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North Dakota Durum Wheat

Variety Trial Results for 2020 and Selection Guide

Joel Ransom, Elias Elias, Andrew Friskop, Tim Friesen, Zhaohui Liu, Shaobin Zhong and Frank Manthey (NDSU Main Station); Blaine Schatz and Mike Ostlie (Carrington Research Extension Center); Glenn Martin (Dickinson Research Extension Center); Bryan Hanson (Langdon Research Extension Center); John Rickertsen (Hettinger Research Extension Center); Eric Eriksmoen (North Central Research Extension Center, Minot); Gautam Pradhan (Williston Research Extension Center).

Durum was planted on 910,000 acres in North Dakota in 2020, up 26% from 2019. The average yield was 39 bushels per acre (bu/a), down from 42.5 last year. The most commonly grown varieties in 2020 and the percent of the acreage they occupied were Joppa (29%), Divide (20%), ND Riveland (11%), VT Peak (9%), Carpio (7%) and Alkabo (6%).

Durum varieties are tested each year at multiple sites throughout North Dakota. The relative performance of these varieties is presented in table form. Variety performance data are used to provide recommendations to producers. Some varieties may not be included in the tables due to insufficient testing or lack of seed availability, or they offer no yield or disease advantage over similar varieties. Yield is reported at 13.5% moisture, while protein content is reported at 12% moisture.

The agronomic data presented in this publication are from replicated research plots using experimental designs that enable the use of statistical analysis. These analyses enable the reader to determine, at a predetermined level of confidence, if the differences observed among varieties are significant or if they might be due to error inherent in the experimental process.

The LSD (least significant difference) numbers beneath the columns in tables are derived from these statistical analyses and only apply to the numbers in the column in which they appear. If the difference between two varieties exceeds the LSD value, it means that with 95% or 90% confidence (LSD probability 0.05 or 0.10), the higher-yielding variety has a significant yield advantage. When the difference between two varieties is less than the LSD value, no significant difference occurs between those two varieties under those growing conditions.

The abbreviation NS is used to indicate no significant difference for that trait among any of the varieties at the 95% or 90% level of confidence. The CV is a measure of variability in the trial. The CV stands for coefficient of variation and is expressed as a percentage. Large CVs mean a large amount of variation that could not be attributed to differences in the varieties.

Presentation of data for the entries tested does not imply approval or endorsement by the authors or agencies conducting the test. North Dakota State University approves the reproduction of any table in the publication only if no portion is deleted, appropriate footnotes are given and the order of the data is not rearranged. Additional data from county sites are available from each Research Extension Center at www.ag.ndsu.edu/varietytrials/durum. Use data from multiple locations and years when selecting a variety.

List of Tables

Table 1. Descriptions and agronomic traits of durum wheat varieties grown in North Dakota, 2020.

Table 2. Yield of durum wheat varieties at six Research Extension Centers in North Dakota, 2018-2020.

Table 3. Test weight and protein of durum wheat varieties at six Research Extension Centers in North Dakota, 2020.

Table 4. Durum wheat variety quality descriptions, milling and processing data averaged for five years (2015-2019) from drill strips (32 locations/years).

Table 5. Durum wheat variety quality descriptions, milling and processing data for 2019 at all locations from drill strips.

Table 1. Descriptions and agronomic traits of durum wheat varieties grown in North Dakota, 2020.

| | Agent or Origin ¹ | Year Released | Height (inches) ² | Straw Strength ³ | Days to Heading ⁴ | Reaction to Disease ⁵ | | | | |
|--------------------------|------------------------------|---------------|------------------------------|-----------------------------|------------------------------|----------------------------------|-----------|----------------|-------------------|-----------|
| | | | | | | Stem Rust | Leaf Rust | Foliar Disease | Bact. Leaf Streak | Head Scab |
| AC Commander | Can. | 2002 | 25 | 5 | 57 | 1 | 1 | 6 | NA | NA |
| Alkabo | ND | 2005 | 27 | 2 | 56 | 1 | 1 | 5 | 7 | 6 |
| Alzada | WB | 2004 | 24 | 6 | 54 | 1 | 1 | 8 | NA | 9 |
| Ben | ND | 1996 | 28 | 4 | 56 | 1 | 1 | 4 | 7 | 8 |
| Carpio | ND | 2012 | 27 | 5 | 58 | 1 | 1 | 5 | 6 | 5 |
| CDC Verona | Can. | 2010 | 27 | 5 | 58 | 1 | 1 | 4 | NA | 8 |
| Divide | ND | 2005 | 27 | 5 | 58 | 1 | 1 | 5 | 7 | 5 |
| Grenora | ND | 2005 | 26 | 5 | 55 | 1 | 1 | 5 | 7 | 6 |
| Joppa | ND | 2013 | 27 | 5 | 57 | 1 | 1 | 5 | 7 | 5 |
| Lebsock | ND | 1999 | 27 | 3 | 55 | 1 | 1 | 5 | 7 | 6 |
| Maier | ND | 1998 | 27 | 5 | 56 | 1 | 1 | 5 | NA | 8 |
| Mountrail | ND | 1998 | 27 | 5 | 57 | 1 | 1 | 5 | 7 | 8 |
| ND Grano ⁶ | ND | 2017 | 27 | 5 | 57 | 1 | 1 | 8 | 7 | 6 |
| ND Riveland ⁶ | ND | 2017 | 29 | 4 | 57 | 1 | 1 | 4 | 7 | 5 |
| Pierce | ND | 2001 | 28 | 5 | 56 | 1 | 1 | 6 | 7 | 8 |
| Rugby | ND | 1973 | 29 | 5 | 56 | 1 | 1 | 4 | NA | 8 |
| Strongfield ⁶ | Can. | 2004 | 26 | 6 | 58 | 1 | 1 | 6 | NA | 8 |
| Tioga | ND | 2010 | 29 | 4 | 57 | 1 | 1 | 5 | 7 | 6 |
| VT Peak | Viterra | 2010 | 28 | 6 | 56 | 1 | NA | NA | NA | NA |

¹Refers to agent or developer: Can. = Agriculture Canada, WB = Westbred, ND = North Dakota State University.

²Plant height was obtained from the average of several locations in 2020.

³Straw Strength = 1-9 scale, with 1 the strongest and 9 the weakest. Based on recent data. These values may change as more data become available.

⁴Days to Heading = the number of days from planting to head emergence from the boot. Averaged from several locations in 2020.

⁵Disease reaction scores from 1-9, with 1 = resistant and 9 = very susceptible. NA = Not adequately tested. Foliar Disease = reaction to tan spot and septoria leaf spot complex.

⁶Low cadmium accumulating variety.

Table 2. Yield of durum wheat varieties at six Research Extension Centers in North Dakota, 2018-2020.

| Variety | <u>Carrington</u> | | <u>Langdon</u> | | <u>Dickinson</u> | | <u>Hettinger</u> | | <u>Minot</u> | | <u>Williston</u> | | <u>Average</u> | |
|--------------|-------------------|-------|----------------|-------|------------------|-------|------------------|-------|--------------|-------|------------------|-------|----------------|-------|
| | 2020 | 3 Yr. | 2020 | 3 Yr. | 2020 | 3 Yr. | 2020 | 3 Yr. | 2020 | 3 Yr. | 2020 | 3 Yr. | 2020 | 3 Yr. |
| | ------(bu/a)----- | | | | | | | | | | | | | |
| AC Commander | 33.4 | 38.8 | 58.6 | 66.0 | 39.2 | 47.0 | 23.3 | 39.4 | 65.3 | 56.6 | 29.5 | 43.7 | 41.6 | 48.6 |
| Alkabo | 32.0 | 40.7 | 79.7 | 75.6 | 39.4 | 49.8 | 22.1 | 44.6 | 64.2 | 58.3 | 28.2 | 42.3 | 44.3 | 51.9 |
| Alzada | 32.1 | 33.5 | 47.5 | 53.9 | 35.4 | 41.4 | 16.7 | 33.5 | 44.7 | 46.1 | 25.1 | 38.3 | 33.6 | 41.1 |
| Ben | 31.7 | 38.2 | 74.5 | 72.7 | 36.1 | 48.4 | 20.4 | 37.5 | 54.0 | 59.3 | 26.9 | 39.7 | 40.6 | 49.3 |
| Carpio | 39.0 | 48.2 | 77.0 | 79.9 | 36.4 | 47.1 | 20.5 | 42.0 | 60.8 | 65.1 | 29.3 | 41.2 | 43.8 | 53.9 |
| CDC Verona | 37.8 | 44.9 | 61.3 | 69.5 | 41.7 | 51.9 | 25.8 | 43.2 | 53.3 | 55.2 | 31.2 | 43.6 | 41.9 | 51.4 |
| Divide | 30.2 | 43.4 | 78.0 | 78.5 | 38.3 | 50.1 | 19.5 | 41.5 | 54.2 | 62.3 | 31.6 | 42.9 | 42.0 | 53.1 |
| Grenora | 35.8 | 43.8 | 83.5 | 80.2 | 39.5 | 49.0 | 22.9 | 43.0 | 68.4 | 59.9 | 30.7 | 43.6 | 46.8 | 53.2 |
| Joppa | 28.4 | 43.8 | 75.9 | 80.3 | 41.5 | 52.8 | 21.6 | 40.8 | 68.5 | 66.8 | 27.4 | 41.6 | 43.9 | 54.3 |
| Lebsock | 30.2 | 39.1 | 74.9 | 73.9 | 38.0 | 50.4 | 20.4 | 39.5 | 65.2 | 62.9 | 25.5 | 39.8 | 42.4 | 50.9 |
| Maier | 28.4 | 36.9 | 61.5 | 70.0 | 35.1 | 46.8 | 18.2 | 38.9 | 63.1 | 58.9 | 23.2 | 40.6 | 38.3 | 48.7 |
| Mountrail | 33.7 | 41.6 | 70.2 | 75.1 | 40.9 | 52.6 | 23.7 | 42.8 | 70.0 | 68.0 | 25.9 | 42.5 | 44.1 | 53.8 |
| ND Grano | 38.0 | 45.5 | 75.2 | 76.2 | 38.7 | 52.4 | 24.1 | 42.4 | 66.8 | 68.1 | 26.5 | 39.9 | 44.9 | 54.1 |
| ND Riveland | 41.8 | 51.6 | 79.2 | 79.9 | 38.3 | 48.1 | 22.5 | 43.9 | 67.7 | 61.6 | 29.4 | 42.2 | 46.5 | 54.5 |
| Pierce | 34.9 | 42.1 | 75.5 | 78.6 | 37.8 | 47.3 | 21.5 | 41.1 | 67.7 | 60.7 | 26.1 | 39.5 | 43.9 | 51.6 |
| Rugby | 38.9 | 44.2 | 62.6 | 67.2 | 36.9 | 48.2 | 23.1 | 38.1 | 61.6 | 56.7 | 27.5 | 39.8 | 41.8 | 49.0 |
| Strongfield | 32.2 | 43.0 | 61.9 | 67.5 | 36.2 | 48.8 | 21.1 | 42.3 | 63.4 | 59.2 | 25.5 | 42.2 | 40.0 | 50.5 |
| Tioga | 30.9 | 43.2 | 76.7 | 78.5 | 37.6 | 51.0 | 20.5 | 39.0 | 66.2 | 63.5 | 24.2 | 42.6 | 42.7 | 53.0 |
| VT Peak | 23.9 | 41.0 | 79.9 | 77.9 | 37.7 | 49.5 | 24.2 | 45.4 | 64.5 | 64.8 | 27.7 | 42.2 | 43.0 | 53.5 |
| Mean | 33.3 | 42.3 | 71.2 | 73.8 | 38.1 | 49.1 | 21.7 | 41.0 | 62.6 | 60.7 | 27.4 | 41.5 | 42.4 | 51.4 |
| CV % | 15.3 | -- | 8.6 | -- | 7.4 | -- | 10.6 | -- | 6.7 | -- | 11.3 | -- | -- | -- |
| LSD 0.05 | 7.7 | -- | 8.8 | -- | 4.0 | -- | 3.3 | -- | 7.1 | -- | 4.9 | -- | 4.8 | 2.9 |
| LSD 0.10 | 6.5 | -- | 7.4 | -- | 3.3 | -- | 2.7 | -- | 6.0 | -- | 4.1 | -- | 4.8 | 2.4 |

Table 3. Test weight and protein of durum wheat varieties at six Research Extension Centers in North Dakota, 2020.

| Variety | <u>Carrington</u> | | <u>Langdon</u> | | <u>Dickinson</u> | | <u>Hettinger</u> | | <u>Minot</u> | | <u>Williston</u> | | <u>Average</u> | |
|--------------|-------------------|---------|----------------|---------|------------------|---------|------------------|---------|--------------|---------|------------------|---------|----------------|---------|
| | Test | Test | Test | Test | Test | Test | Test | Test | Test | Test | Test | Test | Test | |
| | Wt. | Protein | Wt. | Protein | Wt. | Protein | Wt. | Protein | Wt. | Protein | Wt. | Protein | Wt. | Protein |
| | lb/bu | % | lb/bu | | lb/bu | % | lb/bu | % | lb/bu | % | lb/bu | % | lb/bu | % |
| AC Commander | 58.4 | 16.5 | 54.7 | | 60.2 | 15.4 | 57.0 | 15.3 | 58.5 | 14.6 | 58.9 | 18.0 | 58.0 | 16.0 |
| Alkabo | 58.7 | 16.0 | 59.8 | | 60.4 | 14.1 | 58.6 | 13.8 | 60.4 | 13.5 | 59.3 | 16.6 | 59.5 | 14.8 |
| Alzada | 58.8 | 16.3 | 54.1 | | 58.9 | 14.6 | 54.7 | 15.3 | 55.3 | 13.9 | 58.3 | 17.1 | 56.7 | 15.4 |
| Ben | 58.8 | 16.7 | 59.5 | | 60.3 | 15.6 | 57.8 | 15.1 | 59.1 | 14.4 | 58.7 | 17.8 | 59.0 | 15.9 |
| Carpio | 58.9 | 16.2 | 59.5 | | 59.7 | 14.7 | 57.5 | 14.6 | 61.4 | 13.0 | 59.4 | 16.2 | 59.4 | 14.9 |
| CDC Verona | 57.9 | 16.7 | 54.9 | | 61.2 | 15.3 | 59.0 | 15.0 | 59.5 | 13.7 | 58.8 | 18.6 | 58.5 | 15.9 |
| Divide | 57.3 | 17.0 | 58.6 | | 60.1 | 14.9 | 58.4 | 14.6 | 60.0 | 14.3 | 58.6 | 17.5 | 58.8 | 15.7 |
| Grenora | 58.8 | 16.1 | 58.4 | | 60.0 | 15.5 | 57.6 | 14.5 | 59.2 | 13.6 | 58.9 | 17.0 | 58.8 | 15.3 |
| Joppa | 57.9 | 15.8 | 58.3 | | 61.1 | 14.2 | 58.9 | 14.1 | 60.3 | 13.4 | 58.9 | 16.8 | 59.2 | 14.9 |
| Lebsock | 58.6 | 16.5 | 60.4 | | 60.8 | 14.9 | 58.4 | 14.2 | 60.3 | 13.8 | 59.2 | 16.8 | 59.6 | 15.2 |
| Maier | 58.3 | 17.4 | 56.0 | | 59.8 | 15.8 | 57.4 | 15.7 | 59.9 | 14.7 | 58.5 | 18.5 | 58.3 | 16.4 |
| Mountrail | 57.5 | 16.5 | 57.4 | | 59.7 | 14.5 | 58.6 | 13.9 | 58.9 | 13.0 | 58.2 | 17.4 | 58.4 | 15.0 |
| ND Grano | 59.8 | 16.1 | 58.2 | | 60.7 | 15.4 | 59.2 | 13.9 | 60.7 | 13.5 | 59.4 | 17.6 | 59.7 | 15.3 |
| ND Riveland | 59.8 | 15.8 | 58.7 | | 60.2 | 14.9 | 58.5 | 14.3 | 61.4 | 13.7 | 59.0 | 17.7 | 59.6 | 15.3 |
| Pierce | 59.6 | 16.5 | 59.1 | | 60.5 | 15.1 | 58.8 | 14.2 | 60.7 | 13.4 | 59.7 | 16.2 | 59.7 | 15.1 |
| Rugby | 59.0 | 16.1 | 57.1 | | 60.5 | 14.9 | 58.2 | 14.3 | 59.4 | 14.5 | 58.8 | 18.1 | 58.8 | 15.6 |
| Strongfield | 58.0 | 17.7 | 56.2 | | 59.9 | 15.9 | 57.9 | 15.1 | 58.7 | 15.1 | 58.5 | 19.4 | 58.2 | 16.6 |
| Tioga | 57.9 | 16.2 | 58.4 | | 59.7 | 15.2 | 56.8 | 14.4 | 61.5 | 14.0 | 59.7 | 16.9 | 59.0 | 15.3 |
| VT Peak | 56.6 | 17.1 | 59.6 | | 61.6 | 15.4 | 59.2 | 15.0 | 61.4 | 13.7 | 59.8 | 17.6 | 59.7 | 15.8 |
| Mean | 58.7 | 16.4 | 58.3 | | 60.2 | 15.1 | 58.1 | 14.6 | 59.8 | 13.9 | 58.9 | 17.8 | 58.9 | 15.5 |
| CV % | 1.7 | 2.7 | 1.8 | | 0.9 | 3.5 | 1.2 | 2.9 | 1.8 | 4.9 | 0.7 | 2.1 | -- | -- |
| LSD 0.05 | 1.3 | 0.6 | 1.5 | | 0.8 | 0.7 | 1.0 | 0.6 | 1.7 | 1.1 | 0.6 | 0.6 | 1.0 | 0.4 |
| LSD 0.10 | 1.1 | 0.5 | 1.3 | | 0.9 | 0.6 | 0.8 | 0.5 | 1.5 | 0.9 | 0.5 | 0.5 | 0.8 | 0.3 |

Table 4. Durum wheat variety quality descriptions, milling and processing data averaged for five years (2015-2019) from drill strips (32 locations/years).

| Variety | Test Weight | Vitreous Kernels | Large Kernels | Falling Number | Wheat Protein ¹ | Gluten Index ² | Pasta Color ³ | Spaghetti Firmness ⁴ | Overall Quality ⁵ |
|-------------|-------------|------------------|---------------|----------------|----------------------------|---------------------------|--------------------------|---------------------------------|------------------------------|
| | (lb/bu) | (%) | (%) | (sec) | (%) | | (1-12) | (g-cm) | |
| Alkabo | 61.5 | 81 | 56 | 415 | 13.8 | 46 | 8.5 | 3.8 | good |
| Alzada | 59.5 | 86 | 64 | 505 | 14.5 | 84 | 8.1 | 4.3 | good |
| Carpio | 61.6 | 79 | 65 | 480 | 14.0 | 91 | 8.5 | 4.1 | excellent |
| Divide | 61.2 | 85 | 57 | 473 | 14.2 | 73 | 8.3 | 3.9 | good |
| Joppa | 61.4 | 86 | 49 | 461 | 13.7 | 82 | 8.7 | 3.9 | good |
| Maier | 60.8 | 87 | 52 | 439 | 14.7 | 54 | 8.3 | 4.1 | good |
| Mountrail | 60.6 | 89 | 47 | 456 | 14.2 | 25 | 7.9 | 3.7 | fair |
| ND Grano | 61.5 | 84 | 52 | 477 | 14.2 | 66 | 8.7 | 4.0 | excellent |
| ND Riveland | 61.3 | 88 | 62 | 466 | 14.2 | 80 | 8.5 | 4.0 | excellent |
| Strongfield | 60.6 | 88 | 56 | 468 | 14.8 | 66 | 8.0 | 4.1 | good |
| Tioga | 61.1 | 84 | 62 | 423 | 14.1 | 74 | 8.2 | 4.1 | good |
| Average | 61.0 | 85 | 57 | 460 | 14.2 | 67 | 8.3 | 4.0 | |

For all numbered footnotes, refer to bottom of Table 5.

Table 5. Durum wheat variety quality descriptions, milling and processing data for 2019 at all locations from drill strips.

| Variety | Test Weight | Vitreous Kernels | Large Kernels | Falling Number | Wheat Protein ¹ | Gluten Index ² | Pasta Color ³ | Spaghetti Firmness ⁴ | Overall Quality ⁵ |
|-------------|-------------|------------------|---------------|----------------|----------------------------|---------------------------|--------------------------|---------------------------------|------------------------------|
| | (lb/bu) | (%) | (%) | (sec) | (%) | | (1-12) | (g-cm) | |
| Alkabo | 61.3 | 79 | 68 | 335 | 13.8 | 50 | 7.6 | 3.5 | good |
| Alzada | 59.1 | 79 | 72 | 462 | 14.6 | 83 | 6.9 | 4.0 | good |
| Carpio | 61.7 | 74 | 79 | 447 | 14.0 | 93 | 7.9 | 3.8 | good |
| Divide | 61.4 | 81 | 71 | 439 | 14.0 | 80 | 7.8 | 3.5 | good |
| Joppa | 61.5 | 84 | 61 | 420 | 13.9 | 83 | 8.4 | 3.6 | good |
| Maier | 60.9 | 85 | 64 | 371 | 14.7 | 51 | 7.6 | 3.7 | good |
| Mountrail | 60.5 | 87 | 60 | 393 | 14.4 | 22 | 6.7 | 3.3 | fair |
| ND Grano | 61.4 | 86 | 66 | 418 | 14.3 | 69 | 8.1 | 3.6 | good |
| ND Riveland | 61.1 | 88 | 71 | 437 | 14.6 | 85 | 7.8 | 3.8 | good |
| Strongfield | 60.4 | 88 | 70 | 403 | 15.3 | 66 | 7.0 | 3.8 | good |
| Tioga | 60.7 | 79 | 77 | 352 | 14.3 | 78 | 7.0 | 3.7 | good |
| Average | 60.9 | 83 | 69 | 407 | 14.4 | 69 | 7.5 | 3.7 | |

¹Wheat protein is reported on a 12% moisture basis.

²Gluten index is unitless. Numbers less than 15 = very weak and greater than 80 = very strong gluten proteins.

³Pasta Color Score: Higher number indicates better color, with 8.5+ typically considered good.

⁴Work required to cut through a strand of spaghetti.

⁵Overall Quality is determined based on agronomic, milling and spaghetti processing performance.

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