Brady Kueffler, Cleta Lamb, and Teresa Miller.

TABLE 1. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2024. (Exp# 24-9851-DUR)

| ID | 1/ YIELD bu/ac | TEST WT lb/bu | 2/ PROTEIN % | 3/ FN seconds | PLNT HT inches | 4/ SAWFLY % |
|---------------------|----------------------|------------------|--------------------|---------------------|-------------------|-------------------|
| Alzada | 36.8 | 60.4 | 12.2 | 484 | 26.3 | 3.7 |
| Carpio | 34.6 | 58.7 | 13.1 | 454 | 29.7 | 3.7 |
| Divide | 36.2 | 59.9 | 12.7 | 441 | 29.3 | 3.7 |
| Joppa | 35.0 | 60.3 | 13.3 | 450 | 29.6 | 6.7 |
| Lustre | 38.0 | 59.3 | 12.1 | 449 | 30.4 | 3.7 |
| Mountrail | 38.3 | 60.3 | 11.7 | 439 | 28.9 | 2.3 |
| MT Blackbeard | 38.6 | 60.0 | 12.3 | 468 | 30.5 | 8.3 |
| MT Raska | 36.2 | 62.3 | 12.6 | 478 | 24.0 | 2.3 |
| ND Riveland | 37.0 | 59.5 | 13.2 | 456 | 30.1 | 5.0 |
| Tioga | 37.1 | 60.2 | 12.5 | 424 | 33.1 | 8.3 |
| WB8148 | 37.1 | 60.9 | 12.0 | 453 | 23.1 | 2.3 |
| MTD19011 | 36.3 | 60.4 | 11.1 | 469 | 27.1 | 2.3 |
| EXPERIMENTAL MEANS | 36.8 | 60.2 | 12.4 | 455.3 | 28.5 | 4.4 |
| LSD (0.05) | 1.4 | 0.7 | 0.5 | 20.3 | 1.9 | 3.9 |
| C.V.% | 2.3 | 0.7 | 2.2 | 2.6 | 3.9 | 52.7 |
| P-VALUE (Varieties) | 0.0002 | <.0001 | <.0001 | 0.0002 | <.0001 | 0.0169 |

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 the highest or lowest value within a column (whichever is most desirable for the specific characteristic).

Bold indicates values equal to the underlined value within a column based on Fisher's protected LSD (P=0.05).

NS for non-significant replaces the LSD when the probability value (P-Value) exceeds 0.05.

Management Information (24-9851-DUR)

| | |
|----------------|-----------------------------------|
| Seeding Date: | April 26, 2024 |
| Harvest Date: | August 31, 2024 |
| Fertility: | 22-4-2-2 side banded |
| System: | No Till |
| Herbicide: | OpenSky 16 oz |
| Insecticide: | none |
| Previous Crop: | Chemical Fallow - Winter Wheat |
| Precipitation: | 5.82" seeding to harvest maturity |

* Precip from Mesonet website

TABLE 2. Ten-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. 2015-2024. (Exp# 9851-DUR)

| Farm, Farmer: Northern Agricultural Research Center, Havre, Montana: 2019-2024. (Exp# 5851-D04) | | | | | | | | | | | | | | | | | | |
|---|------------------------------------|-----------------------------|------|------|------|------|-------------------------|------------------------------|------------------------------------|---------------------------------|------|------|------|------|-------------------------|--------------------------------|------------------------------|--|
| 2/ VARIETY | 3/ No. of YEARS TESTED | 1/ YIELD (Bushels Per Acre) | | | | | | | | TEST WEIGHT (Pounds Per Bushel) | | | | | | | | |
| | | 2020 | 2021 | 2022 | 2023 | 2024 | 3/ AVE. for YEARS | 4/ % of CHECK YIELD | 5/ 10-YR COMP. AVE. YIELD | 2020 | 2021 | 2022 | 2023 | 2024 | 3/ AVE. for YEARS | 4/ % of CHECK TEST WT | 5/ 10-YR COMP. TEST WT | |
| MT BLACKBEARD (+) | 4 | | 13.0 | 34.3 | 34.4 | 38.6 | 30.0 | 112.5 | 35.8 | | 57.5 | 59.9 | 61.6 | 60.0 | 59.8 | 101.5 | 60.2 | |
| ND-GRANO (+) | 5 | 44.4 | 13.6 | 33.8 | 27.0 | | 32.3 | 103.3 | 32.9 | 58.7 | 59.1 | 60.3 | 61.3 | | 59.8 | 102.2 | 60.6 | |
| TIOGA (+) | 9 | 40.8 | 12.3 | 34.1 | | 37.1 | 33.1 | 102.5 | 32.6 | 58.2 | 58.8 | 59.6 | | 60.2 | 60.2 | 101.7 | 60.3 | |
| CARPIO (+) | 10 | 44.1 | 14.0 | 32.4 | 29.7 | 34.6 | 32.6 | 102.5 | 32.6 | 57.7 | 57.3 | 59.5 | 60.3 | 58.7 | 59.3 | 100.0 | 59.3 | |
| MT RASKA (+) | 4 | | 8.7 | 30.6 | 32.5 | 36.2 | 27.0 | 101.1 | 32.1 | | 60.0 | 61.2 | 62.6 | 62.3 | 61.5 | 104.5 | 62.0 | |
| CDC VIVID (P+) | 6 | 38.7 | 12.5 | 38.1 | | | 30.1 | 100.6 | 32.0 | 57.8 | 58.6 | 60.1 | | | 59.5 | 101.2 | 60.1 | |
| MOUNTRAIL (+) | 10 | 43.9 | 6.7 | 34.2 | 27.6 | 38.3 | 31.8 | 100.0 | 31.8 | 58.1 | 56.1 | 58.9 | 60.1 | 60.3 | 59.3 | 100.0 | 59.3 | |
| DIVIDE (+) | 10 | 40.4 | 11.3 | 32.8 | 29.3 | 36.2 | 31.8 | 99.9 | 31.8 | 58.6 | 57.1 | 59.7 | 61.2 | 59.9 | 60.0 | 101.2 | 60.0 | |
| WB8148 | 3 | | | 36.5 | 26.3 | 37.1 | 33.3 | 99.7 | 31.7 | | | 60.4 | 61.2 | 60.9 | 60.8 | 101.8 | 60.4 | |
| GRENORA (+) | 8 | 44.8 | 6.2 | 35.5 | | | 31.2 | 99.1 | 31.5 | 58.6 | 55.7 | 59.8 | | | 59.3 | 100.3 | 59.5 | |
| ND-RIVELAND (+) | 6 | 45.3 | 15.2 | 32.8 | 24.0 | 37.0 | 31.9 | 98.2 | 31.2 | 58.1 | 58.6 | 59.3 | 60.3 | 59.5 | 59.2 | 100.8 | 59.8 | |
| JOPPA (+) | 10 | 44.2 | 12.0 | 30.7 | 26.8 | 35.0 | 30.7 | 96.7 | 30.7 | 58.7 | 58.3 | 60.5 | 61.5 | 60.3 | 60.3 | 101.7 | 60.3 | |
| LUSTRE (+) | 7 | 43.0 | 9.9 | 30.5 | 24.1 | 38.0 | 31.3 | 95.4 | 30.3 | 57.0 | 56.0 | 58.5 | 59.6 | 59.3 | 58.4 | 100.7 | 59.7 | |
| ALZADA (P+) | 8 | 45.6 | | 36.9 | 29.6 | 36.8 | 33.3 | 95.0 | 30.2 | 57.5 | | 59.6 | 60.7 | 60.4 | 59.9 | 100.6 | 59.7 | |
| MEANS (For Entries Listed) | | 43.2 | 11.3 | 33.8 | 28.3 | 36.8 | | | 31.9 | 58.1 | 57.8 | 59.8 | 60.9 | 60.2 | | | 60.1 | |
| 6/ Growing Season Precipitation (in.) | | 5.45 | 3.48 | 5.22 | 4.64 | 5.82 | 4.72 | | | | | | | | | | | |
| Soil PAW (in.) to SD @ Planting | | n/a | n/a | n/a | 3.70 | n/a | 5.59 | | | | | | | | | | | |
| Total Plant Available Water (in.) | | n/a | n/a | n/a | 8.30 | n/a | 10.77 | | | | | | | | | | | |
| Soil NO3 (lbs.) to SD at Planting | | n/a | n/a | n/a | 47 | n/a | 60 | | | | | | | | | | | |
| SD (Sampling Depth in Inches) | | n/a | n/a | n/a | 34 | n/a | 37 | | | | | | | | | | | |
| Fertilizer Applied | (# N) | 100 | 100 | 46 | 46 | 35 | 85 | | | | | | | | | | | |
| | (# P ₂ O ₅) | 20 | 20 | 9 | 9 | 7 | 17 | | | | | | | | | | | |
| | (# K ₂ O) | 10 | 10 | 5 | 5 | 4 | 8 | | | | | | | | | | | |
| | (# S) | 10 | 10 | 5 | 5 | 4 | 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 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/ 10-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 = 10-Yr average yield or test weight for the check variety Mountrail.

6/ Seeding to 14 days prior to harvest.

TABLE 3. Ten-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. 2015-2024. (Exp# 9851-DUR)

| | | 1/ PROTEIN % (Adjusted to 13% grain moisture) | | | | | | | | SAWFLY RATING (% of cut and lodged stems) | | | | | | | |
|---------------------------------------|---------------------------------|---|------|------|------|------|-------------------------|---------------------|---------------------------|---|------|------|------|------|-------------------------|---------------------|---------------------------|
| 2/ VARIETY | 3/ No. of YEARS TESTED | 2020 | 2021 | 2022 | 2023 | 2024 | 3/ AVE. for YEARS | 4/ % of CHECK | 5/ 10-YR COMP. AVE. | 2020 | 2021 | 2022 | 2023 | 2024 | 3/ AVE. for YEARS | 4/ % of CHECK | 5/ 10-YR COMP. AVE. |
| MT RASKA (+) | 4 | | 17.1 | 15.4 | 14.2 | 12.6 | 14.8 | 100.7 | 15.1 | | 0.7 | 0.0 | 8.3 | 2.3 | 2.8 | 53.1 | 1.2 |
| GRENOIRA (+) | 8 | 15.2 | 16.0 | 14.6 | | | 15.2 | 98.6 | 14.8 | 0.7 | 0.7 | 3.7 | | | 0.7 | 72.7 | 1.7 |
| DIVIDE (+) | 10 | 15.6 | 16.1 | 14.6 | 14.6 | 12.7 | 15.0 | 100.4 | 15.0 | 0.7 | 1.0 | 1.0 | 10.0 | 3.7 | 1.8 | 76.8 | 1.8 |
| CDC VIVID (P+) | 6 | 16.7 | 16.4 | 15.3 | | | 16.3 | 103.1 | 15.4 | 0.7 | 2.3 | 0.7 | | | 0.9 | 77.3 | 1.8 |
| LUSTRE (+) | 7 | 16.4 | 16.8 | 15.1 | 15.2 | 12.1 | 15.4 | 102.7 | 15.4 | 1.0 | 2.3 | 1.0 | 10.0 | 3.7 | 2.6 | 80.9 | 1.9 |
| WB8148 | 3 | | | 14.9 | 14.5 | 12.0 | 13.8 | 99.9 | 15.0 | | | 0.7 | 15.0 | 2.3 | 6.0 | 85.7 | 2.0 |
| ND-RIVELAND (+) | 6 | 16.0 | 15.5 | 14.6 | 15.5 | 13.2 | 15.0 | 101.1 | 15.1 | 0.7 | 2.3 | 3.7 | 8.3 | 5.0 | 3.4 | 92.4 | 2.1 |
| CARPIO (+) | 10 | 15.3 | 15.8 | 14.3 | 14.5 | 13.1 | 14.8 | 99.0 | 14.8 | 0.7 | 1.0 | 5.0 | 10.0 | 3.7 | 2.1 | 92.8 | 2.1 |
| MT BLACKBEARD (+) | 4 | | 16.1 | 14.4 | 14.1 | 12.3 | 14.2 | 96.5 | 14.5 | | 1.0 | 2.3 | 8.3 | 8.3 | 5.0 | 93.8 | 2.2 |
| MOUNTRAIL (+) | 10 | 15.1 | 17.4 | 14.8 | 15.0 | 11.7 | 15.0 | 100.0 | 15.0 | 0.7 | 0.3 | 5.3 | 13.3 | 2.3 | 2.3 | 100.0 | 2.3 |
| ND-GRANO (+) | 5 | 15.6 | 16.0 | 14.5 | 15.1 | | 15.3 | 98.7 | 14.8 | 1.0 | 0.7 | 3.7 | 13.3 | | 3.9 | 100.0 | 2.3 |
| ALZADA (P+) | 8 | 15.1 | | 14.5 | 14.5 | 12.2 | 14.6 | 99.1 | 14.8 | 0.3 | | 1.0 | 16.7 | 3.7 | 2.8 | 100.0 | 2.3 |
| JOPPA (+) | 10 | 15.2 | 15.9 | 14.5 | 14.7 | 13.3 | 15.0 | 100.0 | 15.0 | 0.3 | 2.3 | 2.3 | 13.3 | 6.7 | 2.7 | 115.9 | 2.7 |
| TIOGA (+) | 9 | 15.5 | 16.1 | 14.5 | | 12.5 | 15.1 | 100.6 | 15.1 | 0.3 | 2.3 | 6.7 | | 8.3 | 2.2 | 206.9 | 4.8 |
| MEANS (For Entries Listed) | | 15.6 | 16.3 | 14.7 | 14.7 | 12.5 | | | 15.0 | 0.6 | 1.4 | 2.6 | 11.5 | 4.5 | | | 2.2 |
| 6/ Growing Season Precipitation (in.) | | 5.45 | 3.48 | 5.22 | 4.64 | 5.82 | 4.72 | | | | | | | | | | |
| Soil PAW (in.) to SD @ Planting | | n/a | n/a | n/a | 3.70 | n/a | 5.59 | | | | | | | | | | |
| Total Plant Available Water (in.) | | n/a | n/a | n/a | 8.30 | n/a | 10.77 | | | | | | | | | | |
| Soil NO3 (lbs.) to SD at Planting | | n/a | n/a | n/a | 47 | n/a | 60 | | | | | | | | | | |
| SD (Sampling Depth in Inches) | | n/a | n/a | n/a | 34 | n/a | 37 | | | | | | | | | | |
| Fertilizer Applied | | | | | | | | | | | | | | | | | |
| (# N) | | 100 | 100 | 46 | 46 | 35 | 85 | | | | | | | | | | |
| (# P2O5) | | 20 | 20 | 9 | 9 | 7 | 17 | | | | | | | | | | |
| (# K2O) | | 10 | 10 | 5 | 5 | 4 | 8 | | | | | | | | | | |
| (# S) | | 10 | 10 | 5 | 5 | 4 | 6 | | | | | | | | | | |

Check variety is Mountrail.

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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/ 10-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 = 10-Yr average protein or saw fly rating for the check variety Mountrail.

6/ Seeding to 14 days prior to harvest.