

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

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### **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 33 percent of the 2009-2013 statewide totals (44 percent for winter wheat and 22 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 in north central Montana are provided reliable, unbiased, up-to-date information to make comparisons among improved spring wheat varieties. This report provides producers in north central Montana the information necessary to select varieties best suited for their specific area and growing conditions.

### **Methods:**

Standard off-station variety performance trials were conducted in 2014 on chemical fallow at three locations in three northern Montana counties.

#### **Dryland Spring Durum Trials:**

|                                           |              |            |
|-------------------------------------------|--------------|------------|
| 1. Cederberg Farm, Blaine County          | (3NE Turner) | 13-36N-25E |
| 2. Flansaas/Lumsden Farm, Phillips County | (1SW Loring) | 24-35N-29E |
| 3. Kammerzell Farm, Liberty County        | (2W Chester) | 07-31N-06E |

All three durum trials consisted of 14 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 16.5 feet with a three-point rototiller. Plant height was measured and percent sawfly cutting was 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, test weight and moisture content. Protein content was determined using a Foss Infratec 1241 near infrared analyzer. Other variables specific to each individual trial are listed with the current year data tables.

### **Results:**

Please note that cereal research trial yield results recorded under wheat stem sawfly pressure are 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 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 2014 started out average to marginal with lower than normal early spring precipitation across north central Montana. Timely, above average rainfall events were experienced at Turner and Loring resulting in

excellent spring durum yields for growers who were not hit by one of the frequent hail storms of 2014. The Loma and Chester locations went into the fall and started out early spring dryer than normal but then received timely precipitation resulting in good to very good spring durum seed yields.

At Havre, annual growing season precipitation (9/1/13 through 8/31/14) was 13.34 inches, 11 percent higher than the average for all years since 1916. April 1 through July 31 precipitation was 4.87 inches or 71 percent of the 99-year average. Heat units expressed as "Growing Degree Days" (GDD, base 50) from May through July totaled 1176, 91 percent of the average for the last 64 years (1951-2014). The last spring frost was on May 13 and the first fall frost of 2014 was on September 12, resulting in 121 frost-free days. The minimum winter temperature was -33 degrees F on December 7, 8 and 9. Overall, 2013-2014 crop year temperatures were very close to the long-term average. The April through July growing season saw an average daily temperature of 56.4 degrees F, only 1 degree below normal. July and August average temperatures were slightly higher than normal with the high for 2014 recorded on July 31 at 96 degrees F. There were 15 days with temperatures 90 degrees F or above, with no days over 100 degrees F.

Following a summer of substantial rainfall and minor hail storms, unfortunately the spring durum trial at Turner was hit by a devastating season ending hail storm on August 28. The spring durum plots at the 2014 Cederberg dryland site were not salvageable for any data collection.

Comparable averages are calculated using a standard long-term 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 3 years of data is necessary to be included in comparable average calculation. Nine-year comparable averages for spring durum seed yield and test weight at Turner are summarized in Table 1, while nine-year comparable averages for sawfly cutting are summarized in Table 2.

Loring spring durum yields averaged 39.3 bu/ac with experimental line 'MT06584' producing the highest yield at 43.4 bu/ac (Table 3). 'Alzada' and 'Strongfield' were the only other entries to produce yields statistically equal to that of MT06584. Sawfly cutting was minimal in the durum at Loring, ranging from 0 to less than 4 percent. Stand percent, plant height, yield, moisture, test weight, protein and sawfly cutting data, for the 2014 Loring dryland spring durum trial, are summarized in Table 3. Four-year comparable averages for spring durum seed yield and test weight at Loring are summarized in Table 4, while four-year comparable averages for sawfly cutting are summarized in Table 5.

In 2014, off-station spring durum trials were established at Chester. Spring durum yields at Chester averaged 32 bu/ac. 'Alkabo', Alzada, 'Divide', 'Carpio' and 'Silver' were the highest yielding entries at 37.0, 35.8, 34.6, 34.1 and 33.7 bu/ac, respectively (Table 6). Sawfly cutting in the small plot scenario was also minimal near Chester, averaging only 0.8 percent cutting. Plant height, yield, test weight, moisture, protein and sawfly cutting data for the 2014 Chester dryland spring durum trial are summarized in Table 6. Comparable averages for spring durum at the Chester site will not be available until the 2016 crop year.

### **Summary:**

This work has been strongly supported by producers near each of the 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 twentieth 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 there are quite different. Cooperator and producer support in the Big Flat area have been outstanding through the years with 2014 marking 31 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 4W5132 is to be provided by Montana State University, Office of Sponsored Programs. There is no other grant support for this project.

### **MWBC FY2016 Grant Submission Plans:**

It is planned to submit this project for funding consideration in the next fiscal year.

**TABLE 1. 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. 2005-2014. (Exp# 9851-DUR)**

|                                       |                        | No.<br>of<br>YEARS<br>TESTED<br>3/ | 1/ YIELD (Bushels Per Acre) |      |      |      |            |                                     |                                 | TEST WEIGHT (Pounds Per Bushel)     |      |      |      |      |            |                                     |                                   |
|---------------------------------------|------------------------|------------------------------------|-----------------------------|------|------|------|------------|-------------------------------------|---------------------------------|-------------------------------------|------|------|------|------|------------|-------------------------------------|-----------------------------------|
|                                       |                        |                                    | 2010                        | 2011 | 2012 | 2013 | 2014<br>4/ | AVE<br>for<br>YEARS<br>TESTED<br>3/ | %<br>of<br>CHECK<br>YIELD<br>5/ | 9-YR<br>COMP.<br>AVE<br>YIELD<br>6/ | 2010 | 2011 | 2012 | 2013 | 2014<br>4/ | AVE<br>for<br>YEARS<br>TESTED<br>3/ | %<br>of<br>CHECK<br>TEST WT<br>5/ |
| 2/ VARIETY or SELECTION               |                        |                                    |                             |      |      |      |            |                                     |                                 |                                     |      |      |      |      |            |                                     |                                   |
| STRONGFIELD                           | STRONGFIELD (+)        | 8                                  | 27.0                        | 25.5 | 24.1 | 54.3 | 29.0       | 112.7                               | 30.5                            | 56.0                                | 60.9 | 60.6 | 64.1 | 59.0 | 100.2      | 59.0                                |                                   |
| GRENORA                               | GRENORA (+)            | 8                                  | 24.9                        | 26.6 | 22.4 | 53.2 | 27.8       | 108.0                               | 29.2                            | 55.6                                | 61.3 | 60.1 | 64.2 | 58.9 | 100.0      | 58.8                                |                                   |
| YU894-75                              | ALZADA (P+)            | 9                                  | 28.1                        | 24.4 | 19.5 | 47.4 | 28.6       | 105.8                               | 28.6                            | 56.2                                | 61.3 | 60.8 | 63.5 | 59.1 | 100.5      | 59.1                                |                                   |
| NORMANNO                              | NORMANNO               | 5                                  | 33.1                        | 8.7  | 24.6 | 50.9 | 31.6       | 105.6                               | 28.6                            | 55.8                                | 59.8 | 59.7 | 63.1 | 59.6 | 99.1       | 58.3                                |                                   |
| MT03012                               | SILVER (++, MSU, 2012) | 7                                  | 26.2                        | 24.8 | 18.7 | 45.7 | 26.4       | 102.3                               | 27.6                            | 55.4                                | 61.0 | 60.7 | 63.9 | 58.8 | 99.9       | 58.8                                |                                   |
| D901313                               | MOUNTRAIL (+)          | 9                                  | 15.4                        | 26.8 | 22.6 | 49.5 | 27.0       | 100.0                               | 27.0                            | 56.0                                | 61.2 | 60.1 | 63.5 | 58.9 | 100.0      | 58.9                                |                                   |
| TIOGA                                 | TIOGA                  | 4                                  | 9.4                         | 26.7 | 21.9 | 54.1 | 28.0       | 98.1                                | 26.5                            | 52.9                                | 62.2 | 60.4 | 64.7 | 60.0 | 99.8       | 58.7                                |                                   |
| ALKABO                                | ALKABO (+)             | 8                                  | 17.3                        | 23.9 | 24.3 | 48.9 | 25.2       | 98.0                                | 26.5                            | 57.0                                | 62.7 | 60.9 | 64.9 | 60.0 | 101.8      | 59.9                                |                                   |
| DIVIDE                                | DIVIDE                 | 8                                  | 14.6                        | 25.2 | 20.4 | 50.5 | 24.5       | 94.9                                | 25.6                            | 55.2                                | 61.6 | 61.0 | 64.3 | 59.2 | 100.5      | 59.2                                |                                   |
| PIERCE                                | PIERCE (+)             | 8                                  | 15.5                        | 26.1 | 20.3 |      | 22.6       | 83.8                                | 22.6                            | 56.7                                | 62.1 | 60.8 |      | 59.1 | 100.4      | 59.1                                |                                   |
| MEANS (For Entries Listed)            |                        |                                    | 21.1                        | 23.9 | 21.9 | 50.5 |            |                                     | 27.3                            | 55.7                                | 61.4 | 60.5 | 64.0 |      |            | 59.0                                |                                   |
| 7/ Growing Season Precipitation (in.) |                        |                                    | 10.3                        | 8.3  | 8.3  | n/a  | n/a        | 7.3                                 |                                 |                                     |      |      |      |      |            |                                     |                                   |
| Soil PAW (in.) to SD @ Planting       |                        |                                    | 9.0                         | 7.9  | 9.4  | 7.8  | 8.9        | 8.1                                 |                                 |                                     |      |      |      |      |            |                                     |                                   |
| Total Plant Available Water (in.)     |                        |                                    | 19.2                        | 16.2 | 9.4  | n/a  | n/a        | 14.4                                |                                 |                                     |      |      |      |      |            |                                     |                                   |
| Soil NO3 (lbs.) to SD at Planting     |                        |                                    | 162                         | 51   | 12   | 11   | 65         | 69                                  |                                 |                                     |      |      |      |      |            |                                     |                                   |
| SD (Sampling Depth in Inches)         |                        |                                    | 48                          | 48   | 48   | 48   | 48         | 48                                  |                                 |                                     |      |      |      |      |            |                                     |                                   |
| Fertilizer Applied (# N)              |                        |                                    | 70                          | 70   | 70   | 100  | 100        | 76                                  |                                 |                                     |      |      |      |      |            |                                     |                                   |
| (# P <sub>2</sub> O <sub>5</sub> )    |                        |                                    | 40                          | 40   | 40   | 20   | 20         | 36                                  |                                 |                                     |      |      |      |      |            |                                     |                                   |
| (# K <sub>2</sub> O)                  |                        |                                    | 25                          | 25   | 25   | 10   | 10         | 22                                  |                                 |                                     |      |      |      |      |            |                                     |                                   |

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 or 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 2. 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. 2005-2014. (Exp# 9851-DUR)**

| 2/ VARIETY or SELECTION               |                        | No.<br>of<br>YEARS<br>TESTED | 1/ SAWFLY RATING (% of cut and lodged stems) |      |      |      |      |      |      |      |      |            | AVE<br>for<br>YEARS<br>TESTED | %<br>of<br>CHECK<br>SWFLY | 9-YR<br>COMP.<br>AVE.<br>SWFLY |
|---------------------------------------|------------------------|------------------------------|----------------------------------------------|------|------|------|------|------|------|------|------|------------|-------------------------------|---------------------------|--------------------------------|
|                                       |                        |                              | 2005                                         | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014<br>3/ |                               |                           |                                |
| NORMANNO                              | NORMANNO               | 5                            |                                              |      |      |      | 0.7  | 2.3  | 1.0  | 1.0  | 0.7  |            | 1.1                           | 6.2                       | <b>1.3</b>                     |
| STRONGFLD                             | STRONGFIELD (+)        | 8                            |                                              | 16.7 | 10.0 | 2.3  | 10.0 | 13.3 | 10.0 | 15.0 | 0.3  |            | 9.7                           | 44.3                      | <b>9.4</b>                     |
| YU894-75                              | ALZADA (P+)            | 9                            | 10.0                                         | 20.0 | 6.7  | 2.3  | 8.3  | 8.3  | 15.0 | 16.7 | 2.3  |            | 10.0                          | 46.7                      | <b>10.0</b>                    |
| MT03012                               | SILVER (++, MSU, 2012) | 8                            |                                              | 11.7 | 11.7 | 2.3  | 5.7  | 18.3 | 18.3 | 18.3 | 2.3  |            | 11.1                          | 50.6                      | <b>10.8</b>                    |
| DIVIDE                                | DIVIDE                 | 8                            |                                              | 26.7 | 13.3 | 3.7  | 5.0  | 18.3 | 16.7 | 13.3 | 0.7  |            | 12.2                          | 55.7                      | <b>11.9</b>                    |
| TIOGA                                 | TIOGA                  | 4                            |                                              |      |      |      |      | 21.7 | 23.3 | 26.7 | 2.0  |            | 18.4                          | 88.0                      | <b>18.8</b>                    |
| D901313                               | MOUNTRAIL (+)          | 9                            | 16.7                                         | 48.3 | 25.0 | 10.0 | 8.3  | 21.7 | 31.7 | 26.7 | 3.7  |            | 21.3                          | 100.0                     | <b>21.3</b>                    |
| PIERCE                                | PIERCE (+)             | 8                            | 20.0                                         | 43.3 | 21.7 | 8.3  | 11.7 | 23.3 | 33.3 | 23.3 |      |            | 23.1                          | 108.4                     | <b>23.1</b>                    |
| ALKABO                                | ALKABO (+)             | 8                            |                                              | 48.3 | 25.0 | 15.0 | 8.7  | 21.7 | 46.7 | 20.0 | 7.0  |            | 24.0                          | 109.7                     | <b>23.4</b>                    |
| GRENORA                               | GRENORA (+)            | 8                            |                                              | 50.0 | 33.3 | 11.7 | 15.0 | 25.0 | 38.3 | 21.7 | 3.7  |            | 24.8                          | 113.3                     | <b>24.2</b>                    |
| MEANS (For Entries Listed)            |                        |                              | 15.6                                         | 33.1 | 18.3 | 7.0  | 8.1  | 17.4 | 23.4 | 18.3 | 2.5  |            |                               |                           | <b>15.4</b>                    |
| 6/ Growing Season Precipitation (in.) |                        |                              | 9.7                                          | 2.5  | 7.0  | 6.6  | 6.0  | 10.3 | 8.3  | 8.3  | n/a  | n/a        | 7.3                           |                           |                                |
| Soil PAW (in.) to SD @ Planting       |                        |                              | 8.0                                          | 8.8  | 5.8  | 8.1  | 7.8  | 9.0  | 7.9  | 9.4  | 7.8  | 8.9        | 8.1                           |                           |                                |
| Total Plant Available Water (in.)     |                        |                              | 17.7                                         | 11.3 | 12.8 | 14.6 | 13.8 | 19.2 | 16.2 | 9.4  | n/a  | n/a        | 14.4                          |                           |                                |
| Soil NO3 (lbs.) to SD at Planting     |                        |                              | 84                                           | 64   | 81   | 71   | 94   | 162  | 51   | 12   | 11   | 65         | 69                            |                           |                                |
| SD (Sampling Depth in Inches)         |                        |                              | 48                                           | 48   | 48   | 48   | 48   | 48   | 48   | 48   | 48   | 48         | 48                            |                           |                                |
| Fertilizer Applied                    |                        |                              |                                              |      |      |      |      |      |      |      |      |            |                               |                           |                                |
| (# N)                                 |                        |                              | 70                                           | 70   | 70   | 70   | 70   | 70   | 70   | 70   | 100  | 100        | 76                            |                           |                                |
| (# P <sub>2</sub> O <sub>5</sub> )    |                        |                              | 40                                           | 40   | 40   | 40   | 40   | 40   | 40   | 40   | 20   | 20         | 36                            |                           |                                |
| (# K <sub>2</sub> O)                  |                        |                              | 25                                           | 25   | 25   | 25   | 25   | 25   | 25   | 25   | 10   | 10         | 22                            |                           |                                |

Long-term 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 or 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 3. Dryland Fallow Spring Durum Cultivar Evaluation Nursery Grown Off-Station at the Flansaas-Lumsden Farm, Loring. Northern Agricultural Research Center. Havre, Montana. 2014. (Exp# 14-9855-DUR)**

| ENTRY               | CULTIVAR or SELECTION | STAND<br>% | PLNT HT<br>Inches | 1/<br>YIELD<br>Bu/Ac | TEST WT<br>Lbs/Bu | MOISTURE<br>% | 2/<br>PROTEIN<br>% | 3/<br>SAWFLY<br>% |
|---------------------|-----------------------|------------|-------------------|----------------------|-------------------|---------------|--------------------|-------------------|
| 2                   | Alkabo                | 97.4       | 24.7              | 39.2                 | 56.8              | 11.3          | 14.9               | 1.0               |
| 8                   | Alzada                | 95.9       | 24.3              | <b>41.1</b>          | 56.8              | 11.6          | 14.7               | 1.0               |
| 3                   | Carpio                | 96.8       | 25.6              | 39.0                 | 56.7              | 11.5          | 15.0               | 0.3               |
| 6                   | Divide                | 96.8       | 27.5              | 39.8                 | 57.7              | 11.3          | 15.5               | 0.7               |
| 5                   | Grenora               | 97.1       | 23.8              | 39.0                 | 56.2              | 11.4          | 14.9               | 0.3               |
| 7                   | Joppa                 | 97.4       | 28.6              | 39.4                 | 56.9              | 11.2          | 15.4               | 0.7               |
| 1                   | Mountrail             | 95.5       | 25.4              | 34.8                 | 56.7              | 11.3          | 15.2               | 0.7               |
| 11                  | MT06584 (CC1)         | 98.1       | 22.0              | <b>43.4</b>          | 56.4              | 11.7          | 15.4               | 3.3               |
| 12                  | MT101395 (CC2)        | 99.0       | 25.1              | 39.3                 | 53.4              | 11.1          | 15.5               | 0.3               |
| 13                  | MT101427 (CC2)        | 95.5       | 24.2              | 39.5                 | 56.6              | 11.4          | 15.6               | 1.0               |
| 14                  | MT101730 (CC4)        | 95.2       | 31.7              | 39.2                 | 56.5              | 11.3          | 16.1               | 0.3               |
| 10                  | Silver                | 97.1       | 22.6              | 38.6                 | 56.7              | 11.4          | 15.5               | 1.0               |
| 9                   | Strongfield           | 95.2       | 27.2              | <b>40.5</b>          | 56.4              | 11.5          | 16.3               | 0.3               |
| 4                   | Tioga                 | 98.4       | 29.4              | 37.7                 | 56.0              | 11.3          | 16.6               | 2.0               |
| EXPERIMENTAL MEANS  |                       | 96.8       | 25.9              | 39.3                 | 56.4              | 11.4          | 15.5               | 0.9               |
| LSD (0.05)          |                       | 3.5        | 2.7               | 3.5                  | 1.0               | 0.3           | 1.0                | 1.9               |
| C.V.%               |                       | 2.1        | 6.3               | 5.2                  | 1.1               | 1.6           | 4.0                | 124.4             |
| P-VALUE (Varieties) |                       | 0.4449     | <.0001            | 0.0238               | <.0001            | 0.0717        | 0.0247             | 0.2               |

1/ Volumetric yields are based on plot weights adjusted to uniform 12 percent grain moisture and 60 lbs/bu as the standard test weight for durum.

2/ Protein values are adjusted to 12 percent grain moisture.

3/ 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 (14-9855-SW)

Seeding Date: May 13, 2014

Harvest Date: September 7, 2014

Fertility: 100-20-10 side banded

System: no till

Herbicide: Axial, 16.4 oz/ac; Brox-M, 16 oz/ac

Insecticide: none

Previous Crop: Chemical Fallow - Spring Wheat

Precipitation: 5.59"

**TABLE 4. Four-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. 2011-2014. (Exp# 9855-DUR)**

| 2/ VARIETY or SELECTION                |                        | No.<br>of<br>YEARS<br>TESTED | 1/ YIELD (Bushels Per Acre)        |      |      |      |      |                                |                                 | TEST WEIGHT (Pounds Per Bushel)      |      |      |      |      |      |                                |                                   |                                        |
|----------------------------------------|------------------------|------------------------------|------------------------------------|------|------|------|------|--------------------------------|---------------------------------|--------------------------------------|------|------|------|------|------|--------------------------------|-----------------------------------|----------------------------------------|
|                                        |                        |                              | 2011                               | 2012 | 2013 | 2014 | 2015 | AVE.<br>for<br>YEARS<br>TESTED | %<br>of<br>CHECK<br>YIELD<br>3/ | 4-YR<br>COMP.<br>AVE.<br>YIELD<br>4/ | 2011 | 2012 | 2013 | 2014 | 2015 | AVE.<br>for<br>YEARS<br>TESTED | %<br>of<br>CHECK<br>TEST WT<br>3/ | 4-YR<br>COMP.<br>AVE.<br>TEST WT<br>4/ |
|                                        |                        |                              |                                    |      |      |      |      |                                |                                 |                                      |      |      |      |      |      |                                |                                   |                                        |
| YU894-75                               | ALZADA (P+)            | 4                            | 28.5                               | 24.0 | 52.7 | 41.1 |      | 36.6                           | 110.2                           | 36.6                                 | 61.4 | 60.5 | 60.7 | 56.8 |      | 59.8                           | 100.6                             | 60.8                                   |
| ALKABO                                 | ALKABO (+)             | 4                            | 29.7                               | 26.9 | 50.0 | 39.2 |      | 36.4                           | 109.8                           | 36.4                                 | 62.5 | 60.7 | 62.4 | 56.8 |      | 60.6                           | 101.9                             | 61.6                                   |
| MT03012                                | SILVER (++, MSU, 2012) | 4                            | 31.0                               | 25.8 | 45.2 | 38.6 |      | 35.2                           | 106.0                           | 35.2                                 | 60.1 | 60.4 | 61.6 | 56.7 |      | 59.7                           | 100.4                             | 60.7                                   |
| TIOGA                                  | TIOGA                  | 4                            | 29.9                               | 26.2 | 46.2 | 37.7 |      | 35.0                           | 105.4                           | 35.0                                 | 62.0 | 60.8 | 61.9 | 56.0 |      | 60.2                           | 101.1                             | 61.1                                   |
| STRONGFLD                              | STRONGFIELD (+)        | 4                            | 30.6                               | 24.2 | 44.4 | 40.5 |      | 34.9                           | 105.2                           | 34.9                                 | 61.5 | 60.3 | 62.0 | 56.4 |      | 60.0                           | 100.9                             | 61.0                                   |
| GRENORA                                | GRENORA (+)            | 4                            | 27.6                               | 25.7 | 43.4 | 39.0 |      | 33.9                           | 102.2                           | 33.9                                 | 61.3 | 59.5 | 60.5 | 56.2 |      | 59.4                           | 99.8                              | 60.3                                   |
| DIVIDE                                 | DIVIDE                 | 4                            | 27.9                               | 24.1 | 42.5 | 39.8 |      | 33.6                           | 101.2                           | 33.6                                 | 61.7 | 60.9 | 62.0 | 57.7 |      | 60.6                           | 101.8                             | 61.5                                   |
| D901313                                | MOUNTRAIL (+)          | 4                            | 28.4                               | 24.7 | 44.9 | 34.8 |      | 33.2                           | 100.0                           | 33.2                                 | 60.9 | 59.1 | 61.2 | 56.7 |      | 59.5                           | 100.0                             | 60.4                                   |
| NORMANNO                               | NORMANNO               | 3                            | 11.5                               | 26.7 | 45.3 |      |      | 27.8                           | 85.3                            | 28.3                                 | 60.3 | 59.3 | 59.6 |      |      | 59.7                           | 98.8                              | 59.7                                   |
| MEANS (For Entries Listed)             |                        |                              | 27.2                               | 25.4 | 46.1 | 38.8 |      |                                |                                 | 34.1                                 | 61.3 | 60.2 | 61.3 | 56.7 |      |                                |                                   | 60.8                                   |
| 5/ Grow ing Season Precipitation (in.) |                        |                              | n/a                                | n/a  | 9.0  | 5.6  |      | 7.3                            |                                 |                                      |      |      |      |      |      |                                |                                   |                                        |
| Soil PAW (in.) to SD @ Planting        |                        |                              | 7.1                                | 8.8  | 8.8  | 8.9  |      | 8.4                            |                                 |                                      |      |      |      |      |      |                                |                                   |                                        |
| Total Plant Available Water (in.)      |                        |                              | 2.6                                | 8.8  | 5.8  | n/a  |      | 5.8                            |                                 |                                      |      |      |      |      |      |                                |                                   |                                        |
| Soil NO3 (lbs.) to SD at Planting      |                        |                              | 50                                 | 34   | 34   | 64   |      | 46                             |                                 |                                      |      |      |      |      |      |                                |                                   |                                        |
| SD (Sampling Depth in Inches)          |                        |                              | 48                                 | 48   | 48   | 48   |      | 48                             |                                 |                                      |      |      |      |      |      |                                |                                   |                                        |
| Fertilizer Applied                     |                        |                              | 70                                 | 70   | 100  | 100  |      | 85                             |                                 |                                      |      |      |      |      |      |                                |                                   |                                        |
|                                        |                        |                              | (# N)                              |      |      |      |      |                                |                                 |                                      |      |      |      |      |      |                                |                                   |                                        |
|                                        |                        |                              | (# P <sub>2</sub> O <sub>5</sub> ) | 40   | 40   | 20   | 20   |                                | 30                              |                                      |      |      |      |      |      |                                |                                   |                                        |
|                                        |                        |                              | (# K <sub>2</sub> O)               | 25   | 25   | 10   | 10   |                                | 18                              |                                      |      |      |      |      |      |                                |                                   |                                        |

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 or 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/ 4-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 = 4-Yr saw fly rating for the check variety Mountrail.

5/ Seeding to 14 days prior to harvest maturity.

**TABLE 5. Four-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. 2011-2014. (Exp# 9855-DUR)**

| 2/ VARIETY or SELECTION                |                        |   | No.<br>of<br>YEARS<br>TESTED<br>3/ | 1/ SAWFLY RATING (% of cut and lodged stems) |      |      |      |                               | 4-YR<br>COMP.<br>AVE.<br>SWFLY<br>4/ |
|----------------------------------------|------------------------|---|------------------------------------|----------------------------------------------|------|------|------|-------------------------------|--------------------------------------|
|                                        |                        |   |                                    | 2011                                         | 2012 | 2013 | 2014 | AVE<br>for<br>YEARS<br>TESTED |                                      |
| NORMANNO                               | NORMANNO               | 3 | 0.3                                | 1.0                                          | 0.3  |      | 0.5  | 4.2                           | 0.4                                  |
| STRONGFLD                              | STRONGFIELD (+)        | 4 | 8.3                                | 3.7                                          | 0.7  | 0.3  | 3.2  | 33.0                          | 3.2                                  |
| YU894-75                               | ALZADA (P+)            | 4 | 10.0                               | 5.0                                          | 1.0  | 1.0  | 4.3  | 43.2                          | 4.3                                  |
| DIVIDE                                 | DIVIDE                 | 4 | 13.3                               | 3.7                                          | 5.0  | 0.7  | 5.7  | 57.5                          | 5.7                                  |
| MT03012                                | SILVER (++, MSU, 2012) | 4 | 15.0                               | 3.7                                          | 3.7  | 1.0  | 5.8  | 59.3                          | 5.8                                  |
| GRENORA                                | GRENORA (+)            | 4 | 20.0                               | 8.3                                          | 6.7  | 0.3  | 8.8  | 89.8                          | 8.8                                  |
| D901313                                | MOUNTRAIL (+)          | 4 | 20.0                               | 11.7                                         | 7.0  | 0.7  | 9.8  | 100.0                         | 9.8                                  |
| ALKABO                                 | ALKABO (+)             | 4 | 23.3                               | 8.3                                          | 8.3  | 1.0  | 10.2 | 104.2                         | 10.2                                 |
| TIOGA                                  | TIOGA                  | 4 | 25.0                               | 10.0                                         | 8.3  | 2.0  | 11.3 | 115.3                         | 11.3                                 |
| MEANS (For Entries Listed)             |                        |   | 15.0                               | 6.1                                          | 4.6  | 0.9  |      |                               | 6.6                                  |
| 5/ Grow ing Season Precipitation (in.) |                        |   | n/a                                | n/a                                          | 9.0  | 5.6  | 7.3  |                               |                                      |
| Soil PAW (in.) to SD @ Planting        |                        |   | 7.1                                | 8.8                                          | 8.8  | 8.9  | 8.4  |                               |                                      |
| Total Plant Available Water (in.)      |                        |   | 2.6                                | 8.8                                          | 5.8  | n/a  | 5.8  |                               |                                      |
| Soil NO3 (lbs.) to SD at Planting      |                        |   | 50                                 | 34                                           | 34   | 64   | 46   |                               |                                      |
| SD (Sampling Depth in Inches)          |                        |   | 48                                 | 48                                           | 48   | 48   | 48   |                               |                                      |
| Fertilizer Applied                     |                        |   | (# N)                              | 70                                           | 70   | 100  | 85   |                               |                                      |
|                                        |                        |   | (# P2O5)                           | 40                                           | 40   | 20   | 30   |                               |                                      |
|                                        |                        |   | (# K2O)                            | 25                                           | 25   | 10   | 18   |                               |                                      |

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 or 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/ 4-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 = 4-Yr saw fly rating for the check variety Mountrail.

5/ 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. 2014. (Exp# 14-9853-DUR)**

| ENTRY               | CULTIVAR or SELECTION | STAND<br>% | PLNT HT<br>Inches | 1/<br>YIELD<br>Bu/Ac | TEST WT<br>Lbs/Bu | MOISTURE<br>% | 2/<br>PROTEIN<br>% | 3/<br>SAWFLY<br>% |
|---------------------|-----------------------|------------|-------------------|----------------------|-------------------|---------------|--------------------|-------------------|
| 2                   | Alkabo                | 98.4       | 29.0              | <b>37.0</b>          | 55.1              | 10.4          | 18.0               | 2.3               |
| 8                   | Alzada                | 95.9       | 24.9              | <b>35.8</b>          | 53.9              | 10.0          | 17.2               | 0.3               |
| 3                   | Carpio                | 96.5       | 29.9              | <b>34.1</b>          | 53.7              | 10.4          | 18.2               | 1.0               |
| 6                   | Divide                | 93.7       | 26.4              | <b>34.6</b>          | 55.0              | 10.3          | 18.2               | 0.7               |
| 5                   | Grenora               | 92.4       | 25.4              | 27.3                 | 54.1              | 10.1          | 17.2               | 0.3               |
| 7                   | Joppa                 | 98.1       | 31.5              | 33.4                 | 53.4              | 10.1          | 18.5               | 2.3               |
| 1                   | Mountrail             | 90.5       | 26.9              | 31.8                 | 54.5              | 10.1          | 17.7               | 0.7               |
| 11                  | MT06584 (CC1)         | 97.2       | 22.0              | 32.4                 | 52.7              | 10.0          | 18.6               | 0.3               |
| 12                  | MT101395 (CC2)        | 92.4       | 26.4              | 26.0                 | 49.5              | 10.0          | 19.4               | 0.3               |
| 13                  | MT101427 (CC2)        | 95.9       | 22.4              | 28.8                 | 52.1              | 10.0          | 18.3               | 0.0               |
| 14                  | MT101730 (CC4)        | 97.8       | 32.5              | 26.6                 | 53.7              | 10.8          | 17.6               | 0.7               |
| 10                  | Silver                | 95.9       | 23.4              | <b>33.7</b>          | 53.7              | 10.3          | 18.0               | 1.0               |
| 9                   | Strongfield           | 94.6       | 29.3              | 33.3                 | 54.5              | 10.1          | 19.7               | 0.0               |
| 4                   | Tioga                 | 97.1       | 31.5              | 33.0                 | 55.0              | 10.4          | 19.0               | 1.0               |
| EXPERIMENTAL MEANS  |                       | 95.5       | 27.2              | 32.0                 | 53.6              | 10.2          | 18.3               | 0.8               |
| LSD (0.05)          |                       | 6.3        | 2.0               | 3.4                  | 0.7               | 0.5           | 0.6                | 1.5               |
| C.V.%               |                       | 3.9        | 4.3               | 6.4                  | 0.7               | 2.9           | 2.0                | 117.1             |
| P-VALUE (Varieties) |                       | 0.3064     | <.0001            | <.0001               | <.0001            | 0.0645        | <.0001             | 0.0768            |

1/ Volumetric yields are based on plot weights adjusted to uniform 12 percent grain moisture and 60 lbs/bu as the standard test weight for durum.

2/ Protein values are adjusted to 12 percent grain moisture.

3/ 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 (14-9853-SW)

Seeding Date: May 7, 2014

Harvest Date: August 19, 2014

Fertility: 100-20-10 side banded

System: no till

Herbicide: none

Insecticide: none

Previous Crop: Chemical Fallow - Spring Wheat

Precipitation: not available