Ag. Report No. 37

# Thirty-Seventh Annual Western Dakota Crops Day Research Report 2020

NDSU HETTINGER RESEARCH EXTENSION CENTER

John Rickertsen, Research Agronomist
Caleb Dalley, Weed Scientist
Daniel Abe, UAV & Weed Science Tech
Michael Wells, Agronomy Tech
www.ag.ndsu.edu/HettingerREC

# Acknowledgments

The Hettinger Research Extension Center gratefully acknowledges and thank the following individuals for their willingness to cooperate with us at off-station plot sites and in providing us with materials for this publication. Their participation has enabled us to compile the enclosed information which would not otherwise be possible.

Glenn Martin, Dickinson Research Extension Center
Ryan Buetow, Dickinson Research Extension Center
Dr. Joel Ransom, NDSU, Fargo
Dr. Hans Kandel, NDSU, Fargo
Neal and Justin Freitag, Scranton
August and Perry Kirschmann, Regent
Dan Christman, Hettinger
USDA – ARS Northern Great Plains Research Center, Mandan
Keith Gietzen, Glen Ullin
Pat Doll, Hannover

This work is supported by the USDA National Institute of Food and Agriculture, Hatch projects ND06278 & ND06280.

# Table of Contents

## Trials Not Published

The following trials were not published in this report because of very poor yields and significant plot variation. Trial average yields are reported below.

| Trial | Average Yield |
|---|---|
| Hettinger HRSW VT | 23.6 bu/ac |
| Hettinger Canola Trials | Not harvested due to hail damage |
| Hettinger Winter Wheat VT | Not harvested due to poor stands |

# Interpreting Statistical Analysis

Field research involves the testing of one or more variables such as crop varieties, fertilizer rates, weed control methods, planting dates, etc. Field testing of such variables is conducted in order to determine which variety, fertilizer rate, herbicide, date, etc. is best for the particular area of production. The main objectives of crop production research are to determine the best means of producing a crop and how to maximize yield and economic return from farming.

Agricultural researchers use statistics as a tool to help differentiate production variables so meaningful conclusions can be drawn from the data gathered from research trials. Attempts are made to control human error and environmental conditions such as soil variability by replicating the variable in question. For example, there were four plots (replications) of the every variety grown in the Hettinger HRSW variety trial. These plots are randomly placed throughout the trial to help eliminate differences that might be a result of soil or other variations.

The coefficient of variation (C.V.%) listed at the bottom of each data column is a relative measure of the amount of variation recorded for a particular trait expressed as a percentage of the mean for that trait. It is a measure of the precision or effectiveness of the trial and the procedures used in conducting it. The numbers that you see in the tables are an average of all four replications. The C.V. for yield in the 2020 Scranton HRSW variety trial was 5.9% meaning that there was a 5.9 percent average variation between high and low yields among replications. In summation, a trial with a C.V. of 6% is more precise and reliable than a trial with a C.V. of 18%. When comparing yields, trials with a C.V. less than 15% are generally considered reliable.

To determine if one variety, fertilizer rate, herbicide, planting date, etc. is better than another, use the least significant difference (LSD 5%) value at the bottom of each data column. The LSD 5% value is a statistical method of indicating if a trait like yield differs when comparing two hybrids. If the yield of hybrid A exceeds hybrid B by more than the LSD value, you can conclude that under like environmental conditions, hybrid A is expected to significantly out-yield hybrid B. The LSD value allows you to separate variety yields or any other variable and determine whether or not they are actually different.

For example, in the HRSW trial at Scranton, the variety “Elgin ND” averaged 48.3 bu/ac in 2020 compared to “Bolles” at 39.6 bu/ac. Did the yield difference between these varieties differ significantly? Compare the yield difference of 8.7 bu/ac between the varieties (48.3 – 39.6) to the LSD 5% value of 5.9 bu/ac. Since the 8.7 bu/ac difference is more than the LSD value of 5.9 bu/a, the varieties do differ significantly in yield. If the difference between these two varieties would have been 5.0 bu/ac, their difference would have been less than 5.9 bu/ac; therefore, the yield difference between these varieties would not have been statiscally significant.

When selecting a variety or hybrid evaluate as much performance information as possible. Give more weight to information from trials close to home and look at relative performance over many locations and years. Performance averaged over many tests is called “yield stability.”
Good yield stability means that, while a variety may or may not be the best yielder at all locations, it ranks high in yielding potential at many locations and years. A hybrid that ranks in the upper 20% at all locations exhibits better yield stability than one that is the top variety at one location but ranks in the lower 40% at the other locations.

## Weather Summary – Hettinger

**Frost Free Days**

| | 28ºF | 32ºF | 50% Probability 32ºF |
|---|---|---|---|
| Date of Last Frost | May 11 | May 11 | May 20 |
| Date of First Frost | September 8 | September 8 | September 16 |
| **Frost Free Days** | **120** | **120** | **119** |

**Precipitation (inches)**

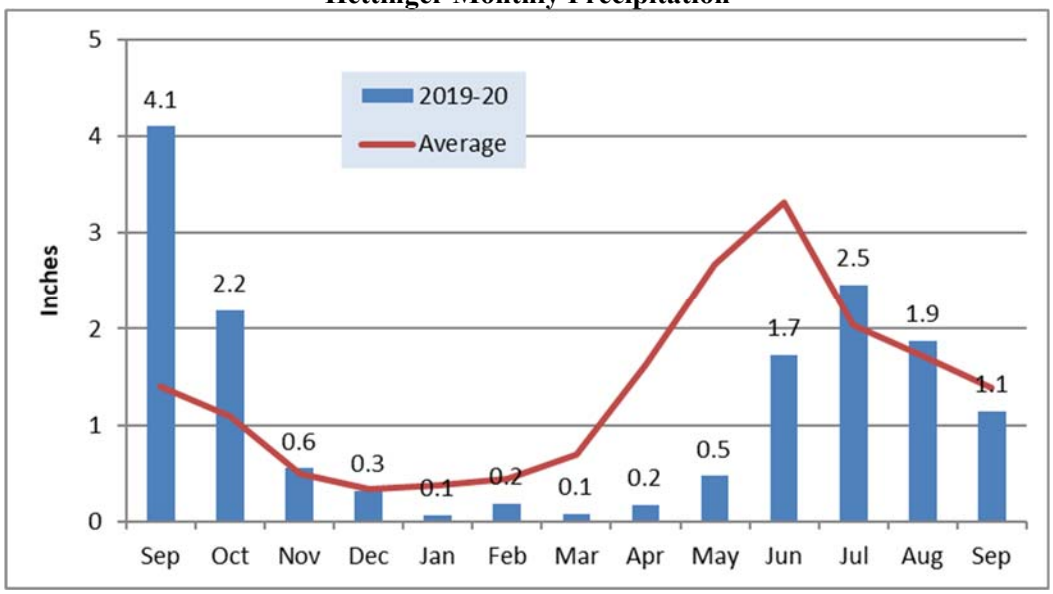
| Month | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 65 Year Average |
|---|---|---|---|---|---|---|
| October | 2.0 | 0.9 | 0.0 | 0.6 | 2.2 | 1.1 |
| November | 0.0 | 0.4 | 0.2 | 0.7 | 0.6 | 0.5 |
| December | 0.5 | 0.1 | 0.2 | 0.4 | 0.3 | 0.3 |
| January | 0.2 | 0.6 | 0.3 | 0.4 | 0.1 | 0.4 |
| February | 0.4 | 0.2 | 0.6 | 1.1 | 0.2 | 0.4 |
| March | 0.2 | 0.9 | 0.3 | 0.3 | 0.1 | 0.7 |
| April | 3.7 | 1.2 | 1.6 | 1.3 | 0.2 | 1.6 |
| May | 1.0 | 0.6 | 1.7 | 4.0 | 0.5 | 2.7 |
| June | 0.9 | 0.3 | 3.7 | 3.9 | 1.7 | 3.3 |
| July | 1.5 | 1.7 | 2.7 | 2.1 | 2.5 | 2.0 |
| August | 1.7 | 1.8 | 0.9 | 3.0 | 1.9 | 1.7 |
| September | 2.3 | 1.9 | 1.7 | 4.1 | 1.1 | 1.4 |
| **April-August** | **8.9** | **5.6** | **10.6** | **14.4** | **6.7** | **11.4** |
| **Total** | **14.4** | **10.6** | **13.9** | **21.9** | **11.2** | **16.2** |

**Air Temperature (°F)**

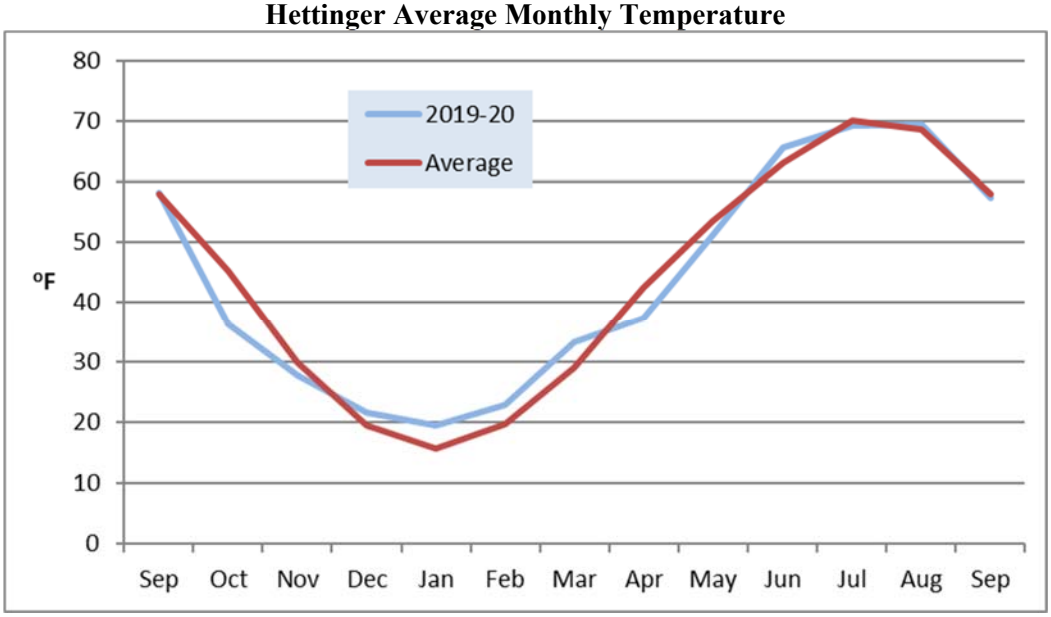
| Month | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 65 Year Average |
|---|---|---|---|---|---|---|
| October | 48.5 | 48.1 | 44.9 | 40.5 | 36.3 | 45.3 |
| November | 32.4 | 39.5 | 32.4 | 27.7 | 27.9 | 30.0 |
| December | 23.9 | 10.1 | 19.0 | 24.0 | 21.6 | 19.6 |
| January | 20.1 | 11.8 | 17.1 | 17.8 | 19.5 | 15.6 |
| February | 32.0 | 24.6 | 6.0 | -0.6 | 22.8 | 19.7 |
| March | 38.8 | 34.1 | 27.4 | 20.3 | 33.3 | 29.2 |
| April | 44.2 | 43.6 | 35.1 | 42.0 | 37.5 | 42.4 |
| May | 54.2 | 55.2 | 58.7 | 47.2 | 51.3 | 53.6 |
| June | 68.7 | 66.1 | 65.4 | 61.9 | 65.7 | 63.2 |
| July | 72.0 | 76.3 | 69.1 | 68.8 | 69.4 | 70.2 |
| August | 69.0 | 66.8 | 67.8 | 65.4 | 69.5 | 68.6 |
| September | 60.7 | 58.2 | 56.3 | 58.3 | 57.4 | 58.0 |
| **Average** | **47.0** | **44.5** | **41.6** | **39.4** | **42.7** | **43.0** |

| Corn Growing Degree Days (GDD) | | | | | | |
|---|---|---|---|---|---|---|
| Month | 2016 | 2017 | 2018 | 2019 | 2020 | 48 Year Average |
| May | 298 | 297 | 371 | 154 | 218 | 259 |
| June | 545 | 519 | 467 | 409 | 505 | 424 |
| July | 626 | 699 | 579 | 556 | 593 | 587 |
| August | 568 | 520 | 511 | 529 | 586 | 537 |
| September | 380 | 339 | 321 | 393 | 336 | 327 |
| **Total** | **2417** | **2374** | **2249** | **2041** | **2238** | **2135** |

**Hettinger Monthly Precipitation**




**Hettinger Average Monthly Temperature**



**2020 Weather Summary for the Dickinson Research Extension Center Ranch Headquarters, Manning, ND.**

| | ----Maximum temp. | | -------Minimum temp. | | ---------Precipitation | | --------Small grains GDD[1] | | -----Corn GDD[2] | |
|---|---|---|---|---|---|---|---|---|---|---|
| Month | Long Term 1983 - 2020 | Current Year | Long Term 1983 - 2020 | Current Year | Long Term 1983 - 2020 | Current year | Long Term 1983 - 2020 | Current year | Long Term 1983 - 2020 | Current year |
| | ----------°F ---------- | | ---------- °F ---------- | | ----- inches ----- | | | | | |
| November - 19 | 39.5 | 36.5 | 18.9 | 17.9 | 0.56 | 0.75 | | | | |
| December - 19 | 26.9 | 29.8 | 7.8 | 12.6 | 0.44 | 0.58 | | | | |
| January | 24.9 | 25.5 | 5.7 | 7.0 | 0.42 | 0.68 | | | | |
| February | 28.4 | 31.0 | 8.6 | 11.4 | 0.44 | 0.44 | | | | |
| March | 40.0 | 42.8 | 18.8 | 21.7 | 0.74 | 0.27 | | | | |
| April | 54.3 | 51.1 | 29.1 | 24.4 | 1.41 | 0.59 | 333 | 332 | | |
| May | 66.3 | 65.5 | 40.7 | 38.1 | 2.58 | 1.45 | 673 | 637 | 256 | 252 |
| June | 76.1 | 80.9 | 50.6 | 51.2 | 3.12 | 1.10 | 925 | 1021 | 401 | 493 |
| July | 83.6 | 82.9 | 55.7 | 55.6 | 2.31 | 2.67 | 1169 | 1155 | 611 | 583 |
| August | 82.7 | 84.5 | 54.0 | 54.7 | 2.01 | 2.56 | 1127 | 1163 | 569 | 578 |
| September | 71.4 | 71.6 | 43.9 | 42.5 | 1.70 | 0.86 | 770 | 756 | 322 | 327 |
| October | 55.9 | 50.4 | 31.1 | 26.1 | 1.17 | 0.26 | | | | |
| Mean | 54.2 | 54.4 | 30.4 | 30.3 | | | | | | |
| Total | | | | | 16.91 | 12.21 | 4998 | 5062 | 2159 | 2231 |

[1] Small grains GDD, is growing degree days calculated with 95°F as the maximum temperature and 32°F as the base temperature.

[2] Corn GDD, is growing degree days calculated with 86°F as the maxium temperature and 50°F as the base temperature.

Source: Dickinson Research Extension Center. Data compiled by Garry Ottmar, Ranch Manager; Ryan Buetow, Area Extension Specialist/ Cropping System; and Sheri Schneider, Information Processing Specialist.

**North Dakota hard red spring wheat variety descriptions, agronomic traits, 2020.**

| Variety | Agent or Origin[1] | Year Released | Height (inches) | Straw Strength[2] | Days to Head[3] | Reaction to Disease[4] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Stem Rust[5] | Leaf Rust | Stripe Rust | Tan Spot | Bact. Leaf Streak | Head Scab |
| AP Murdock | Syngenta/AgriPro | 2019 | 26 | 4 | 53 | 1 | NA | NA | NA | 5 | 6 |
| Ambush | Dyna-Gro | 2016 | 27 | 5 | 53 | 1 | 4 | 3 | 4 | 6 | 5 |
| Ballistic | Dyna-Gro | 2018 | 28 | 3 | 54 | 1 | 5 | NA | NA | 5 | 3 |
| Barlow | ND | 2009 | 28 | 6 | 52 | 1 | 6 | 4 | 4 | 4 | 4 |
| Bolles | MN | 2015 | 28 | 4 | 56 | 1 | 3 | 5 | 4 | 6 | 5 |
| Boost | SD | 2016 | 29 | 5 | 56 | 1 | 4 | 3 | 8 | 2 | 5 |
| Commander | Dyna-Gro | 2019 | 27 | 3 | 53 | 1 | 4 | NA | 3 | 4 | 5 |
| CP3530 | Croplan | 2015 | 30 | 5 | 56 | 1 | 2 | 8 | 6 | 5 | 5 |
| **CP3903** | **Croplan** | **2020** | **27** | **2** | **53** | **1** | **7** | **NA** | **NA** | **5** | **4** |
| CP3910 | Croplan | 2019 | 26 | 5 | 52 | 1 | 1 | NA | 8 | 8 | 6 |
| CP3915 | Croplan | 2019 | 27 | 4 | 54 | 1 | 1 | NA | 7 | 4 | 5 |
| Dagmar[6] | MT | 2019 | 27 | 6 | 53 | 1 | 7 | NA | NA | 7 | 7 |
| Driver | SD | 2019 | 28 | 3 | 55 | 1 | 1 | NA | NA | 7 | 3 |
| Elgin-ND | ND | 2012 | 30 | 5 | 53 | 1 | 6 | 5 | 6 | 6 | 4 |
| Faller | ND | 2007 | 28 | 5 | 56 | 1 | 7 | 8 | 7 | 5 | 4 |
| Glenn | ND | 2005 | 30 | 4 | 52 | 1 | 6 | 4 | 6 | 4 | 4 |
| Lang-MN | MN | 2017 | 28 | 5 | 55 | 1 | 2 | 1 | 4 | 3 | 3 |
| Lanning | MT | 2017 | 26 | 4 | 54 | 1 | 7 | NA | NA | 8 | 6 |
| **LCS Buster** | **Limagrain** | **2020** | **28** | **6** | **59** | **NA** | **NA** | **NA** | **NA** | **4** | **5** |
| LCS Cannon | Limagrain | 2018 | 26 | 4 | 51 | 1 | 7 | NA | 5 | 7 | 6 |
| LCS Rebel | Limagrain | 2017 | 29 | 6 | 52 | 1 | 7 | 4 | 3 | 4 | 5 |
| LCS Trigger | Limagrain | 2016 | 29 | 5 | 60 | 1 | 1 | 2 | 6 | 3 | 3 |
| Linkert | MN | 2013 | 25 | 2 | 54 | 1 | 3 | 1 | 4 | 6 | 5 |
| **MN-Torgy** | **MN** | **2020** | **27** | **3** | **54** | **1** | **4** | **NA** | **NA** | **3** | **3** |
| MN-Washburn | MN | 2019 | 26 | 3 | 56 | 1 | 1 | NA | 6 | 5 | 5 |
| MS Barracuda | Meridian Seeds | 2018 | 25 | 4 | 51 | 1 | 2 | NA | 7 | 7 | 6 |
| MS Chevelle | Meridian Seeds | 2014 | 26 | 5 | 53 | 1 | 4 | 3 | 6 | 7 | 6 |
| **MS Ranchero** | **Meridian Seeds** | **2020** | **27** | **5** | **54** | **1** | **4** | **NA** | **NA** | **6** | **6** |
| **ND Frohberg** | **ND** | **2020** | **29** | **4** | **54** | **1** | **5** | **NA** | **NA** | **4** | **5** |
| ND VitPro | ND | 2016 | 28 | 3 | 53 | 1 | 4 | 3 | 7 | 4 | 4 |
| Shelly | MN | 2016 | 26 | 4 | 56 | 1 | 6 | 5 | 3 | 7 | 5 |
| SY 611CL2 | Syngenta/AgriPro | 2019 | 25 | 5 | 54 | 1 | 6 | NA | 4 | 6 | 5 |
| SY Ingmar | Syngenta/AgriPro | 2014 | 27 | 3 | 54 | 1 | 3 | 6 | 6 | 4 | 5 |
| SY Longmire[6] | Syngenta/AgriPro | 2019 | 27 | 4 | 54 | 1 | 7 | NA | 2 | 6 | 7 |
| SY McCloud | Syngenta/AgriPro | 2019 | 27 | 4 | 54 | 1 | 5 | NA | 7 | 8 | 5 |
| SY Rockford | Syngenta/AgriPro | 2017 | 27 | 4 | 55 | 1 | 6 | NA | 2 | 8 | 6 |
| SY Soren | Syngenta/AgriPro | 2011 | 25 | 3 | 54 | 1 | 2 | 7 | 2 | 7 | 7 |
| SY Valda | Syngenta/AgriPro | 2015 | 26 | 4 | 54 | 1 | 2 | 7 | 6 | 6 | 5 |
| TCG-Heartland | 21st Century Genetics | 2019 | 26 | 3 | 52 | 1 | 2 | NA | 5 | 7 | 6 |
| TCG-Spitfire | 21st Century Genetics | 2015 | 27 | 3 | 57 | 1 | 5 | 4 | 8 | 4 | 6 |
| **TCG-Wildcat** | **21st Century Genetics** | **2020** | **27** | **3** | **55** | **1** | **5** | **NA** | **NA** | **5** | **NA** |
| Velocity | Dyna-Gro | 2019 | 27 | 3 | 54 | 1 | 2 | NA | NA | 6 | 5 |

[1]Refers to agent or developer: MN = University of Minnesota; MT = Montana State University; ND = North Dakota State University; SD = South Dakota State University. Bold varieties are those recently released, so data are limited and rating values may change.

[2]Straw Strength = 1 to 9 scale, with 1 the strongest and 9 the weakest. These values are based on recent data and may change as more data become available.

[3]Days to Head = the number of days from planting to head emergence from the boot, averaged based on data from several locations in 2020.

[4]Disease reaction scores from 1 to 9, with 1 = resistant and 9 = very susceptible, NA = not available.

[5]Fargo stem rust nursery inoculated with Puccinia graminis f. sp. Tritici races TPMK, TMLK, RTQQ, QFCQ and QTHJ.

[6]Solid stemmed or semisolid stem, imparting resistance to sawfly.

**Quality data from 2019 western North Dakota locations.**

| Variety | Test Weight[1] | Vitreous Kernels[2] | 1,000 KWT[3] | Falling Number[4] | Wheat Protein[5] | Flour Extraction[6] | Farinograph Absorption[7] | Farinograph Stability[8] | Loaf Volume[9] |
|---|---|---|---|---|---|---|---|---|---|
| | (lb/bu) | (%) | (gram) | (seconds) | (%) | (%) | (%) | (minutes) | (cubic cm) |
| Ambush | 61.8 | 42 | 38.3 | 393 | 16.4 | 66.0 | 62.7 | 10.7 | 975 |
| Barlow | 61.7 | 59 | 35.9 | 370 | 16.0 | 67.8 | 66.3 | 16.1 | 1,003 |
| Bolles | 60.2 | 53 | 37.1 | 446 | 17.8 | 64.4 | 65.4 | 30.7 | 990 |
| Boost | 60.3 | 55 | 37.4 | 424 | 15.7 | 66.8 | 65.3 | 8.5 | 988 |
| Commander | 61.3 | 40 | 38.4 | 401 | 15.9 | 67.0 | 64.1 | 7.5 | 905 |
| CP 3530 | 60.8 | 30 | 37.7 | 380 | 15.1 | 69.0 | 65.4 | 10.9 | 965 |
| CP 3910 | 62.6 | 81 | 34.8 | 363 | 16.2 | 69.4 | 61.9 | 13.5 | 1,015 |
| CP 3915 | 62.5 | 88 | 34.3 | 422 | 16.3 | 70.7 | 64.5 | 15.0 | 960 |
| Elgin-ND | 60.7 | 50 | 34.1 | 391 | 15.7 | 66.9 | 65.5 | 9.6 | 975 |
| Faller | 60.5 | 36 | 38.1 | 400 | 14.6 | 68.3 | 63.2 | 12.2 | 955 |
| Glenn | 63.3 | 92 | 35.6 | 352 | 16.4 | 65.8 | 65.8 | 14.0 | 988 |
| Lang-MN | 61.5 | 81 | 36.0 | 395 | 16.4 | 67.3 | 66.1 | 9.5 | 918 |
| Lanning | 61.2 | 81 | 39.4 | 372 | 16.3 | 65.4 | 64.6 | 10.4 | 903 |
| LCS Cannon | 62.7 | 51 | 36.6 | 338 | 15.7 | 69.6 | 64.0 | 12.7 | 985 |
| LCS Rebel | 62.0 | 60 | 38.3 | 384 | 15.7 | 68.5 | 64.2 | 12.7 | 930 |
| LCS Trigger | 61.1 | 59 | 33.4 | 439 | 13.1 | 68.4 | 63.5 | 10.2 | 728 |
| Linkert | 61.1 | 59 | 39.6 | 430 | 16.9 | 65.1 | 65.7 | 20.2 | 1,000 |
| MN-Torgy | 61.6 | 46 | 35.7 | 449 | 15.8 | 66.3 | 63.5 | 19.0 | 858 |
| MN-Washburn | 61.0 | 94 | 33.0 | 431 | 15.0 | 69.4 | 61.8 | 18.0 | 883 |
| MS Barracuda | 61.4 | 56 | 41.7 | 447 | 16.7 | 67.4 | 65.7 | 12.2 | 1,013 |
| MS Chevelle | 61.1 | 45 | 34.5 | 367 | 14.6 | 67.8 | 64.0 | 11.2 | 970 |
| ND Frohberg | 61.8 | 56 | 39.0 | 426 | 16.0 | 65.7 | 68.6 | 13.3 | 980 |
| ND VitPro | 62.9 | 92 | 35.9 | 409 | 16.5 | 66.6 | 65.6 | 9.7 | 998 |
| Shelly | 61.4 | 35 | 37.8 | 470 | 15.2 | 70.0 | 61.6 | 25.7 | 878 |
| SY 611 CL2 | 63.0 | 78 | 37.2 | 417 | 16.0 | 65.4 | 69.3 | 8.2 | 890 |
| SY Ingmar | 61.9 | 55 | 34.8 | 412 | 16.4 | 66.6 | 64.9 | 12.2 | 1,063 |
| SY Longmire | 61.9 | 47 | 36.8 | 447 | 16.0 | 67.8 | 65.4 | 12.3 | 993 |
| SY McCloud | 62.4 | 46 | 40.8 | 340 | 16.4 | 66.3 | 67.3 | 10.9 | 940 |
| SY Rockford | 60.0 | 41 | 36.9 | 452 | 15.3 | 66.3 | 66.4 | 11.4 | 905 |
| SY Soren | 61.7 | 32 | 34.0 | 413 | 16.6 | 67.1 | 64.8 | 10.3 | 1,038 |
| SY Valda | 60.9 | 67 | 37.3 | 380 | 15.1 | 67.2 | 62.8 | 9.6 | 933 |
| TCG-Heartland | 62.5 | 49 | 39.6 | 421 | 16.3 | 68.1 | 64.9 | 17.3 | 918 |
| TCG-Spitfire | 60.9 | 53 | 36.0 | 366 | 14.8 | 67.3 | 65.0 | 14.6 | 935 |
| TCG-Stalwart | 60.4 | 54 | 38.1 | 426 | 16.5 | 68.4 | 64.5 | 15.5 | 973 |

[1]Test weight - Expressed in pounds (lbs) per bushel. A high test weight is desirable. A 58 lb test weight is required for a grade of U.S. No. 1.

[2]Vitreous kernels - Expressed as a percentage of seeds having a vitreous-colored endosperm. A high percentage is desirable. US No. 1 DNS requires greater than 75% vitreous kernels.

[3]1,000 KWT - Estimate of weight of 1,000 seeds based on a clean 10g sample. Expressed in grams and used to approximate seed size.

[4]Falling Number - Expressed in seconds at a 14% moisture basis. It is used as an indicator of sprouting based on elevated enzyme activity. A high falling number is desirable, preferably greater than 400 seconds.

[5]Wheat Protein - Measured by NIR at a 12% moisture basis. A high protein is desirable for baking quality.

[6]Flour Extraction - Percentage of milled flour recovered from cleaned and tempered wheat. A high flour extraction percentage is desirable.

[7]Farinograph Absorption - Measured by NIR at a 14% moisture basis. A measure of dough water absorption, expressed as percent. A high absorption is desirable.

[8]Farinograph Stability - A measure of dough strength. It is expressed in minutes above the 500 Brabender unit line during mixing. A high stability is desirable.

[9]Loaf Volume - The volume of the pup loaf of bread, expressed in cubic centimeters. A high volume is desirable.

**Hard Red Spring Wheat - 2020** **Scranton, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AP Murdock | 23 | 0 | 60.3 | 15.3 | -- | -- | 35.7 | -- | -- |
| Barlow | 29 | 0 | 64.0 | 15.0 | 33.0 | 28.3 | 47.2 | 37.8 | 36.2 |
| Bolles | 27 | 0 | 59.4 | 17.6 | 34.4 | 18.9 | 39.6 | 29.3 | 31.0 |
| CP3910 | 25 | 0 | 63.1 | 14.3 | -- | -- | 47.6 | -- | -- |
| CP3915 | 24 | 0 | 62.3 | 14.9 | -- | -- | 41.4 | -- | -- |
| Dagmar | 25 | 0 | 60.6 | 15.4 | -- | -- | 45.4 | -- | -- |
| Dyna-Gro Commander | 25 | 0 | 61.3 | 14.8 | -- | -- | 38.5 | -- | -- |
| Elgin-ND | 29 | 0 | 61.8 | 15.7 | 44.0 | 30.2 | 48.3 | 39.3 | 40.8 |
| Glenn | 28 | 0 | 63.8 | 15.6 | 33.7 | 21.2 | 40.2 | 30.7 | 31.7 |
| Lang-MN | 28 | 0 | 61.8 | 15.6 | 44.0 | 29.5 | 45.3 | 37.4 | 39.6 |
| Lanning | 25 | 0 | 61.7 | 15.4 | -- | 25.0 | 50.3 | 37.7 | -- |
| LCS Cannon | 26 | 0 | 64.1 | 14.6 | -- | 27.8 | 44.0 | 35.9 | -- |
| LCS Rebel | 27 | 0 | 62.3 | 15.5 | 33.9 | 25.8 | 45.7 | 35.8 | 35.1 |
| LCS Trigger | 26 | 0 | 61.2 | 13.0 | 57.0 | 39.1 | 50.6 | 44.9 | 48.9 |
| MN Torgy | 26 | 0 | 62.7 | 14.5 | -- | -- | 45.8 | -- | -- |
| MN Washburn | 24 | 0 | 61.2 | 14.4 | -- | 29.0 | 43.0 | 36.0 | -- |
| ND Frohberg | 28 | 0 | 60.9 | 16.4 | -- | 19.9 | 40.4 | 30.2 | -- |
| ND VitPro | 26 | 0 | 62.9 | 15.3 | 35.4 | 24.1 | 43.6 | 33.9 | 34.4 |
| Shelly | 25 | 0 | 60.7 | 14.7 | 44.2 | 26.0 | 40.7 | 33.4 | 37.0 |
| SY Longmire | 24 | 0 | 62.1 | 15.4 | -- | 35.7 | 41.3 | 38.5 | -- |
| SY McCloud | 25 | 0 | 62.8 | 15.7 | -- | -- | 42.7 | -- | -- |
| SY Rockford | 25 | 0 | 59.4 | 15.7 | 41.1 | 29.5 | 43.2 | 36.4 | 37.9 |
| SY Soren | 23 | 0 | 61.7 | 15.0 | 37.2 | 28.0 | 42.2 | 35.1 | 35.8 |
| TCG Heartland | 24 | 0 | 61.5 | 15.9 | -- | -- | 40.2 | -- | -- |
| TCG Spitfire | 24 | 0 | 61.2 | 14.8 | 46.7 | 36.0 | 43.6 | 39.8 | 42.1 |
| | | | | | | | | | |
| Trial Mean | 26 | 0 | 61.8 | 15.2 | 39.9 | 28.1 | 43.5 | 35.9 | 37.7 |
| C.V. % | 3.8 | -- | 1.6 | 3.2 | 5.3 | 16.8 | 9.6 | -- | -- |
| LSD 5% | 1.4 | NS | 1.4 | 0.7 | 3.0 | 6.6 | 5.9 | -- | -- |
| LSD 10% | 1.2 | NS | 1.1 | 0.6 | 2.5 | 5.6 | 4.9 | -- | -- |

* 0 = no lodging, 9 = 100% lodged.

Planting Date: April 22

Harvest Date: August 22

**Hard Red Spring Wheat - 2020** **Regent, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2019 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AP Murdock | 24 | 0 | 55.7 | 14.1 | -- | -- | 21.3 | -- | -- |
| Barlow | 27 | 0 | 59.2 | 15.4 | 45.1 | 40.9 | 26.1 | 33.5 | 37.4 |
| Bolles | 26 | 0 | 59.0 | 16.3 | 45.2 | 41.5 | 16.4 | 29.0 | 34.4 |
| CP3910 | 24 | 0 | 59.0 | 14.4 | -- | -- | 18.5 | -- | -- |
| CP3915 | 25 | 0 | 59.1 | 14.9 | -- | -- | 29.0 | -- | -- |
| Dagmar | 25 | 0 | 56.5 | 15.2 | -- | -- | 28.0 | -- | -- |
| Dyna-Gro Commander | 24 | 0 | 57.4 | 14.8 | -- | -- | 19.3 | -- | -- |
| Elgin-ND | 28 | 0 | 57.7 | 15.1 | 48.6 | 48.7 | 26.7 | 37.7 | 41.3 |
| Glenn | 26 | 0 | 58.7 | 15.2 | 46.3 | 39.0 | 21.6 | 30.3 | 35.6 |
| Lang-MN | 27 | 0 | 59.3 | 14.9 | 53.4 | 47.7 | 28.4 | 38.1 | 43.2 |
| Lanning | 25 | 0 | 56.8 | 15.1 | -- | 46.0 | 21.3 | 33.7 | -- |
| LCS Cannon | 24 | 0 | 60.2 | 14.3 | -- | 37.5 | 19.6 | 28.6 | -- |
| LCS Rebel | 26 | 0 | 59.2 | 15.3 | 48.8 | 42.7 | 24.7 | 33.7 | 38.7 |
| LCS Trigger | 25 | 0 | 60.0 | 13.4 | 52.9 | 58.8 | 38.2 | 48.5 | 50.0 |
| MN Torgy | 25 | 0 | 56.8 | 14.8 | -- | -- | 22.4 | -- | -- |
| MN Washburn | 24 | 0 | 58.4 | 14.8 | -- | 44.6 | 26.9 | 35.8 | -- |
| ND Frohberg | 26 | 0 | ** | 15.4 | -- | 43.1 | 14.7 | 28.9 | -- |
| ND VitPro | 26 | 0 | 58.8 | 15.8 | 48.3 | 38.0 | 24.5 | 31.3 | 36.9 |
| Shelly | 23 | 0 | 57.3 | 14.2 | 51.6 | 44.3 | 20.8 | 32.6 | 38.9 |
| SY Longmire | 24 | 0 | 59.5 | 15.3 | -- | 49.6 | 27.8 | 38.7 | -- |
| SY McCloud | 25 | 0 | 58.4 | 16.1 | -- | -- | 20.9 | -- | -- |
| SY Rockford | 26 | 0 | 55.9 | 15.4 | 51.3 | 44.0 | 20.4 | 32.2 | 38.6 |
| SY Soren | 22 | 0 | ** | 15.4 | 47.3 | 44.1 | 16.3 | 30.2 | 35.9 |
| TCG Heartland | 23 | 0 | 58.0 | 15.4 | -- | -- | 18.4 | -- | -- |
| TCG Spitfire | 24 | 0 | 56.5 | 14.8 | 48.9 | 51.9 | 26.8 | 39.4 | 42.5 |
| | | | | | | | | | |
| Trial Mean | 25 | 0 | 58.2 | 15.0 | 48.1 | 44.2 | 23.2 | 34.2 | 39.5 |
| C.V. % | 4.6 | -- | 2.2 | 3.8 | 6.3 | 6.9 | 16.7 | -- | -- |
| LSD 5% | 1.6 | NS | 1.6 | 0.8 | 4.3 | 4.3 | 5.5 | -- | -- |
| LSD 10% | 1.4 | NS | 1.3 | 0.7 | 3.6 | 3.6 | 4.6 | -- | -- |

* 0 = no lodging, 9 = 100% lodged.

** Not enough sample for test weight reading.

Planting Date: April 22

Harvest Date: August 20

**Hard Red Spring Wheat - 2020** **Mandan, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AAC Concord | 28 | 0 | 60.3 | 14.5 | -- | -- | 45.5 | -- | -- |
| AP Murdock | 23 | 0 | 61.2 | 14.3 | -- | 40.6 | 44.7 | 42.7 | -- |
| Barlow | 26 | 0 | 62.1 | 14.8 | 46.2 | 34.4 | 43.0 | 38.7 | 41.2 |
| Bolles | 26 | 0 | 60.2 | 17.2 | 48.6 | 35.6 | 40.7 | 38.2 | 41.6 |
| Boost | 27 | 0 | 60.7 | 15.1 | 50.5 | 34.8 | 44.5 | 39.7 | 43.3 |
| CP3530 | 28 | 0 | 62.2 | 14.7 | 48.2 | 38.8 | 45.9 | 42.4 | 44.3 |
| CP3903 | 26 | 0 | 62.2 | 15.0 | -- | -- | 42 | -- | -- |
| CP3910 | 24 | 0 | 63.1 | 15.1 | -- | 33.6 | 45.3 | 39.5 | -- |
| CP3915 | 25 | 0 | 62.4 | 14.4 | -- | 36.2 | 47.9 | 42.1 | -- |
| Dagmar | 25 | 0 | 60.8 | 15.3 | -- | -- | 40.5 | -- | -- |
| Driver | 27 | 0 | 62.5 | 13.9 | -- | -- | 50.7 | -- | -- |
| Dyna-Gro Ambush | 25 | 0 | 61.5 | 14.3 | 50.5 | 36.2 | 42.9 | 39.6 | 43.2 |
| Dyna-Gro Ballistic | 27 | 0 | 61.7 | 13.9 | -- | 31.9 | 52.6 | 42.3 | -- |
| Dyna-Gro Commander | 25 | 0 | 61.0 | 14.7 | -- | 35.0 | 44.5 | 39.8 | -- |
| Dyna-Gro Velocity | 24 | 0 | 61.3 | 14.8 | -- | -- | 38.2 | -- | -- |
| Elgin ND | 28 | 0 | 61.8 | 14.2 | 48.9 | 38.7 | 51.6 | 45.2 | 46.4 |
| Faller | 25 | 0 | 61.5 | 13.8 | 45.6 | 42.1 | 48.3 | 45.2 | 45.3 |
| Glenn | 28 | 0 | 62.4 | 15.0 | 56.0 | 34.8 | 42.0 | 38.4 | 44.3 |
| Lang MN | 26 | 0 | 62 | 14.9 | 51.3 | 40 | 48.8 | 44.4 | 46.7 |
| Lanning | 24 | 0 | 61.1 | 14.9 | 46.3 | 36.7 | 47.4 | 42.1 | 43.5 |
| LCS Buster | 26 | 0 | 61.6 | 12.2 | -- | -- | 54.0 | -- | -- |
| LCS Cannon | 25 | 0 | 62.9 | 14.8 | 50.0 | 37.1 | 41.5 | 39.3 | 42.9 |
| LCS Rebel | 28 | 0 | 61.8 | 15.6 | 52.0 | 36.8 | 46.8 | 41.8 | 45.2 |
| LCS Trigger | 24 | 0 | 62.4 | 12.1 | 43.5 | 41.7 | 50.2 | 46.0 | 45.1 |
| Linkert | 24 | 0 | 62.1 | 15.0 | 45.9 | 35.5 | 45.1 | 40.3 | 42.2 |
| MN Torgy | 23 | 0 | 62.4 | 14.1 | -- | 40.7 | 48.2 | 44.5 | -- |
| MN Washburn | 24 | 0 | 61.6 | 13.7 | 52.4 | 35.4 | 40.4 | 37.9 | 42.7 |
| MS Barracuda | 24 | 0 | 60.6 | 16.3 | 50.2 | 34.7 | 43.6 | 39.2 | 42.8 |
| MS Chevelle | 23 | 0 | 61.5 | 13.7 | 49.8 | 36.3 | 41.7 | 39.0 | 42.6 |
| MS Ranchero | 24 | 0 | 60.4 | 14.3 | -- | -- | 49.1 | -- | -- |
| ND Frohberg | 26 | 0 | 61.6 | 15.2 | -- | 32.1 | 45.2 | 38.7 | -- |
| ND VitPro | 25 | 0 | 62.4 | 15.7 | 47.1 | 36.9 | 46.1 | 41.5 | 43.4 |
| Shelly | 23 | 0 | 60.1 | 14.1 | 51.8 | 37.2 | 48.7 | 43.0 | 45.9 |

***Table continued on next page***

**Hard Red Spring Wheat - 2020** **Mandan, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| ***Table continues from previous page*** | | | | | | | | | |
| SY 611 CL2 | 23 | 0 | 63.2 | 15.0 | 45.3 | 40.7 | 44.3 | 42.5 | 43.4 |
| SY Ingmar | 24 | 0 | 61.8 | 15.6 | 55.4 | 33.0 | 39.9 | 36.5 | 42.8 |
| SY Longmire | 25 | 0 | 62.3 | 15.4 | 52.6 | 32.6 | 45.1 | 38.9 | 43.4 |
| SY McCloud | 26 | 0 | 62.3 | 15.8 | 45.8 | 32.5 | 41.5 | 37.0 | 39.9 |
| SY Rockford | 26 | 0 | 60.1 | 15.2 | 46.0 | 38.2 | 49.6 | 43.9 | 44.6 |
| SY Soren | 23 | 0 | 61.9 | 15.0 | 48.0 | 30.4 | 39.4 | 34.9 | 39.3 |
| SY Valda | 25 | 0 | 61.8 | 14.1 | 46.0 | 41.5 | 51.5 | 46.5 | 46.3 |
| TCG Heartland | 24 | 0 | 62.6 | 15.3 | -- | 30.9 | 42.1 | 36.5 | -- |
| TCG Sptifire | 25 | 0 | 61.8 | 13.2 | 49.2 | 38.5 | 48.7 | 43.6 | 45.5 |
| TCG Wildcat | 25 | 0 | 61.9 | 15.6 | -- | -- | 38.9 | -- | -- |
| | | | | | | | | | |
| Trial Mean | 25 | 0 | 61.6 | 14.7 | 49.3 | 36.1 | 44.8 | 40.9 | 43.6 |
| C.V. % | 6.5 | -- | 1.5 | 3.3 | 15.7 | 7.6 | 14.0 | -- | -- |
| LSD 5% | 2.3 | -- | 1.3 | 0.7 | 4.1 | 3.8 | 8.8 | -- | -- |
| LSD 10% | 1.9 | -- | 1.1 | 0.6 | 3.4 | 3.2 | 7.4 | -- | -- |

* 0 = no lodging, 9 = 100% lodged.

Planting Date: May 1

Harvest Date: August 26

Previous Crop: Soybean

**2020 Hard Red Spring Wheat - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Protein | Grain Yield 2018 | Grain Yield 2019 | Grain Yield 2020 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | % | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| AAC Concord | 61 | 11,938 | 26 | 60.0 | 15.9 | -- | -- | 43.5 | -- | -- |
| AP Murdock | 59 | 13,230 | 21 | 60.5 | 15.8 | -- | -- | 42.0 | -- | -- |
| Barlow | 58 | 12,501 | 26 | 62.2 | 15.7 | 60.2 | 45.2 | 43.5 | 44.3 | 49.6 |
| Bolles | 61 | 11,500 | 25 | 60.4 | 18.5 | 65.0 | 38.4 | 38.6 | 38.5 | 47.3 |
| Boost | 61 | 11,484 | 25 | 60.7 | 17.0 | 57.5 | 47.7 | 42.3 | 45.0 | 49.2 |
| CP 3530 | 61 | 11,219 | 28 | 61.0 | 15.7 | 63.1 | 52.0 | 44.4 | 48.2 | 53.2 |
| CP 3903 | 59 | 13,046 | 24 | 61.8 | 16.3 | -- | -- | 42.2 | -- | -- |
| CP 3910 | 57 | 12,856 | 23 | 62.2 | 16.2 | -- | 51.0 | 40.7 | 45.9 | -- |
| CP 3915 | 60 | 12,285 | 25 | 62.0 | 16.4 | -- | 51.5 | 44.5 | 48.0 | -- |
| Dagmar | 59 | 10,902 | 24 | 61.0 | 16.3 | -- | -- | 44.8 | -- | -- |
| Driver | 60 | 12,318 | 27 | 62.6 | 15.7 | -- | -- | 45.4 | -- | -- |
| Dyna-Gro Ambush | 58 | 12,273 | 24 | 61.3 | 16.7 | 61.6 | 46.5 | 40.8 | 43.6 | 49.6 |
| Dyna-Gro Ballistic | 60 | 11,938 | 26 | 61.0 | 16.1 | -- | -- | 48.5 | -- | -- |
| Dyna-gro Commander | 59 | 11,824 | 23 | 61.1 | 16.7 | -- | 47.2 | 40.7 | 44.0 | -- |
| Dyna-Gro Velocity | 59 | 13,154 | 24 | 61.7 | 17.0 | -- | -- | 40.4 | -- | -- |
| Elgin-ND | 59 | 12,306 | 26 | 61.0 | 15.7 | 60.1 | 47.3 | 43.8 | 45.5 | 50.4 |
| Faller | 60 | 11,335 | 25 | 60.8 | 16.0 | 72.1 | 51.2 | 46.8 | 49.0 | 56.7 |
| Glenn | 57 | 13,125 | 26 | 62.6 | 16.6 | 63.5 | 44.8 | 37.3 | 41.0 | 48.5 |
| LCS Buster | 64 | 11,649 | 24 | 60.8 | 13.9 | -- | -- | 52.2 | -- | -- |
| LCS Cannon | 57 | 12,568 | 23 | 62.7 | 15.3 | 56.6 | 47.3 | 44.4 | 45.8 | 49.4 |
| LCS Rebel | 57 | 11,248 | 26 | 61.9 | 16.7 | 60.4 | 48.9 | 44.4 | 46.7 | 51.3 |
| LCS Trigger | 65 | 12,906 | 25 | 61.7 | 14.4 | 76.0 | 47.1 | 51.6 | 49.3 | 58.2 |
| Lang-MN | 60 | 13,204 | 25 | 61.6 | 16.1 | 61.3 | 51.2 | 42.6 | 46.9 | 51.7 |
| Lanning | 59 | 11,228 | 22 | 60.4 | 16.7 | 69.5 | 49.2 | 44.4 | 46.8 | 54.3 |
| Linkert | 59 | 11,321 | 23 | 60.9 | 17.5 | 58.8 | 47.1 | 40.1 | 43.6 | 48.7 |
| MN Washburn | 61 | 12,754 | 23 | 61.2 | 15.5 | 64.8 | 48.6 | 40.1 | 44.4 | 51.2 |
| MN Torgy | 59 | 12,033 | 24 | 61.5 | 15.8 | -- | -- | 45.4 | -- | -- |
| MS Barracuda | 56 | 11,249 | 22 | 60.9 | 17.0 | 51.1 | 36.8 | 36.4 | 36.6 | 41.4 |
| MS Chevelle | 59 | 13,416 | 23 | 61.7 | 14.6 | 67.3 | 54.8 | 46.9 | 50.8 | 56.3 |
| MS Ranchero | 58 | 11,891 | 24 | 60.3 | 15.2 | -- | -- | 47.5 | -- | -- |
| Mott | 61 | 13,020 | 27 | 60.9 | 16.5 | 60.1 | 42.7 | 43.8 | 43.2 | 48.9 |
| ND Frohberg | 60 | 11,125 | 26 | 61.4 | 16.8 | 55.7 | 48.2 | 41.2 | 44.7 | 48.4 |
| ND-VitPro | 59 | 12,509 | 25 | 61.8 | 17.0 | 59.6 | 44.7 | 38.9 | 41.8 | 47.7 |

***Table continued on next page***

**2020 Hard Red Spring Wheat - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Protein | Grain Yield 2018 | Grain Yield 2019 | Grain Yield 2020 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | % | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| ***Table continues from previous page*** | | | | | | | | | | |
| SY Ingmar | 60 | 12,802 | 23 | 62.1 | 16.7 | 61.8 | 46.8 | 43.3 | 45.1 | 50.7 |
| SY Longmire | 60 | 11,644 | 24 | 61.5 | 16.0 | 61.5 | 49.8 | 43.0 | 46.4 | 51.4 |
| SY McCLoud | 60 | 11,521 | 23 | 61.7 | 17.5 | 60.5 | 46.2 | 39.9 | 43.1 | 48.9 |
| SY Rockford | 61 | 11,667 | 24 | 59.8 | 16.1 | 64.9 | 54.0 | 47.5 | 50.7 | 55.4 |
| Sy Soren | 60 | 12,742 | 21 | 61.3 | 16.9 | 61.9 | 48.6 | 40.5 | 44.5 | 50.3 |
| Sy Valda | 60 | 11,612 | 22 | 61.8 | 15.0 | 62.9 | 47.0 | 46.6 | 46.8 | 52.2 |
| SY611CL2 | 59 | 12,098 | 23 | 61.9 | 16.4 | -- | 49.8 | 44.2 | 47.0 | -- |
| Shelly | 62 | 11,946 | 24 | 61.8 | 15.3 | 70.4 | 48.1 | 45.9 | 47.0 | 54.8 |
| TCG-Heartland | 58 | 12,417 | 23 | 61.7 | 17.1 | -- | 43.9 | 41.0 | 42.5 | -- |
| TCG-Spitfire | 63 | 11,495 | 25 | 61.5 | 14.7 | 66.1 | 52.6 | 47.7 | 50.1 | 55.5 |
| TCG-Wildcat | 60 | 11,715 | 24 | 62.0 | 16.2 | -- | -- | 47.3 | -- | -- |
| Trial Mean | 60 | 12,127 | 24 | 61.4 | 16.2 | 63.1 | 47.6 | 43.3 | -- | -- |
| CV % | 1.4 | 4.7 | 4.7 | 0.7 | 3.6 | 8.5 | 8.1 | 7.6 | -- | -- |
| LSD 0.05 | 1 | 788 | 2 | 0.6 | 0.8 | 7.5 | 5.4 | 4.6 | -- | -- |
| LSD 0.10 | 1 | 660 | 1 | 0.5 | 0.7 | 6.2 | 4.5 | 3.8 | -- | -- |

Planting Date: April 27, 2020
Harvest Date: August 12, 2020
Previous Crop: Soybean
Seeding Rate: 1.2 million live seeds/ac

**2020 Glen Ullin Spring Wheat - Recrop** **Dickinson, ND**

| Variety | Seeds per Pound | Test Weight | Protein | Grain Yield 2017 | Grain Yield 2018 | Grain Yield 2020 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|
| | | lbs/bu | % | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| Barlow | 13,887 | 61.9 | 14.6 | 33.9 | 72.8 | 50.0 | 61.4 | 52.2 |
| CP 3915 | 14,814 | 61.6 | 13.8 | -- | -- | 51.1 | -- | -- |
| Driver | 13,877 | 61.4 | 13.8 | -- | -- | 50.9 | -- | -- |
| Dyna-Gro Commander | 13,500 | 60.5 | 14.3 | -- | -- | 49.0 | -- | -- |
| LCS Cannon | 14,447 | 62.0 | 14.4 | -- | -- | 41.8 | -- | -- |
| Lanning | 13,633 | 61.0 | 14.5 | -- | -- | 46.1 | -- | -- |
| MN Washburn | 13,713 | 60.3 | 13.5 | -- | -- | 49.5 | -- | -- |
| MN-Torgy | 13,291 | 61.2 | 14.1 | -- | -- | 57.7 | -- | -- |
| MS Barracuda | 12,747 | 60.2 | 14.8 | -- | -- | 45.9 | -- | -- |
| ND Frohberg | 12,301 | 60.4 | 14.5 | -- | -- | 47.0 | -- | -- |
| ND VitPro | 13,739 | 61.9 | 15.2 | 35.3 | 71.5 | 43.6 | 57.6 | 50.2 |
| SY Longmire | 12,626 | 61.1 | 14.8 | -- | -- | 48.9 | -- | -- |
| SY McCLoud | 11,827 | 61.2 | 14.9 | -- | -- | 43.6 | -- | -- |
| Trial Mean | 13,416 | 61.1 | 14.4 | 37.2 | 75.0 | 48.1 | -- | -- |
| CV % | 3.9 | 0.9 | 2.2 | 16.4 | 6.6 | 8.1 | -- | -- |
| LSD 0.05 | 755 | 0.8 | 0.5 | NS | 7.1 | 5.6 | -- | -- |
| LSD 0.10 | 628 | 0.6 | 0.4 | NS | 5.9 | 4.6 | -- | -- |

Planting Date: May 6, 2020
2019 Crop was lost due to hail
Harvest Date: August 18, 2020
Seeding Rate: 1.2 million live seeds/ac

**North Dakota hard red winter wheat variety description and agronomic traits.**

| Variety | Agent or Origin[2] | Year | Reaction to Disease[1] | | | | | Days to Heading[3] | Straw Strength[4] | Height[5] (inches) | Winter[6] Hardiness |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stripe Rust | Leaf Rust | Stem Rust | Scab | Tan Spot | | | | |
| **AAC Wildfire** | **FP Genetics** | **2015** | **1** | **5** | **8** | **NA** | **NA** | **1** | **3** | **29** | **3** |
| AC Emerson | Meridian | 2011 | 1 | 6 | 1 | 3 | 5 | 1 | 2 | 32 | 4 |
| Ideal | SD | 2011 | 4 | 1 | 3 | 8 | 4 | -1 | 4 | 28 | 4 |
| Jerry | ND | 2001 | 8 | 3 | 1 | 8 | 8 | 0 | 5 | 34 | 3 |
| Keldin | WB | 2011 | 2 | 3 | 3 | 5 | 3 | 0 | 3 | 29 | 5 |
| **ND Noreen** | **ND** | **2020** | **3** | **3** | **1** | **3** | **5** | **0** | **4** | **29** | **3** |
| Northern | MT | 2015 | 1 | 8 | 1 | 8 | 6 | 2 | 4 | 29 | 5 |
| Oahe | SD | 2016 | 2 | 6 | 6 | 4 | 6 | -2 | 5 | 29 | 4 |
| Peregrine | CDC | 2008 | 1 | 3 | 1 | 6 | 6 | 1 | 5 | 34 | 2 |
| SY Monument | Agripro | 2014 | 3 | 3 | 1 | 6 | 5 | -2 | 4 | 27 | 3 |
| SY Sunrise | Agripro | 2015 | 3 | 4 | 2 | 6 | 7 | -2 | 4 | 23 | 6 |
| SY Wolf | Agripro | 2010 | 3 | 3 | 1 | 6 | 1 | -2 | 3 | 27 | 6 |
| SY Wolverine | Agripro | 2019 | 4 | 3 | 1 | 4 | 5 | -5 | 4 | 25 | 4 |
| TCG-Boomlock | TCG | 2019 | NA | NA | NA | NA | NA | -1 | 4 | 29 | 6 |
| Thompson | SD | 2017 | 5 | 3 | 3 | 3 | 6 | -1 | 3 | 30 | 5 |
| WB4462 | WB | 2016 | 7 | 3 | NA | 8 | 6 | -5 | 4 | 28 | 4 |
| WB4595 | WB | 2019 | 4 | 4 | NA | 6 | 6 | -1 | 3 | 28 | 6 |

[1]Disease reaction scores from 1-9, with 1 = resistant and 9 = very susceptible, NA = not available.

[2]CDC = Crop Development Centre, University of Saskatchewan; MT = Montana State University; ND = North Dakota State University; SD = South Dakota State University; TCG = Twenty-first Century Genetics; WB = WestBred.

[3]Days to heading relative to Jerry.

[4]Straw strength: 1 = strongest, 9 = weakest. Based on field observations in limited sites in 2020.

[5]Based on the average of several environments, and should be used for comparing varieties. The environment can impact the height of varieties.

[6]Relative winter hardiness rating: 1 = excellent, 10 = no survival. These values are subject to change as additional information becomes available.
Bold varieties are those recently released or the first time tested, so data are limited and rating values may change.

**2020 Winter Wheat - Recrop** **Dickinson, ND**

| Variety | Winter Survival | Heading Date | Seeds per Pound | Plant Height | Test Weight | Protein | Grain Yield 2018 | Grain Yield 2019 | Grain Yield 2020 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | from 1/1 | | in | lbs/bu | % | | -----bu/ac----- | | bu/ac | bu/ac |
| AAC-Wildfire | 100 | 167 | 12,386 | 25 | 60.1 | 14.1 | -- | -- | 51.8 | -- | -- |
| AC Emerson | 100 | 165 | 15,369 | 24 | 59.1 | 15.4 | 83.1 | 45.2 | 38.0 | 41.6 | 55.4 |
| Ideal | 100 | 164 | 13,068 | 22 | 59.5 | 12.4 | 90.6 | 49.6 | 45.5 | 47.5 | 61.9 |
| Jerry | 100 | 163 | 13,176 | 24 | 57.7 | 13.3 | 84.6 | 46.7 | 45.1 | 45.9 | 58.8 |
| Keldin | 100 | 166 | 10,898 | 22 | 60.1 | 13.7 | 99.0 | 53.9 | 38.2 | 46.0 | 63.7 |
| NE14696 | 100 | 162 | 12,837 | 22 | 58.7 | 12.9 | -- | -- | 40.5 | -- | -- |
| NW13493 | 100 | 163 | 12,905 | 21 | 59.9 | 12.4 | -- | -- | 43.1 | -- | -- |
| Northern | 100 | 165 | 12,657 | 21 | 59.6 | 14.3 | 85.2 | 54.0 | 44.3 | 49.1 | 61.1 |
| Oahe | 100 | 163 | 11,671 | 22 | 59.4 | 13.1 | 74.7 | 54.6 | 41.2 | 47.9 | 56.8 |
| Peregrine | 100 | 164 | 13,970 | 25 | 59.9 | 12.5 | 90.6 | 51.3 | 46.5 | 48.9 | 62.8 |
| SY Monument | 100 | 162 | 13,373 | 21 | 58.0 | 12.0 | 76.2 | 54.9 | 41.0 | 47.9 | 57.4 |
| SY Sunrise | 100 | 162 | 12,883 | 18 | 58.9 | 12.1 | 64.1 | 49.3 | 37.5 | 43.4 | 50.3 |
| SY Wolf | 100 | 162 | 13,030 | 21 | 60.1 | 13.5 | 80.5 | 60.4 | 42.1 | 51.2 | 61.0 |
| SY Wolverine | 100 | 161 | 12,601 | 20 | 59.1 | 12.5 | -- | -- | 40.5 | -- | -- |
| TCG Boomlock | 100 | 163 | 14,124 | 22 | 59.6 | 13.4 | -- | 53.2 | 42.6 | 47.9 | -- |
| Thompson | 100 | 164 | 14,152 | 23 | 59.1 | 14.0 | 84.4 | 53.2 | 44.2 | 48.7 | 60.6 |
| WB-4462 | 100 | 161 | 12,317 | 21 | 58.2 | 12.2 | 68.7 | 55.2 | 39.6 | 47.4 | 54.5 |
| WB-4595 | 100 | 164 | 12,182 | 21 | 62.4 | 12.2 | -- | 60.0 | 43.3 | 51.6 | -- |
| Trial Mean | 100 | 163 | 12,870 | 22 | 59.5 | 13.2 | 83.3 | 53.0 | 42.9 | -- | -- |
| CV % | 0 | 0.4 | 7.1 | 5.1 | 0.6 | 3.3 | 8.8 | 8.5 | 8.1 | -- | -- |
| LSD 0.05 | 0 | 1 | 1,296 | 2 | 0.5 | 0.6 | 10.3 | 6.4 | 4.9 | -- | -- |
| LSD 0.10 | 0 | 1 | 1,082 | 1 | 0.4 | 0.5 | 8.6 | 5.3 | 4.1 | -- | -- |

Planting Date: September 23, 2019
Harvest Date: August 3, 2020
Protein adjusted to 12% moisture
Previous Crop: oat hay
Seeding Rate: 1 million live seeds/ac

**Winter Rye - 2020** **Hettinger, ND**

| Variety | Spring Stand | Heading Date | Plant Height | Plant Lodge | Test Weight | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | | inches | 0-9[1] | lbs/bu | ---------- Bushels per acre ---------- | | | | |
| Aroostok | 83 | 5/31 | 50 | 6 | 50.4 | 27.6 | 54.1 | 36.6 | 45.4 | 39.4 |
| Bono (hybrid) | 84 | 6/5 | 38 | 1 | 54.4 | -- | 98.2 | 68.9 | 83.6 | -- |
| Brasetto (hybrid) | 80 | 6/5 | 37 | 1 | 53.6 | 58.6 | 89.9 | 64.3 | 77.1 | 70.9 |
| Dacold | 48 | 6/6 | 44 | 3 | 51.1 | 37.6 | 43.8 | 38.4 | 41.1 | 39.9 |
| Danko | 78 | 6/4 | 43 | 2 | 54.0 | -- | -- | 45.5 | -- | -- |
| Hazlet | 86 | 6/4 | 41 | 5 | 53.6 | 40.2 | 68.6 | 50.1 | 59.4 | 53.0 |
| ND Dylan | 85 | 6/4 | 45 | 4 | 52.1 | 21.6 | 69.5 | 50.5 | 60.0 | 47.2 |
| ND Gardner | 90 | 5/31 | 47 | 6 | 51.1 | 28.6 | 61.7 | 38.3 | 50.0 | 42.9 |
| Rymin | 74 | 6/3 | 41 | 5 | 52.9 | 39.6 | 65.0 | 44.6 | 54.8 | 49.7 |
| Spooner | 85 | 6/2 | 44 | 5 | 52.3 | 32.6 | 63.2 | 42.2 | 52.7 | 46.0 |
| Trial Mean | 79 | 6/3 | 43 | 4 | 52.5 | 34.2 | 62.6 | 47.9 | 58.2 | 48.6 |
| C.V. % | 5.4 | 0.4 | 5.8 | 19.6 | 1.8 | 15.3 | 6.9 | 15.0 | -- | -- |
| LSD 0.05 | 6.2 | 1.0 | 3.6 | 1.1 | 1.4 | 7.6 | 6.2 | 10.5 | -- | -- |
| LSD 0.10 | 5.2 | 0.8 | 3.0 | 0.9 | 1.1 | 6.3 | 5.2 | 8.7 | -- | -- |

[1] 0 = no lodging, 9 = 100% lodged.

Planting Date: September 26

Harvest Date: July 28

Previous Crop: Spring Wheat

**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 | NA | 7 | 6 |
| ND Riveland[6] | ND | 2017 | 29 | 4 | 57 | 1 | 1 | NA | 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 |

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

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

[3]Straw 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.

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

[5]Disease 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.

[6]Low cadmium accumulating variety.

**Durum Wheat - 2020** **Hettinger, ND**

| Variety | Days to Head | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AC Commander | | 20 | 0 | 57.0 | 15.3 | 37.3 | 57.5 | 23.3 | 40.4 | 39.4 |
| Alkabo | | 20 | 0 | 58.6 | 13.8 | 38.1 | 73.6 | 22.1 | 47.9 | 44.6 |
| Alzada | | 21 | 0 | 54.7 | 15.3 | 35.6 | 48.2 | 16.7 | 32.5 | 33.5 |
| Ben | | 22 | 0 | 57.8 | 15.1 | 31.9 | 60.3 | 20.4 | 40.4 | 37.5 |
| Carpio | | 21 | 0 | 57.5 | 14.6 | 41.9 | 63.7 | 20.5 | 42.1 | 42.0 |
| CDC Verona | | 22 | 0 | 59.0 | 15.0 | 36.2 | 67.7 | 25.8 | 46.8 | 43.2 |
| Divide | | 20 | 0 | 58.4 | 14.6 | 34.1 | 70.8 | 19.5 | 45.2 | 41.5 |
| Grenora | | 21 | 0 | 57.6 | 14.5 | 38.3 | 67.9 | 22.9 | 45.4 | 43.0 |
| Joppa | | 22 | 0 | 58.9 | 14.1 | 34.6 | 66.2 | 21.6 | 43.9 | 40.8 |
| Lebsock | | 23 | 0 | 58.4 | 14.2 | 33.2 | 64.8 | 20.4 | 42.6 | 39.5 |
| Maier | | 21 | 0 | 57.4 | 15.7 | 35.9 | 62.7 | 18.2 | 40.5 | 38.9 |
| Mountrail | | 20 | 0 | 58.6 | 13.9 | 37.7 | 66.9 | 23.7 | 45.3 | 42.8 |
| ND Grano | | 21 | 0 | 59.2 | 13.9 | 34.6 | 68.5 | 24.1 | 46.3 | 42.4 |
| ND Riveland | | 21 | 0 | 58.5 | 14.3 | 36.3 | 73.0 | 22.5 | 47.8 | 43.9 |
| Pierce | | 23 | 0 | 58.8 | 14.2 | 32.2 | 69.6 | 21.5 | 45.6 | 41.1 |
| Rugby | | 23 | 0 | 58.2 | 14.3 | 31.5 | 59.8 | 23.1 | 41.5 | 38.1 |
| Strongfield | | 21 | 0 | 57.9 | 15.1 | 38.8 | 67.0 | 21.1 | 44.1 | 42.3 |
| Tioga | | 21 | 0 | 56.8 | 14.4 | 32.1 | 64.5 | 20.5 | 42.5 | 39.0 |
| VT Peak | | 22 | 0 | 59.2 | 15.0 | 39.5 | 72.4 | 24.2 | 48.3 | 45.4 |
| | | | | | | | | | | |
| Trial Mean | | 21 | 0 | 58.1 | 14.6 | 36.7 | 67.6 | 22.0 | 44.5 | 41.6 |
| C.V. % | | 5.9 | -- | 1.2 | 2.9 | 8.1 | 7.6 | 10.6 | -- | -- |
| LSD 5% | | 1.8 | -- | 1.0 | 0.6 | 4.1 | 7.2 | 3.3 | -- | -- |
| LSD 10% | | 1.5 | -- | 0.8 | 0.5 | 3.5 | 6.1 | 2.7 | -- | -- |

[1] Days to Head = the number of days from planting to head emergence from the boot.

[2] 0 = no lodging, 9 = 100% lodged.

Planting Date: April 10

Harvest Date: August 17

Previous Crop: Soybean

**Durum Wheat - 2020** **Scranton, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| Alkabo | 27 | 0 | 60.3 | 12.6 | 33.6 | 23.6 | 41.1 | 32.4 | 32.8 |
| Carpio | 27 | 0 | 58.1 | 13.1 | 36.4 | 23.3 | 38.4 | 30.9 | 32.7 |
| Joppa | 28 | 0 | 60.4 | 12.4 | 34.9 | 24.9 | 36.4 | 30.7 | 32.1 |
| ND Grano | 26 | 0 | 59.9 | 13.1 | 32.1 | 22.0 | 37.0 | 29.5 | 30.4 |
| ND Riveland | 30 | 0 | 59.5 | 13.1 | 36.4 | 21.6 | 42.0 | 31.8 | 33.3 |
| Tioga | 30 | 0 | 60.1 | 13.5 | 34.0 | 26.3 | 35.9 | 31.1 | 32.1 |
| Trial Mean | 28 | 0 | 59.7 | 13.0 | 34.6 | 23.6 | 38.5 | 31.0 | 32.2 |
| C.V. % | 3.3 | -- | 1.2 | 3.4 | 7.7 | 14.4 | 6.3 | -- | -- |
| LSD 5% | 1.3 | NS | 1.1 | 0.7 | 4.0 | 5.1 | 3.6 | -- | -- |
| LSD 10% | 1.1 | NS | 0.9 | 0.6 | 3.3 | 4.2 | 3.0 | -- | -- |

* 0 = no lodging, 9 = 100% lodged.

Planting Date: April 22

Harvest Date: August 22

**Durum Wheat - 2020** **Regent, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| Alkabo | 28 | 0 | 57.4 | 13.6 | 52.4 | 43.8 | 26.2 | 35.0 | 40.8 |
| Carpio | 28 | 0 | 58.1 | 14.0 | 49.3 | 46.5 | 28.9 | 37.7 | 41.6 |
| Joppa | 28 | 0 | 58.0 | 13.0 | 53.8 | 38.1 | 25.8 | 32.0 | 39.2 |
| ND Grano | 28 | 0 | 57.0 | 13.9 | 50.2 | 44.1 | 24.8 | 34.5 | 39.7 |
| ND Riveland | 29 | 0 | 59.1 | 14.0 | 52.0 | 40.9 | 28.9 | 34.9 | 40.6 |
| Tioga | 30 | 0 | 57.3 | 15.0 | 52.3 | 45.2 | 24.1 | 34.7 | 40.5 |
| Trial Mean | 28 | 0 | 57.8 | 13.9 | 51.7 | 43.1 | 26.5 | 34.8 | 40.4 |
| C.V. % | 3.6 | -- | 2.2 | 2.9 | 5.4 | 8.0 | 9.0 | -- | -- |
| LSD 5% | 1.6 | NS | 1.9 | 0.6 | 4.2 | 5.2 | 3.6 | -- | -- |
| LSD 10% | 1.3 | NS | 1.6 | 0.5 | 3.4 | 4.3 | 2.9 | -- | -- |

* 0 = no lodging, 9 = 100% lodged.

Planting Date: April 22

Harvest Date: August 22

**2020 Durum - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Protein | Grain Yield 2018 | Grain Yield 2019 | Grain Yield 2020 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | % | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| AC Commander | 61 | 9,906 | 23 | 60.2 | 15.4 | 48.1 | 53.6 | 39.2 | 46.4 | 47.0 |
| Alkabo | 61 | 10,079 | 24 | 60.4 | 14.1 | 63.2 | 46.8 | 39.4 | 43.1 | 49.8 |
| Alzada | 57 | 9,898 | 20 | 58.9 | 14.6 | 38.4 | 50.2 | 35.4 | 42.8 | 41.4 |
| Ben | 61 | 10,749 | 26 | 60.3 | 15.6 | 56.5 | 52.7 | 36.1 | 44.4 | 48.4 |
| CDC Verona | 62 | 10,123 | 24 | 61.2 | 15.3 | 64.1 | 49.7 | 41.7 | 45.7 | 51.9 |
| Carpio | 61 | 10,161 | 26 | 59.7 | 14.7 | 57.9 | 47.0 | 36.4 | 41.7 | 47.1 |
| Divide | 61 | 10,234 | 26 | 60.1 | 14.9 | 62.4 | 49.7 | 38.3 | 44.0 | 50.1 |
| Grenora | 60 | 10,106 | 24 | 60.0 | 15.5 | 55.9 | 51.5 | 39.5 | 45.5 | 49.0 |
| Joppa | 61 | 10,665 | 25 | 61.1 | 14.2 | 65.8 | 51.0 | 41.5 | 46.2 | 52.8 |
| Lebsock | 61 | 10,166 | 24 | 60.8 | 14.9 | 59.1 | 53.9 | 38.0 | 46.0 | 50.4 |
| Maier | 61 | 10,916 | 24 | 59.8 | 15.8 | 57.5 | 47.7 | 35.1 | 41.4 | 46.8 |
| Mountrail | 61 | 10,939 | 25 | 59.7 | 14.5 | 64.8 | 52.1 | 40.9 | 46.5 | 52.6 |
| ND Grano | 61 | 10,130 | 25 | 60.7 | 15.4 | 64.5 | 53.9 | 38.7 | 46.3 | 52.4 |
| ND Riveland | 61 | 10,549 | 27 | 60.2 | 14.9 | 60.1 | 45.8 | 38.3 | 42.1 | 48.1 |
| Pierce | 61 | 10,077 | 26 | 60.5 | 15.1 | 56.8 | 47.2 | 37.8 | 42.5 | 47.3 |
| Rugby | 60 | 11,008 | 28 | 60.5 | 14.9 | 63.2 | 44.5 | 36.9 | 40.7 | 48.2 |
| Strongfield | 62 | 10,685 | 23 | 59.9 | 15.9 | 60.3 | 49.8 | 36.2 | 43.0 | 48.8 |
| Tioga | 61 | 9,588 | 27 | 59.7 | 15.2 | 63.3 | 52.1 | 37.6 | 44.9 | 51.0 |
| VT Peak | 61 | 10,058 | 26 | 61.6 | 15.4 | 60.3 | 50.5 | 37.7 | 44.1 | 49.5 |
| Trial Mean | 61 | 10,296 | 25 | 60.2 | 15.1 | 61.6 | 51.1 | 37.9 | -- | -- |
| CV % | 0.9 | 5.0 | 5.2 | 0.9 | 3.5 | 9.0 | 9.3 | 7.4 | -- | -- |
| LSD 0.05 | 1 | 726 | 2 | 0.8 | 0.7 | 7.8 | 6.6 | 4.0 | -- | -- |
| LSD 0.10 | 1 | 608 | 2 | 0.9 | 0.6 | 6.5 | 5.6 | 3.3 | -- | -- |

Planting Date: April 27, 2020
Harvest Date: August 11, 2020
Previous Crop: Soybean
Seeding Rate: 1.2 million live seeds/ac

**2020 North Dakota barley variety descriptions.**

| Variety | Use[1] | Origin[2] | Year Released | Awn Type[3] | Rachilla Hair Length[4] | Aleurone Color | Height (inch) | Days to Head | Straw Strength[5] | Reaction to Disease[6] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Stem Rust | Spot-form Net Blotch | Spot Blotch | Net Blotch |
| **Six-rowed** | | | | | | | | | | | | | |
| Tradition | M/F | BARI | 2003 | S | L | White | 23 | 58 | 3 | 8 | 6 | 3 | 7 |
| **Two-rowed** | | | | | | | | | | | | | |
| AAC Connect | M/F | Meridian | 2017 | R | L | White | 21 | 62 | 3 | 4 | 5 | 4 | 5 |
| AAC Synergy | M/F | Syngenta | 2015 | R | L | White | 21 | 63 | 5 | 4 | 3 | 4 | 4 |
| **CDC Bow** | **M/F** | **CDC** | **2016** | **R** | **L** | **White** | **22** | **64** | **3** | **NA** | **NA** | **NA** | **NA** |
| Conlon[7] | M/F | ND | 1996 | S | L | White | 23 | 57 | 7 | 8 | 4 | 6 | 3 |
| Explorer | M | Secobra | NA | R | L | White | 20 | 61 | 4 | NA | NA | 8 | 4 |
| ND Genesis | M/F | ND | 2015 | S | L | White | 24 | 61 | 5 | 8 | 4 | 4 | 6 |
| Pinnacle | M/F | ND | 2006 | S | L | White | 22 | 60 | 6 | 8 | 8 | 4 | 6 |

[1]M = malting; F = feed.

[2]BARI = Busch Agricultural Resources Inc.; CDC = Crop Development Centre, University of Saskatchewan.MN = University of Minnesota; ND = North Dakota State University.

[3]R = rough; S = smooth.

[4]S = short; L = long.

[5]Straw Strength scores from 1-9, with 1 = strongest and 9 = weakest.

[6]Disease reaction scores from 1-9, with 1 = resistant and 9 = very susceptible, NA – not available.

[7]Lower DON accumulations than other varieties tested.

**Barley - 2020** **Hettinger, ND**

| Variety | Days to Head | Plant Height | Plant Lodge | Plump | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | % | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| **TWO ROW** | | | | | | | | | | | |
| AAC Connect | 77 | 20 | 0 | 96 | 49.1 | 15.1 | -- | 109.8 | 43.0 | 76.4 | -- |
| AAC Synergy | 76 | 21 | 0 | 97 | 48.9 | 14.8 | 88.6 | 117.4 | 41.3 | 79.4 | 82.4 |
| CDC Bow | 78 | 21 | 0 | 97 | 49.3 | 14.7 | -- | -- | 48.7 | -- | -- |
| Conlon | 71 | 23 | 0 | 97 | 47.6 | 15.6 | 75.5 | 89.0 | 26.5 | 57.8 | 63.7 |
| Explorer | 76 | 20 | 0 | 98 | 47.9 | 16.7 | 95.5 | 90.1 | 43.1 | 66.6 | 76.2 |
| ND Genesis | 76 | 23 | 0 | 94 | 48.4 | 12.8 | 90.3 | 124.7 | 47.6 | 86.2 | 87.5 |
| Pinnacle | 75 | 21 | 0 | 97 | 49.3 | 13.4 | 90.4 | 80.9 | 39.2 | 60.1 | 70.2 |
| **SIX ROW** | | | | | | | | | | | |
| Tradition | 75 | 23 | 0 | 95 | 47.6 | 16.8 | 76.4 | 113.2 | 34.4 | 73.8 | 74.7 |
| Trial Mean | 75 | 22 | 0 | 96 | 48.2 | 14.3 | 82.9 | 107.6 | 42.1 | 74.3 | 78.0 |
| C.V. % | 1.3 | 6.0 | -- | 0.9 | 1.1 | 2.5 | 5.7 | 4.4 | 11.5 | -- | -- |
| LSD 5% | 1.4 | 1.8 | -- | 1.2 | 0.7 | 0.5 | 6.7 | 6.7 | 6.8 | -- | -- |
| LSD 10% | 1.2 | 1.5 | -- | 1.0 | 0.6 | 0.4 | 5.6 | 5.6 | 5.7 | -- | -- |

[1] Days to Head = the number of days from planting to head emergence from the boot.

[2] 0 = no lodging, 9 = 100% lodged.

Planting Date: April 10

Harvest Date: August 21

Previouis Crop: Oat

**Barley - 2020** **Scranton, ND**

| Variety | Plant Height | Plant Lodge | Plump | Test Weight | Grain Protein | ----- Grain Yield ----- 2017 | 2018 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | % | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| **TWO ROW** | | | | | | | | | | |
| AAC Connect | 24 | 0 | 92 | 47.6 | 12.4 | -- | -- | 78.5 | -- | -- |
| AAC Synergy | 24 | 0 | 95 | 47.6 | 11.5 | -- | -- | 81.9 | -- | -- |
| Explorer | 22 | 0 | 92 | 47.0 | 12.1 | -- | -- | 73.0 | -- | -- |
| ND Genesis | 26 | 0 | 93 | 47.5 | 11.4 | 11.3 | 52.7 | 72.9 | 62.8 | 45.6 |
| **SIX ROW** | | | | | | | | | | |
| Tradition | 26 | 0 | 95 | 47.3 | 12.7 | 12.1 | 32.9 | 66.5 | 49.7 | 37.2 |
| Trial Mean | 24 | 0 | 93 | 47.4 | 12.0 | 11.2 | 50.7 | 74.6 | 35.7 | 51.3 |
| C.V. % | 3.8 | -- | 2.1 | 0.9 | 4.7 | 23.1 | 6.8 | 11.1 | -- | -- |
| LSD 5% | 1.4 | NS | 3.0 | 0.7 | 0.9 | 4.0 | 10.5 | 12.8 | -- | -- |
| LSD 10% | 1.2 | NS | 2.4 | 0.5 | 0.7 | 3.3 | 8.6 | 0.3 | -- | -- |

* 0 = no lodging, 9 = 100% lodged.

Planting Date: April 22

Harvest Date: August 22

**Barley - 2020** **Regent, ND**

| Variety | Plant Height | Plant Lodge | Plump | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | % | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| **TWO ROW** | | | | | | | | | | |
| AAC Connect | 21 | 0 | 92 | 43.9 | 15.0 | -- | -- | 32.2 | -- | -- |
| AAC Synergy | 25 | 0 | 94 | 44.8 | 15.0 | -- | -- | 34.8 | -- | -- |
| Explorer | 21 | 0 | 95 | 44.9 | 15.0 | -- | 70.9 | 39.0 | 55.0 | -- |
| ND Genesis | 25 | 0 | 93 | 44.8 | 13.7 | 87.0 | 76.3 | 39.9 | 58.1 | 67.7 |
| **SIX ROW** | | | | | | | | | | |
| Tradition | 23 | 0 | 94 | 40.2 | 16.5 | 85.4 | 67.6 | 24.4 | 46.0 | 59.1 |
| Trial Mean | 23 | 0 | 93 | 43.7 | 15.0 | 83.7 | 72.8 | 34.1 | 26.3 | 50.1 |
| C.V. % | 6.5 | -- | 0.9 | 3.8 | 3.4 | 6.7 | 7.8 | 7.7 | -- | -- |
| LSD 5% | 2.3 | NS | 1.3 | 2.6 | 0.8 | 8.6 | 8.8 | 4.1 | -- | -- |
| LSD 10% | 1.9 | NS | 1.1 | 2.1 | 0.6 | 7.0 | 7.2 | 3.3 | -- | -- |

* 0 = no lodging, 9 = 100% lodged.

Planting Date: April 22

Harvest Date: August 22

**2020 Barley - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Protein | % Plump | ------- Grain Yield-------- 2018 | 2019 | 2020 | Average Yield 2 Year | 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | % | >6/64 | ----------bu/ac---------- | | | ----bu/ac---- | |
| **Six Row** | | | | | | | | | | | |
| Tradition | 60 | 11,714 | 19 | 48.6 | 13.3 | 94.0 | 124.9 | 67.3 | 40.7 | 54.0 | 77.6 |
| **Two Row** | | | | | | | | | | | |
| AAC Connect | 63 | 10,180 | 18 | 49.1 | 12.9 | 95.8 | -- | 73.7 | 49.5 | 61.6 | -- |
| AAC Synergy | 64 | 10,694 | 18 | 49.4 | 11.9 | 96.6 | 141.3 | 73.8 | 50.3 | 62.0 | 88.5 |
| CDC Bow | 66 | 10,362 | 20 | 49.6 | 11.8 | 96.5 | -- | -- | 47.7 | -- | -- |
| Conlon | 58 | 9,791 | 19 | 49.2 | 12.2 | 97.7 | 79.9 | 60.7 | 45.7 | 53.2 | 62.1 |
| Explorer | 65 | 10,005 | 17 | 49.1 | 11.8 | 97.3 | 134.5 | 86.9 | 52.4 | 69.7 | 91.3 |
| ND Genesis | 63 | 9,957 | 22 | 49.8 | 10.7 | 96.7 | 134.4 | 69.1 | 50.5 | 59.8 | 84.7 |
| Pinnacle | 60 | 9,809 | 21 | 50.3 | 11.4 | 97.4 | 133.9 | 76.4 | 49.2 | 62.8 | 86.5 |
| | | | | | | | | | | | |
| Trial Mean | 62 | 10,151 | 19 | 48.9 | 11.4 | 97 | 127.8 | 73.0 | 48.7 | -- | -- |
| CV % | 1.9 | 4.6 | 6.4 | 0.9 | 4.7 | 0.8 | 7.2 | 11.3 | 7.2 | -- | -- |
| LSD 0.05 | 2 | 665 | 2 | 0.6 | 0.8 | 1 | 13.0 | 11.8 | 5.0 | -- | -- |
| LSD 0.10 | 1 | 555 | 1 | 0.5 | 0.6 | 1 | 10.8 | 9.8 | 4.2 | -- | -- |

Planting Date: April 27, 2020
Harvest Date: August 7, 2020
Previous Crop: Soybean
Seeding Rate: 1.2 million live seeds/ac
Grain protein percentages reported on a 0% moisture basis

**2020 Glen Ullin Barley - Recrop** **Dickinson, ND**

| Variety | Seeds per Pound | Test Weight | % Plump | Protein | ------Grain Yield------ 2017 | 2018 | 2020 | Average Yield 2 Year | 3 Year |
|---|---|---|---|---|---|---|---|---|---|
| | | lbs/bu | >6/64 | % | --------bu/ac-------- | | | ----bu/ac---- | |
| **Six Row** | | | | | | | | | |
| Tradition | 9,551 | 51.2 | 96.3 | 15.0 | 65.6 | 106.3 | 76.1 | 91.2 | 82.7 |
| **Two Row** | | | | | | | | | |
| AAC Synergy | 8,956 | 51.3 | 96.3 | 12.9 | -- | -- | 106.8 | -- | -- |
| CDC Bow | 9,352 | 49.9 | 92.2 | 12.6 | -- | -- | 94.5 | -- | -- |
| ND Genesis | 9,193 | 50.9 | 95.1 | 11.3 | 65.8 | 115.8 | 102.8 | 109.3 | 94.8 |
| Trial Mean | 9,186 | 50.6 | 95 | 12.7 | 64.6 | 117.9 | 95.4 | -- | -- |
| CV % | 7.8 | 1.2 | 1.8 | 3.8 | 11.3 | 9.2 | 7.6 | -- | -- |
| LSD 0.05 | NS | 0.9 | 3 | 0.7 | NS | 16.3 | 10.8 | -- | -- |
| LSD 0.10 | NS | 0.8 | 2 | 0.6 | NS | 13.4 | 9.9 | -- | -- |

Planting Date: May 6, 2020
Harvest Date: August 15, 2020
2019 Crop lost due to hail
Seeding Rate: 1.2 million live seeds/ac
Grain protein percentages reported on a 0% moisture basis

**2020 North Dakota oat variety descriptions.**

| Variety | Origin[1] | Year Released | Grain Color | Height | Straw Strength | Days to Heading[2] | Reaction to Diseases: Stem Rust[3] | Reaction to Diseases: Crown Rust[3] | Reaction to Diseases: Barley Y.Dwf[4] | Test Weight | Protein[5] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Beach | ND | 2004 | White | 35 | M.strg. | 63 | 8 | 4 | 6 | V.good | M |
| CDC Dancer | Sask. | 2000 | White | 35 | Strong | 63 | 8 | 6 | 8 | V.good | M |
| CDC Minstrel | Sask. | 2006 | White | 34 | M.strg. | 64 | 8 | 8 | 8 | Good | M |
| CS Camden | Meridian | 2016 | White | 33 | Strong | 64 | 8 | 6 | NA | Good | M |
| Deon | MN | 2013 | Yellow | 37 | Strong | 65 | 8 | 2 | 2 | V.good | M |
| Hayden | SD | 2014 | White | 36 | Med. | 62 | 8 | 6 | NA | V.good | M |
| HiFi | ND | 2001 | White | 35 | Strong | 63 | 4 | 8 | 2 | Good | M |
| Hytest | SD | 1986 | White | 38 | M.strg. | 62 | 8 | 6 | 8 | V.good | H |
| Jury | ND | 2012 | White | 34 | M.strg. | 64 | 1 | 8 | 4 | V.good | M |
| Killdeer | ND | 2000 | White | 32 | Strong | 63 | 8 | 6 | 4 | Good | M |
| Leggett | AAFC | 2005 | White | 33 | Strong | 63 | 3 | 1 | 8 | Good | M |
| **ND Heart** | **ND** | **2020** | **White** | **39** | **Strong** | **60** | **3** | **6** | **4** | **Good** | **H** |
| Newburg | ND | 2011 | White | 38 | Med. | 62 | 1 | 8 | 4 | Good | M |
| Otana | MT | 1977 | White | 36 | M.weak | 63 | 8 | 8 | 8 | V.good | M/L |
| Paul6 | ND | 1994 | Hull-less | 37 | Strong | 68 | 1 | 4 | 2 | Good | H |
| Rockford | ND | 2008 | White | 38 | Strong | 65 | 8 | 8 | 4 | V.good | M |
| Souris | ND | 2006 | White | 33 | Strong | 63 | 6 | 8 | 6 | V.good | M |
| Stallion | SD | 2006 | White | 34 | Med. | 64 | 8 | 3 | NA | V.good | M |
| Warrior | SD | 2018 | White | 32 | Strong | 62 | 6 | 1 | NA | V.good | M |

[1]AAFC = Agriculture & Agri-Food Canada; MN = University of Minnesota; ND = North Dakota State University; SD = South Dakota State University; Sask. = University of Saskatchewan; MT = Montana State University.

[2]Days after planting.

[3]Disease reaction scores from 1-9, with 1 = resistant and 9 = very susceptible.

[4]Disease reaction scores from 1-9, with 1 = resistant and 9 = very susceptible, NA – not available.

[5]H = high; M = medium; L = low; NA = not available.

[6]Hull-less variety.

**Oat - 2020** **Hettinger, ND**

| Variety | Days to Head | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| Beach | 70 | 25 | 0 | 33.4 | | 90.9 | 153.9 | 44.9 | 99.4 | 96.6 |
| CS Camden | 75 | 23 | 0 | 32.6 | | 114.1 | 173.9 | 56.4 | 115.2 | 114.8 |
| CDC Dancer | 74 | 24 | 0 | 33.3 | | 98.9 | 172.9 | 45.2 | 109.1 | 105.7 |
| Deon | 75 | 24 | 0 | 34.6 | | 89.8 | 160.6 | 40.0 | 100.3 | 96.8 |
| Hayden | 74 | 25 | 0 | 34.7 | | 105.2 | 174.1 | 48.2 | 111.2 | 109.2 |
| ND Heart | 72 | 27 | 0 | 34.0 | | 101.1 | 154.1 | 42.9 | 98.5 | 99.4 |
| HiFi | 75 | 25 | 0 | 34.0 | | 94.1 | 161.7 | 50.6 | 106.2 | 102.1 |
| Hytest | 70 | 27 | 0 | 36.3 | | 84.3 | 146.4 | 48.7 | 97.6 | 93.1 |
| Jury | 73 | 27 | 0 | 32.9 | | 92.3 | 162.2 | 48.2 | 105.2 | 100.9 |
| Killdeer | 73 | 22 | 0 | 34.1 | | 108.3 | 150.5 | 48.6 | 99.6 | 102.5 |
| Leggett | 76 | 22 | 0 | 33.0 | | 99.7 | 160.5 | 49.9 | 105.2 | 103.4 |
| CDC Minstrel | 75 | 23 | 0 | 33.8 | | 99.6 | 183.6 | 47.8 | 115.7 | 110.3 |
| Newburg | 75 | 24 | 0 | 32.8 | | 95.6 | 159.1 | 40.5 | 99.8 | 98.4 |
| Otana | 75 | 26 | 0 | 36.0 | | 97.1 | 159.3 | 42.9 | 101.1 | 99.8 |
| Rockford | 74 | 26 | 0 | 36.5 | | 112.3 | 167.7 | 55.9 | 111.8 | 112.0 |
| Souris | 74 | 24 | 0 | 35.1 | | 103.6 | 152.3 | 46.4 | 99.4 | 100.8 |
| Stallion | 74 | 23 | 0 | 36.4 | | 96.5 | 144.9 | 33.8 | 89.4 | 91.7 |
| Warrior | 70 | 22 | 0 | 33.3 | | -- | 168.1 | 47.4 | 107.8 | -- |
| Paul (hull-less) | 76 | 24 | 0 | 43.0 | | 72.7 | 105.5 | 32.9 | 69.2 | 70.4 |
| | | | | | | | | | | |
| Trial Mean | 74 | 24 | 0 | 34.9 | | 97.3 | 157.6 | 46.8 | 110.9 | 104.8 |
| C.V. % | 0.9 | 6.2 | -- | 2.3 | -- | 6.0 | 7.3 | 7.5 | -- | -- |
| LSD 5% | 0.9 | 2.1 | -- | 1.1 | -- | 8.2 | 16.2 | 4.9 | -- | -- |
| LSD 10% | 0.8 | 1.8 | -- | 0.9 | -- | 6.9 | 13.5 | 4.1 | -- | -- |

[1] Days to Head = the number of days from planting to head emergence from the boot.

[2] 0 = no lodging, 9 = 100% lodged.

Planting Date: April 10

Harvest Date: August 24

Previous Crop: Spring Wheat

**2020 Oat - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Grain Yield 2018 | Grain Yield 2019 | Grain Yield 2020 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| Beach | 59 | 10,866 | 27 | 39.4 | 83.5 | 108.5 | 90.3 | 99.4 | 94.1 |
| CDC Dancer | 63 | 11,611 | 27 | 37.8 | 95.3 | 102.3 | 83.7 | 93.0 | 93.7 |
| CDC Minstrel | 62 | 11,154 | 23 | 37.7 | 106.0 | 127.5 | 93.9 | 110.7 | 109.1 |
| Cs Camden | 62 | 11,201 | 26 | 35.0 | 111.4 | 102.4 | 98.5 | 100.4 | 104.1 |
| Deon | 61 | 12,234 | 26 | 36.9 | 95.5 | 149.8 | 94.5 | 122.2 | 113.3 |
| Hayden | 61 | 11,545 | 25 | 38.2 | 117.4 | 129.5 | 93.2 | 111.3 | 113.3 |
| HiFi | 62 | 13,160 | 26 | 35.9 | 109.4 | 118.0 | 93.3 | 105.7 | 106.9 |
| Hytest | 59 | 12,368 | 28 | 38.2 | 101.6 | 90.5 | 86.9 | 88.7 | 93.0 |
| Jury | 60 | 12,573 | 30 | 36.3 | 95.2 | 122.6 | 93.6 | 108.1 | 103.8 |
| Killdeer | 59 | 12,859 | 24 | 36.0 | 109.3 | 125.7 | 102.5 | 114.1 | 112.5 |
| Leggett | 63 | 12,027 | 25 | 37.9 | 95.4 | 97.9 | 88.5 | 93.2 | 93.9 |
| ND Heart | 59 | 11,498 | 26 | 33.8 | 103.0 | 99.2 | 93.0 | 96.1 | 98.4 |
| Newburg | 63 | 11,682 | 25 | 37.4 | 82.1 | 107.5 | 101.3 | 104.4 | 97.0 |
| Otana | 63 | 13,821 | 29 | 37.9 | 97.7 | 108.0 | 94.5 | 101.2 | 100.1 |
| Paul | 64 | 16,706 | 27 | 43.8 | 82.2 | 87.5 | 62.3 | 74.9 | 77.3 |
| Rockford | 61 | 13,370 | 27 | 38.2 | 99.1 | 123.4 | 90.5 | 107.0 | 104.3 |
| Souris | 60 | 14,388 | 24 | 36.9 | 94.5 | 110.9 | 103.2 | 107.1 | 102.9 |
| Stallion | 60 | 13,889 | 26 | 38.7 | 103.6 | 113.7 | 94.6 | 104.2 | 104.0 |
| Warrior | 59 | 13,413 | 23 | 36.8 | -- | 97.0 | 91.6 | 94.3 | -- |
| Trial Mean | 61 | 12,394 | 26 | 37.8 | 100.7 | 113.7 | 91.3 | -- | -- |
| CV % | 1.1 | 4.9 | 5.2 | 2.6 | 13.7 | 14.6 | 7.9 | -- | -- |
| LSD 0.05 | 1 | 860 | 2 | 1.4 | 19.3 | 23.2 | 10.1 | -- | -- |
| LSD 0.10 | 1 | 720 | 2 | 1.2 | 16.1 | 19.4 | 8.4 | -- | -- |

Planting Date: April 27, 2020
Harvest Date: August 17, 2020
Previous Crop: Field Pea
Seeding Rate: 1 million live seeds/ac

**Oil Type Sunflower - 2020** **Hettinger, ND**

| Company/Brand | Hybrid | Oil Type & Traits[1] | Days to Bloom[2] | Plant Height | Test Weight | Oil Content | Grain Yield 2020 | Grain Yield 2-Year | Grain Yield 3-Year |
|---|---|---|---|---|---|---|---|---|---|
| | | | | inches | lbs/bu | % | --------lbs/ac-------- | | |
| CROPLAN | CP3845 | HO | 68 | 62 | 31.1 | 43.4 | 1347 | 1939 | -- |
| CROPLAN | CP432E | NS, EX | 65 | 63 | 29.4 | 37.8 | 1717 | 1688 | 2265 |
| CROPLAN | CP450E | HO, EX | 69 | 66 | 30.3 | 39.3 | 2075 | 1950 | -- |
| CROPLAN | CP455E | HO, EX | 68 | 67 | 31.1 | 42.0 | 2220 | 2090 | 2631 |
| CROPLAN | CP4909E | NS, EX | 69 | 62 | 31.1 | 39.9 | 2000 | 1950 | -- |
| Dairyland Seed | D643HO | HO, EX | 68 | 69 | 30.5 | 42.9 | 1903 | -- | -- |
| Dairyland Seed | D683MO | NS, EX | 68 | 67 | 30.9 | 42.5 | 1998 | -- | -- |
| Dairyland Seed | D684HO | HO, EX | 70 | 73 | 30.6 | 41.9 | 1997 | -- | -- |
| Dairyland Seed | D690MO | NS, EX | 71 | 78 | 28.9 | 42.9 | 1762 | -- | -- |
| Dyna-Gro | H42HO18CL | HO, CL | 68 | 64 | 31.3 | 41.0 | 1725 | 1805 | -- |
| Dyna-Gro | H44HO12CL | HO, CL | 65 | 66 | 31.2 | 44.1 | 2008 | 2074 | -- |
| Dyna-Gro | H45HO10EX | HO, EX | 68 | 65 | 28.6 | 39.5 | 1681 | 1854 | -- |
| Dyna-Gro | H45NS16CL | NS, CL | 67 | 66 | 31.4 | 42.2 | 1967 | 2226 | -- |
| Dyna-Gro | H48HO15CL | HO, CL | 71 | 68 | 29.5 | 45.1 | 1640 | 1958 | -- |
| Dyna-Gro | H49HO19CL | HO, CL | 71 | 70 | 31.6 | 42.9 | 2005 | 2286 | -- |
| Dyna-Gro | H49NS14CL | NS, CL | 70 | 65 | 31.6 | 41.5 | 1732 | 2022 | -- |
| Dyna-Gro | XH00H57 | NS | 70 | 72 | 31.1 | 43.5 | 1833 | -- | -- |
| Dyna-Gro | XH81H52CP | HO, CLP | 71 | 69 | 32.5 | 43.9 | 1817 | 2014 | -- |
| Dyna-Gro | XH82H63EX | HO, EX | 69 | 76 | 31.0 | 41.8 | 1784 | -- | -- |
| Dyna-Gro | XH82H65EX | HO, EX | 66 | 70 | 31.3 | 42.7 | 1779 | -- | -- |
| Dyna-Gro | XH91H54CL | HO, CL | 69 | 75 | 30.9 | 42.2 | 1921 | 2064 | -- |
| Dyna-Gro | XH93H79CL | HO, CL | 72 | 73 | 30.2 | 41.6 | 1673 | 2174 | -- |
| Legend Seeds | Kaledonia | HO, CL | 69 | 74 | 29.7 | 35.8 | 2149 | -- | -- |
| Nuseed | Camaro II | NS, CL | 69 | 70 | 32.9 | 41.4 | 2006 | 2299 | 2501 |
| Nuseed | Falcon | NS, EX | 69 | 64 | 31.2 | 41.3 | 1982 | 2018 | 2350 |
| Nuseed | Hornet | HO, CL | 72 | 67 | 30.3 | 41.1 | 1699 | 2036 | 2496 |
| Nuseed | N4H302 E | HO, EX | 68 | 61 | 29.6 | 40.7 | 1819 | 1921 | 2127 |
| Nuseed | N4H422 CL | HO, CL | 69 | 75 | 31.1 | 41.1 | 1768 | -- | -- |
| Nuseed | N4H470 CL Plus | HO, CLP | 71 | 72 | 33.0 | 44.8 | 1820 | 2016 | 2533 |
| Nuseed | N4H521 CL | HO, CL | 70 | 62 | 30.6 | 43.1 | 2313 | 2394 | 2715 |
| Nuseed | N4HM354 | NS, CL | 67 | 66 | 32.0 | 43.5 | 1684 | 1797 | 2121 |
| Proseed | 12G25 CL | HO, CL | 67 | 62 | 32.6 | 44.8 | 2146 | -- | -- |
| Proseed | E-50016 | HO, CL | 70 | 66 | 29.6 | 41.3 | 1878 | -- | -- |
| Proseed | E-91 E | HO, EX | 70 | 77 | 30.8 | 40.9 | 1723 | -- | -- |
| Proseed | E-93 E | NS, CL | 69 | 70 | 28.1 | 38.1 | 1837 | -- | -- |
| S&W | SF110 | HO, CL | 67 | 71 | 31.4 | 41.8 | 1677 | -- | -- |
| S&W | SF440 | HO, CL | 72 | 72 | 30.9 | 42.1 | 1947 | -- | -- |
| SunOpta | 4415 HO/CLP/DM | HO, CLP | 69 | 72 | 29.6 | 39.5 | 1766 | 2110 | 2403 |
| SunOpta | 4425CL | NS, CL | 69 | 76 | 29.0 | 38.2 | 1798 | 1889 | 2261 |
| SunOpta | 44725CL | NS, CL | 69 | 74 | 28.4 | 41.6 | 1868 | 2063 | -- |
| SunOpta | 9583CLP | Conf, CLP | 71 | 73 | 23.9 | -- | 1579 | 1585 | -- |
| SunOpta | EXSS90 | Conf | 69 | 77 | 24.1 | -- | 1343 | -- | -- |

***Table continued on next page***

**Oil Type Sunflower - 2020** **Hettinger, ND**

| Company/Brand | Hybrid | Oil Type & Traits[1] | Days to Bloom[2] | Plant Height | Test Weight | Oil Content | Grain Yield 2020 | Grain Yield 2-Year | Grain Yield 3-Year |
|---|---|---|---|---|---|---|---|---|---|
| ***Table continues from previous page*** | | | | | | | | | |
| USDA (Check) | 894 | TR | 67 | 71 | 31.2 | 39.7 | 1315 | 1469 | 1915 |
| USDA (Check) | Honeycomb NS | NS | 61 | 66 | 31.5 | 43.6 | 788 | -- | -- |
| Croplan (Check) | 559 CL | NS, CL | 69 | 74 | 29.8 | 37.8 | 1537 | 2019 | -- |
| Mycogen (Check) | 8N270CLDM | NS, CL | 64 | 62 | 32.1 | 43.0 | 1591 | 1770 | 1933 |
| | | | | | | | | | |
| Trial Mean | | | 69 | 69 | 30.4 | 41.1 | 1803 | 1982 | 2327 |
| C.V. % | | | 1.4 | 6.3 | 3.6 | 2.9 | 10.3 | -- | -- |
| LSD 5% | | | 1.4 | 6.1 | 1.3 | 1.7 | 259 | -- | -- |
| LSD 10% | | | 1.1 | 5.1 | 1.1 | 1.4 | 217 | -- | -- |

[1] Type: TR-Traditonal, NS-NuSun, HO-High Oleic, CL=Clearfield, CLP=Clearfield Plus, EX=ExpressSu
Conf=Confectionary.

[2] Days after planting.

Planting Date: May 18

Harvest Date: October 18

Previous Crop: Spring Wheat

## NDSU Hettinger Research Extension Center

**Flax - 2020** **Hettinger, ND**

| Variety | Days to Bloom | Plant Height | Test Weight | Oil Content | -------Grain Yield-------- 2016 | 2018 | 2020 | Average Yield 2-Yr | 3-Yr |
|---|---|---|---|---|---|---|---|---|---|
| | ** | inches | lbs/bu | % | ---------- bu per acre ---------- | | | | |
| AAC Bright | 51 | 20 | *** | 46.4 | -- | -- | 12.5 | -- | -- |
| Bison | 47 | 21 | | 43.8 | 18.7 | 21.6 | 14.9 | 18.3 | 18.4 |
| Carter* | 49 | 21 | | 43.2 | 18.2 | 24.5 | 14.1 | 19.3 | 18.9 |
| CDC Buryu | 47 | 19 | | 43.1 | -- | -- | 13.1 | -- | -- |
| CDC Dorado* | 46 | 17 | | 44.6 | -- | -- | 13.9 | -- | -- |
| CDC Glas | 50 | 22 | | 44.5 | 21.1 | 24.1 | 15.0 | 19.6 | 20.1 |
| CDC Neela | 48 | 19 | | 43.4 | 21.6 | 25.1 | 16.1 | 20.6 | 20.9 |
| CDC Plava | 51 | 21 | | 44.8 | -- | -- | 16.2 | -- | -- |
| Gold ND* | 50 | 21 | | 44.1 | 19.4 | 22.0 | 13.9 | 18.0 | 18.4 |
| ND Hammond | 50 | 20 | | 41.0 | -- | 22.0 | 13.2 | 17.6 | -- |
| Omega* | 51 | 21 | | 42.7 | 19.4 | 18.9 | 16.3 | 17.6 | 18.2 |
| Prairie Thunder | 51 | 23 | | 43.9 | 18.9 | 27.0 | 17.9 | 22.5 | 21.3 |
| Webster | 50 | 21 | | 44.2 | 20.1 | 23.9 | 14.8 | 19.4 | 19.6 |
| York | 50 | 19 | | 43.7 | 19.4 | 24 | 17.2 | 20.6 | 20.2 |
| Trial Mean | 49 | 20 | | 43.8 | 19.5 | 23.0 | 14.9 | 19.0 | 19.6 |
| C.V. % | 1.6 | 7.1 | | 1.0 | 9.6 | 11.6 | 11.3 | -- | -- |
| LSD 5% | 1.2 | 2.1 | | 0.6 | 2.7 | 3.7 | 2.4 | -- | -- |
| LSD 10% | 1.0 | 1.7 | | 0.5 | 2.2 | 3.1 | 2.0 | -- | -- |

* Yellow seed type.

** Days after planting.

*** Not enough grain sample for a test weight reading.

Lodging notes were taken at harvest, however no lodging was observed.

Planting Date: May 6

Harvest Date: September 4

Previous Crop: Peas

**2020 Flax - Recrop** **Dickinson, ND**

| Variety | Days to Flower | Days to Mature | Plant Height | Test Weight | Oil Content | -- Grain Yield-- 2019 | 2020 | 2 Year Average |
|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | % | ------bu/ac------ | | bu/ac |
| AAC Bright | 56 | 103 | 14 | 52.1 | 46.6 | 13.6 | 20.1 | 16.9 |
| Bison | 55 | 102 | 16 | 53.6 | 43.5 | 16.2 | 22.1 | 19.2 |
| CDC Buryu | 57 | 103 | 15 | 53.1 | 44.0 | 15.4 | 22.9 | 19.2 |
| CDC Dorado | 50 | 104 | 14 | 53.1 | 44.6 | -- | 17.9 | -- |
| CDC Glas | 57 | 103 | 15 | 52.2 | 44.2 | 13.3 | 19.7 | 16.5 |
| CDC Neela | 55 | 103 | 15 | 53.1 | 44.6 | 13.9 | 22.7 | 18.3 |
| CDC Plava | 56 | 102 | 14 | 52.8 | 44.2 | 9.9 | 18.4 | 14.2 |
| Carter | 55 | 104 | 16 | 53.4 | 44.0 | 14.7 | 20.0 | 17.3 |
| Gold ND | 57 | 105 | 16 | 53.3 | 45.2 | 14.1 | 19.1 | 16.6 |
| ND Hammond | 56 | 105 | 17 | 53.0 | 42.3 | 11.0 | 19.2 | 15.1 |
| Omega | 57 | 104 | 15 | 53.7 | 43.8 | 13.3 | 19.0 | 16.2 |
| Prairiethunder | 56 | 105 | 18 | 53.5 | 43.6 | 15.9 | 22.8 | 19.4 |
| Webster | 55 | 105 | 17 | 53.2 | 44.6 | 13.9 | 22.2 | 18.1 |
| York | 55 | 103 | 15 | 53.2 | 43.9 | 18.4 | 20.6 | 19.5 |
| Trial Mean | 56 | 105 | 16 | 53.3 | 44.5 | 14.6 | 21.1 | 21.1 |
| CV % | 1.1 | 1.3 | 7.1 | 0.8 | 0.9 | 15.0 | 10.9 | 10.9 |
| LSD 0.05 | 1 | 2 | 2 | 0.7 | 0.6 | 3.6 | 3.7 | 3.7 |
| LSD 0.10 | 1 | 2 | 2 | 0.6 | 0.5 | 3.0 | 3.1 | 3.1 |

Planting Date: April 30, 2020
Harvest Date: September 3, 2020
Previous Crop: Oat
No Lodging observed
Oil content reported on 9% moisture basis

## NDSU Hettinger Research Extension Center

**Safflower - 2020** **Hettinger, ND**

| Variety | Days to Flower | Plant Height | Test Weight | Oil Content | Grain Yield 2018 | Grain Yield 2019 | Grain Yield 2020 | Average Yield 2-Yr | Average Yield 3-Yr |
|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | lbs/bu | % | lbs per acre | | | | |
| **Linoleic Types** | | | | | | | | | |
| Cardinal | 87 | 24 | 42.4 | 42.3 | 1825 | 1577 | 2363 | 1970 | 1922 |
| Finch | 83 | 22 | 43.5 | 43.8 | 1335 | 1456 | 2281 | 1869 | 1691 |
| NutraSaff | 87 | 24 | 37.0 | 51.7 | 1425 | 555 | 1910 | 1233 | 1297 |
| Rubis Red | 89 | 23 | 44.9 | 36.7 | 1393 | 706 | 1693 | 1200 | 1264 |
| **Oleic Types** | | | | | | | | | |
| Chickadee | 86 | 21 | 42.1 | 40.2 | 1497 | 1299 | 2194 | 1747 | 1663 |
| Hybrid 1601 | 85 | 25 | 36.0 | 42.7 | 1929 | 1142 | 2043 | 1593 | 1705 |
| Hybrid 200 | 87 | 24 | 41.1 | 34.2 | 1397 | 1108 | 2050 | 1579 | 1518 |
| Hybrid 446 | 86 | 23 | 42.7 | 33.4 | 1297 | 1665 | 2394 | 2030 | 1785 |
| MonDak | 87 | 22 | 40.9 | 38.3 | 1680 | 1668 | 2135 | 1902 | 1828 |
| Montola 2003 | 89 | 21 | 38.2 | 39.6 | 1830 | 851 | 1871 | 1361 | 1517 |
| Trial Mean | 86 | 23 | 40.9 | 40.3 | 1561 | 1203 | 2093 | 1648 | 1619 |
| C.V. % | 1.2 | 7.7 | 3.3 | 0.9 | 9.5 | 15.3 | 9.3 | -- | -- |
| LSD 5% | 1.5 | 2.8 | 1.8 | 0.5 | 215 | 268 | 283 | -- | -- |
| LSD 10% | 1.2 | 2.1 | 1.5 | 0.4 | 179 | 222 | 235 | -- | -- |

[1] Days after planting.

Planting Date: May 6

Harvest Date: September 17

Previous Crop: Field Pea

**Dry Bean - 2020** **Hettinger, ND**

| Variety | Type | Plant Height | Plant Lodge | Test Weight | Grain Yield 2018 | Grain Yield 2019 | Grain Yield 2020 | Average Yield 2 yr | Average Yield 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | | inches | 0-9[1] | lbs/bu | lbs per acre | lbs per acre | lbs per acre | lbs per acre | lbs per acre |
| LaPaz | Pinto | 26 | 6 | 49.9 | 1691 | 1441 | 1139 | 1290 | 1424 |
| Lariat | Pinto | 36 | 8 | 51.8 | 1375 | 1245 | 1159 | 1202 | 1260 |
| Monterrey | Pinto | 30 | 5 | 51.1 | 1653 | 1345 | 1036 | 1191 | 1345 |
| ND-Falcon | Pinto | 27 | 6 | 50.9 | -- | 1509 | 1105 | 1307 | -- |
| Palomino | Pinto | 29 | 5 | 53.2 | 1536 | 1611 | 1019 | 1315 | 1389 |
| Stampede | Pinto | 33 | 5 | 50.4 | 1609 | 1797 | 1207 | 1502 | 1538 |
| Torreon | Pinto | 31 | 5 | 53.2 | -- | 1437 | 1031 | 1234 | -- |
| Vibrant | Pinto | 30 | 5 | 56.1 | -- | 1286 | 1150 | 1218 | -- |
| Windbreaker | Pinto | 36 | 7 | 51.2 | 1534 | 1295 | 1070 | 1183 | 1300 |
| Blizzard | Navy | 31 | 5 | ** | -- | 1166 | 787 | 977 | -- |
| HMS Medalist | Navy | 29 | 3 | 51.8 | 937 | 1130 | 962 | 1046 | 1010 |
| T9905 | Navy | 27 | 4 | ** | 1243 | 1350 | 878 | 1114 | 1157 |
| Merlot | Sm Red | 24 | 6 | ** | 1011 | 1757 | 794 | 1276 | 1187 |
| Viper | Sm Red | 25 | 5 | 54.3 | -- | 1659 | 1257 | 1458 | -- |
| Black Tails | Black | 24 | 6 | 56.6 | -- | 1870 | 1151 | 1511 | -- |
| Eclipse | Black | 24 | 3 | 49.0 | 1162 | 1661 | 1250 | 1456 | 1358 |
| ND Twilight | Black | 24 | 4 | 58.3 | -- | 1525 | 1073 | 1299 | -- |
| ND Pegasus | Great Northern | 32 | 3 | 50.4 | -- | 1811 | 1342 | 1577 | -- |
| Trial Mean | | 29 | 5 | 52.1 | 1288 | 1488 | 1063 | 1286 | 1297 |
| C.V. % | | 16.8 | 10.2 | -- | 13.0 | 15.7 | 12.2 | -- | -- |
| LSD 5% | | 6.8 | 1.0 | -- | 240 | 330 | 184 | -- | -- |
| LSD 10% | | 5.7 | 0.8 | -- | 200 | 275 | 154 | -- | -- |

[1] 0 = no lodging, 9 = lying flat on ground.

** Not enough sample for the weigh system to register a test weight.

Planting Date: May 19

Harvest Date: September 15

Previous Crop: Oats

**Chickpea - 2020** **Hettinger, ND**

| Variety | Days to Flower | Height | Lodging | -----Seed Size (mm)----- | | | | Seed Size | Test Weight | ----- Grain Yield ----- | | | Average Yield | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | <8 | 8-9 | 9-10 | >10 | | | 2018 | 2019 | 2020 | 2 yr | 3 yr |
| | DAP[1] | inches | 0 - 9[2] | ----------%---------- | | | | seed/lb | lb/bu | ----------lbs/ac---------- | | | | |
| **Kabuli Type** | | | | | | | | | | | | | | |
| CDC Frontier | 63 | 16 | 0 | 8 | 63 | 24 | 4 | 1295 | ** | 1802 | 1483 | 761 | 1122 | 1349 |
| CDC Leader | 62 | 15 | 0 | 7 | 56 | 31 | 5 | 1274 | | -- | 2307 | 834 | 1571 | -- |
| CDC Orion | 59 | 17 | 0 | 7 | 39 | 38 | 16 | 1231 | | 1456 | 1918 | 624 | 1271 | 1333 |
| CDC Palmer | 59 | 15 | 0 | 5 | 43 | 42 | 10 | 1112 | | -- | 2762 | 648 | 1705 | -- |
| ND Crown | 62 | 18 | 0 | 5 | 35 | 43 | 17 | 1123 | | -- | -- | 487 | -- | -- |
| Royal | 65 | 23 | 0 | 12 | 25 | 33 | 30 | 1282 | | -- | -- | 340 | -- | -- |
| Sawyer | 65 | 20 | 0 | 11 | 31 | 34 | 24 | 1296 | | 1439 | 662 | 347 | 505 | 816 |
| Sierra | 65 | 21 | 0 | 10 | 32 | 35 | 24 | 1336 | | 1066 | 280 | 271 | 276 | 539 |
| Mean | 63 | 18 | 0 | 8 | 40 | 35 | 16 | 1244 | | 1507 | 1823 | 539 | 1075 | 1009 |
| C.V. % | 1.3 | 12.6 | -- | 24.1 | 10.6 | 10.0 | 21.7 | 3.8 | | 11.1 | 13.0 | 10.3 | -- | -- |
| LSD 5% | 1.4 | 3.3 | NS | 3 | 6 | 5 | 5 | 70 | | 253 | 343 | 82 | -- | -- |
| LSD 10% | 1.2 | 2.7 | NS | 2 | 5 | 4 | 4 | 58 | | 208 | 284 | 68 | -- | -- |

[1] Days after planting.

[2] Lodging: 0 = none, 9 = lying flat on ground.

** Not enough sample for a test weight.

Planting Date: April 21

Harvest Date: September 5

Previous Crop: Corn

**2020 Chickpea - Recrop** **Dickinson, ND**

| Variety | Days to Flower | Days to Mature | Plant Height | 1000 seed weight | Seeds per Pound | Test Weight | --------Seed Size (mm)-------- <8 | 8-9 | 9-10 | >10 | Yield |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | in | gm | | lbs/bu | ----------%---------- | | | | lbs/ac |
| ***Kabuli type*** | | | | | | | | | | | |
| CDC Frontier | 56 | 97 | 11 | 384 | 1,181 | 60.5 | 42 | 49 | 10 | 0 | 1018 |
| CDC Orion | 50 | 95 | 11 | 436 | 1,040 | 58.7 | 18 | 49 | 33 | 1 | 1006 |
| ND Crown | 52 | 96 | 12 | 447 | 1,016 | 60.0 | 19 | 44 | 37 | 0 | 952 |
| Royal | 57 | 97 | 12 | 525 | 865 | 58.7 | 7 | 27 | 60 | 6 | 670 |
| Sawyer | 52 | 97 | 12 | 518 | 875 | 57.7 | 6 | 31 | 60 | 3 | 666 |
| Sierra | 56 | 97 | 10 | 517 | 880 | 57.5 | 6 | 29 | 61 | 3 | 569 |
| Trial Mean | 54 | 96 | 11 | 471 | 976 | 58.9 | 16 | 38 | 43 | 2 | 813 |
| CV % | 1.4 | 1.0 | 8.3 | 3.7 | 3.2 | 0.7 | 14.7 | 6.0 | 9.2 | 33.9 | 18 |
| LSD 0.05 | 1 | 2 | 2 | 31 | 57 | 0.7 | 4 | 4 | 7 | 1 | 262 |
| LSD 0.10 | 1 | 1 | 1 | 25 | 47 | 0.6 | 4 | 3 | 6 | 1 | 213 |

Planting Date: April 28, 2020
Harvest Date: August 17, 2020
Previous Crop: Barley

## NDSU Hettinger Research Extension Center

**Field Pea - 2020** **Hettinger, ND**

| Variety | Days to Flower | Flower Duration | Days to Mature | Canopy Height | Lodging | Seed Protein | 1,000 Seed Wt. | Seeds Lb | Test Weight | Seed Yield | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 2020 | 2-Yr. Avg. | 3-Yr. Avg. |
| | DAP[1] | days | DAP[1] | inches | 0 - 9[2] | % | gm | seeds | lb/bu | -------Bushels per acre------- | | |
| **Yellow Cotyledon Type** | | | | | | | | | | | | |
| AAC Asher | 55 | 15 | 81 | 15 | 3 | 25.7 | 251 | 1815 | 62.1 | 36.6 | 41.3 | -- |
| AAC Carver | 55 | 15 | 80 | 22 | 3 | 25.4 | 232 | 1958 | 62.2 | 33.6 | 42.0 | -- |
| AAC Chrome | 56 | 14 | 81 | 19 | 3 | 25.5 | 247 | 1835 | 62.5 | 31.9 | 40.2 | -- |
| AAC Profit | 57 | 13 | 81 | 22 | 3 | 25.8 | 235 | 1929 | 63.4 | 35.8 | 43.0 | 38.7 |
| Agassiz | 57 | 15 | 83 | 23 | 3 | 25.6 | 226 | 2013 | 62.4 | 31.9 | 40.2 | 35.2 |
| CDC Amarillo | 58 | 13 | 82 | 21 | 1 | 25.5 | 228 | 1992 | 61.9 | 34.2 | 39.2 | -- |
| CDC Dakota | 59 | 11 | 81 | 18 | 2 | 30.9 | 202 | 2250 | 61.2 | 29.8 | -- | -- |
| CDC Inca | 57 | 14 | 83 | 21 | 3 | 26.1 | 240 | 1892 | 63.2 | 35.4 | 43.2 | -- |
| CDC Saffron | 57 | 14 | 81 | 17 | 3 | 26.1 | 236 | 1926 | 61.9 | 29.2 | 38.0 | -- |
| CDC Spectrum | 58 | 14 | 83 | 20 | 3 | 27.2 | 236 | 1923 | 60.9 | 33.5 | 40.1 | -- |
| Cronos | 52 | 15 | 78 | 19 | 3 | 29.9 | 220 | 2070 | 60.3 | 19.2 | -- | -- |
| DL Apollo | 54 | 16 | 81 | 21 | 2 | 28.1 | 217 | 2112 | 62.8 | 25.0 | 36.4 | -- |
| DS Admiral | 54 | 17 | 81 | 22 | 2 | 27.5 | 237 | 1923 | 62.0 | 26.2 | 35.1 | 29.9 |
| Durwood | 55 | 16 | 82 | 24 | 2 | 27.1 | 221 | 2069 | 61.6 | 29.2 | 37.2 | 31.9 |
| Hyline | 57 | 13 | 81 | 19 | 3 | 25.9 | 253 | 1797 | 63.6 | 30.8 | 38.1 | 30.5 |
| Jetset | 54 | 16 | 81 | 21 | 3 | 27.9 | 208 | 2181 | 60.2 | 24.4 | 35.2 | -- |
| Kite | 53 | 17 | 81 | 17 | 6 | 27.1 | 235 | 1939 | 60.0 | 21.5 | -- | -- |
| Korando | 52 | 18 | 81 | 20 | 3 | 30.6 | 284 | 1599 | 60.5 | 24.0 | 32.9 | -- |
| LG Equator | 53 | 19 | 82 | 20 | 2 | 27.0 | 226 | 2008 | 61.4 | 28.6 | -- | -- |
| LG Stunner | 54 | 16 | 81 | 21 | 2 | 27.9 | 246 | 1850 | 61.6 | 27.5 | 36.0 | 32.2 |
| ND Dawn | 55 | 14 | 81 | 22 | 3 | 26.3 | 236 | 1929 | 60.9 | 27.2 | 34.9 | -- |
| Nette 2010 | 53 | 17 | 81 | 19 | 2 | 27.5 | 225 | 2021 | 61.8 | 26.7 | 36.1 | 30.1 |
| Orchestra | 53 | 18 | 82 | 21 | 3 | 28.9 | 228 | 2003 | 60.2 | 26.1 | -- | -- |
| Peregrine | 52 | 16 | 80 | 17 | 5 | 27.8 | 232 | 1958 | 61.0 | 19.8 | -- | -- |
| Salamanca | 54 | 17 | 82 | 20 | 3 | 27.9 | 249 | 1829 | 61.6 | 27.1 | 38.2 | 32.2 |
| **Green Cotyledon Type** | | | | | | | | | | | | |
| Aragorn | 53 | 17 | 81 | 18 | 4 | 27.7 | 214 | 2126 | 61.9 | 22.4 | -- | -- |
| Arcadia | 54 | 15 | 80 | 19 | 3 | 26.6 | 219 | 2080 | 63.6 | 31.6 | 36.1 | 25.9 |
| CDC Striker | 56 | 14 | 81 | 19 | 3 | 28.9 | 227 | 1998 | 61.4 | 25.9 | 34.6 | 26.2 |
| Empire | 57 | 12 | 80 | 23 | 2 | 25.5 | 217 | 2104 | 62.1 | 27.4 | 33.9 | -- |
| Greenwood | 54 | 17 | 81 | 17 | 4 | 26.8 | 215 | 2117 | 62.9 | 26.7 | -- | -- |
| Hampton | 56 | 15 | 81 | 19 | 4 | 29.1 | 240 | 1893 | 61.1 | 25.1 | 28.7 | -- |
| LG Koda | 57 | 13 | 81 | 21 | 3 | 26.0 | 241 | 1885 | 62.2 | 26.1 | 33.0 | 28.8 |
| Shamrock | 56 | 15 | 82 | 20 | 3 | 26.7 | 218 | 2098 | 59.4 | 25.2 | 33.1 | 28.3 |
| Viper | 53 | 17 | 80 | 22 | 4 | 29.9 | 210 | 2163 | 59.8 | 20.1 | 29.3 | 23.8 |
| Mean | 55 | 15 | 81 | 20 | 3 | 27.2 | 231 | 1977 | 61.5 | 27.2 | 36.5 | 30.3 |
| C.V. % | 1.4 | 8.6 | 1.4 | 9.2 | 38.7 | 2.1 | 5.1 | 5.3 | 1.5 | 10.2 | -- | -- |
| LSD 5% | 1.1 | 1.8 | 1.6 | 2.6 | 1.6 | 0.8 | 17 | 146 | 1.3 | 3.2 | -- | -- |
| LSD 10% | 0.9 | 1.5 | 1.3 | 2.1 | 1.4 | 0.7 | 14 | 122 | 1.1 | 2.5 | -- | -- |

[1] Days after planting.

[2] Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 27 Harvest Date: August 3

**2020 Field Pea - Recrop** **Dickinson, ND**

| Variety | Days to Flower | Days to Mature | 1000 Seed Weight | Seeds per Pound | Plant Height | Test Weight | Protein | Seed Yield 2020 | Seed Yield 2 Year | Seed Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | gm | | in | lbs/bu | % | | --bu/ac-- | |
| ***Yellow Cotyledon Types*** | | | | | | | | | | |
| AAC Asher | 56 | 84 | 315 | 1,443 | 14 | 65.4 | 22.2 | 31.0 | -- | -- |
| AAC Carver | 55 | 84 | 292 | 1,558 | 15 | 65.4 | 22.5 | 24.2 | 35.6 | -- |
| AAC Chrome | 56 | 85 | 322 | 1,411 | 13 | 66.1 | 21.8 | 26.1 | 38.1 | -- |
| AAC Profit | 57 | 84 | 327 | 1,387 | 18 | 64.9 | 23.9 | 30.8 | 43.3 | -- |
| Agassiz | 56 | 84 | 287 | 1,581 | 15 | 65.5 | 23.4 | 24.4 | 38.3 | 33.2 |
| CDC Amarillo | 58 | 86 | 291 | 1,559 | 19 | 65.5 | 24.7 | 34.5 | 38.9 | -- |
| CDC Dakota | 60 | 86 | 217 | 2,099 | 20 | 66.5 | 26.6 | 29.9 | -- | -- |
| CDC Inca | 57 | 84 | 285 | 1,594 | 18 | 66.1 | 23.5 | 29.2 | 41.8 | -- |
| CDC Saffron | 56 | 84 | 282 | 1,611 | 14 | 65.8 | 23.3 | 27.3 | 37.4 | -- |
| CDC Spectrum | 56 | 84 | 307 | 1,480 | 17 | 65.8 | 23.5 | 29.5 | 37.6 | -- |
| Cronos | 51 | 84 | 330 | 1,379 | 16 | 65.7 | 25.5 | 21.8 | -- | -- |
| DS Admiral | 54 | 84 | 289 | 1,571 | 18 | 66.6 | 23.9 | 30.4 | 35.6 | 32.3 |
| Durwood | 55 | 84 | 273 | 1,662 | 19 | 65.8 | 25.0 | 31.7 | -- | -- |
| Hyline | 56 | 84 | 311 | 1,462 | 18 | 66.4 | 21.9 | 34.1 | 41.4 | 36.0 |
| Jetset | 55 | 84 | 271 | 1,681 | 18 | 64.4 | 23.3 | 31.1 | 37.4 | -- |
| Peregrine | 50 | 83 | 276 | 1,645 | 12 | 65.7 | 22.7 | 21.7 | -- | -- |
| Kite | 53 | 84 | 309 | 1,469 | 18 | 65.5 | 23.5 | 37.7 | -- | -- |
| Korando | 50 | 84 | 324 | 1,403 | 14 | 66.8 | 26.7 | 26.9 | -- | -- |
| LG Equator | 53 | 84 | 274 | 1,662 | 18 | 65.6 | 23.7 | 26.0 | -- | -- |
| ND Dawn | 55 | 84 | 316 | 1,446 | 16 | 64.5 | 23.8 | 25.8 | 33.8 | -- |
| Nette 2010 | 54 | 83 | 283 | 1,602 | 19 | 66.7 | 23.1 | 30.2 | -- | -- |
| Salamanca | 54 | 84 | 327 | 1,396 | 18 | 65.7 | 24.9 | 25.7 | 35.6 | 32.6 |
| ***Green Cotyledon Types*** | | | | | | | | | | |
| AAC Comfort | 59 | 87 | 350 | 1,298 | 17 | 66.1 | 23.7 | 25.8 | 36.1 | -- |
| Aragorn | 51 | 80 | 279 | 1,629 | 14 | 62.8 | 25.3 | 23.4 | -- | -- |
| Arcadia | 55 | 84 | 252 | 1,808 | 16 | 65.3 | 22.8 | 33.6 | 38.9 | 35.2 |
| CDC | 56 | 86 | 307 | 1,477 | 20 | 65.3 | 23.1 | 34.9 | 38.0 | -- |
| CDC Striker | 56 | 85 | 282 | 1,614 | 18 | 66.1 | 25.0 | 23.2 | 34.7 | 31.7 |
| Daytona | 55 | 84 | 324 | 1,406 | 17 | 65.0 | 23.9 | 28.7 | -- | -- |
| Empire | 56 | 85 | 300 | 1,526 | 22 | 66.6 | 24.6 | 26.7 | -- | -- |
| Greenwood | 54 | 83 | 254 | 1,796 | 15 | 64.8 | 24.2 | 25.1 | -- | -- |
| Hampton | 55 | 85 | 316 | 1,435 | 14 | 65.1 | 26.0 | 24.4 | 35.5 | -- |
| MS-20GP5 | 55 | 86 | 307 | 1,484 | 19 | 66.1 | 24.0 | 28.4 | -- | -- |
| Shamrock | 57 | 84 | 280 | 1,628 | 20 | 66.4 | 23.3 | 32.8 | -- | -- |
| Trial Mean | 55 | 84 | 295 | 1,556 | 17 | 65.6 | 23.9 | 28.4 | -- | -- |
| CV % | 2.1 | 0.7 | 5.6 | 5.7 | 14.6 | 0.6 | 4.0 | 17.1 | -- | -- |
| LSD 0.05 | 2 | 1 | 23 | 124 | 3 | 0.5 | 1.3 | 6.8 | -- | -- |
| LSD 0.10 | 1 | 1 | 19 | 104 | 3 | 0.4 | 1.1 | 5.7 | -- | -- |

Planting Date: April 28, 2020 Harvest Date: July 29, 2020
Previous Crop: Durum
Seeding Rate: 325,000 live seeds/ac
Grain protein percentages reported on 0% moisture basis

## NDSU Hettinger Reserach Extension Center

**Lentil - 2020** **Hettinger, ND**

| Variety | Days to Flower | Height | Lodging | 1,000 Seed Wt. | Seeds Lb | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2019 | 2020 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0 - 9[2] | gm | seeds | lb/bu | % | ----------lbs/acre---------- | | | | |
| **Large Green Type** | | | | | | | | | | | | |
| CDC Greenstar | 59 | 16 | 0 | 82 | 5521 | 59.2 | 24.4 | -- | -- | 1893 | -- | -- |
| **Medium Green Type** | | | | | | | | | | | | |
| Avondale | 58 | 14 | 0 | 73 | 6196 | 59.2 | 24.3 | -- | -- | 1852 | -- | -- |
| CDC Richlea | 58 | 14 | 1 | 83 | 5452 | 58.9 | 24.2 | 1233 | 1830 | 1700 | 1765 | 1588 |
| **Small Green Type** | | | | | | | | | | | | |
| CDC Imvincible CL | 61 | 13 | 1 | 55 | 8307 | 60.6 | 27.7 | -- | -- | 1562 | -- | -- |
| CDC Kermit | 62 | 12 | 1 | 46 | 9822 | 62.2 | 26.0 | -- | -- | 1688 | -- | -- |
| ND Eagle | 58 | 13 | 0 | 76 | 6011 | 60.4 | 25.3 | 1455 | 2134 | 1671 | 1903 | 1753 |
| **Small Red Type** | | | | | | | | | | | | |
| CDC Impalabn CL | 61 | 14 | 1 | 81 | 5625 | 60.2 | 26.7 | -- | -- | 1619 | -- | -- |
| CDC Maxim CL | 58 | 12 | 0 | 60 | 7599 | 58.9 | 24.6 | -- | -- | 1512 | -- | -- |
| Trial Mean | 59 | 13 | 0 | 69 | 6817 | 59.9 | 25.4 | 1306 | 1912 | 1687 | 1834 | 1670 |
| C.V. % | 1.1 | 5.7 | 139.5 | 3.6 | 4.4 | 2.0 | 1.4 | 18.9 | 11.5 | 12.4 | -- | -- |
| LSD 5% | 1.0 | 1.1 | 0.8 | 3.7 | 442 | 1.8 | 0.5 | 357 | 317 | 310 | -- | -- |
| LSD 10% | 0.8 | 0.9 | 0.6 | 3.0 | 365 | 1.5 | 0.4 | 297 | 264 | 256 | -- | -- |

[1] Days after planting.

[2] Lodging: 0 = none, 9 = lying flat on ground.

Planting Date: April 21

Harvest Date: August 13

Previous Crop: Field Peas

**2020 Lentil - Recrop** **Dickinson, ND**

| Variety | Days to Flower | Days to Mature | 1000 Seed Weight | Seeds per Pound | Plant Height | Test Weight | protein | Seed Yield 2020 | Seed Yield 2 Year | Seed Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | gm | | in | lbs/bu | % | | ---lbs/ac--- | |
| ***Large Green Types*** | | | | | | | | | | |
| CDC Greenstar | 60 | 98 | 69 | 6,603 | 10 | 58.6 | 26.0 | 1276 | -- | -- |
| ***Medium Green Type*** | | | | | | | | | | |
| Avondale | 58 | 98 | 53 | 8,640 | 9 | 60.7 | 24.9 | 1034 | -- | -- |
| CDC Richlea | 60 | 97 | 52 | 8,752 | 10 | 60.3 | 24.3 | 1269 | 1,335 | 1,176 |
| ***Small Green Type*** | | | | | | | | | | |
| CDC Imvincible-CL | 57 | 91 | 40 | 11,497 | 10 | 62.0 | 26.8 | 1375 | -- | -- |
| CDC Kermit | 60 | 94 | 32 | 14,378 | 9 | 62.1 | 26.5 | 1386 | -- | -- |
| ND Eagle | 59 | 95 | 41 | 11,089 | 10 | 61.2 | 26.5 | 1332 | 1,279 | 1,061 |
| ***Small Red Types*** | | | | | | | | | | |
| CDC Maxim-CL | 55 | 91 | 43 | 10,505 | 9 | 61.7 | 23.9 | 1210 | -- | -- |
| ***Extra Small Red Type*** | | | | | | | | | | |
| CDC Impala-CL | 57 | 91 | 33 | 13,773 | 10 | 62.4 | 26.2 | 1598 | -- | -- |
| Trial Mean | 58 | 94 | 45 | 10,655 | 10 | 61.1 | 25.6 | 1,310 | -- | -- |
| CV % | 1.3 | 1.3 | 5.5 | 7.2 | 7.0 | 0.4 | 1.6 | 13.8 | -- | -- |
| LSD 0.05 | 1 | 2 | 4 | 1,344 | 1 | 0.4 | 0.7 | 316 | -- | -- |
| LSD 0.10 | 1 | 2 | 4 | 1,104 | 1 | 0.3 | 0.6 | 260 | -- | -- |

Planting Date: April 28, 2020
Harvest Date: August 11, 2020
Previous Crop: Barley
Seeding Rate: 600,000 live seeds/ac
Grain protein percentages reported on 0% moisture basis

**Soybean - Roundup Ready - 2020** **Hettinger, ND**

| Company/Brand | Variety | Maturity | Mature Date | Plant Height | Test Weight | Seed Oil | Seed Protein | Seed Yield 2020 | Seed Yield 2-Yr |
|---|---|---|---|---|---|---|---|---|---|
| | | | | inches | lbs/bu | % | % | -----Bu/ac----- | |
| NDSU | ND17009GT | 00.9 | 9/4 | 29 | 57.3 | 17.0 | 36.6 | 23.6 | 32.1 |
| Proseed | XT80-20N | 0.2 | 9/12 | 30 | 55.2 | 15.5 | 36.2 | 22.2 | -- |
| INTEGRA | 50309N | 0.3 | 9/8 | 29 | 55.2 | 15.7 | 35.8 | 25.4 | 34.2 |
| INTEGRA | 40300N | 0.3 | 9/11 | 26 | 55.9 | 15.6 | 35.4 | 27.1 | -- |
| REA Hybrids | RX0411 | 0.4 | 9/12 | 30 | 54.9 | 16.7 | 34.4 | 23.5 | -- |
| Proseed | XT60-40 | 0.4 | 9/12 | 27 | 54.6 | 16.7 | 36.2 | 21.9 | 31.0 |
| REA Hybrids | RX0520 | 0.5 | 9/13 | 28 | 56.8 | 15.8 | 36.4 | 18.2 | 28.4 |
| REA Hybrids | RX0721 | 0.7 | 9/13 | 28 | 55.8 | 15.6 | 36.5 | 22.5 | -- |
| Trial Mean | | | 9/8 | 27 | 55.4 | 16.7 | 35.4 | 21.4 | 31.8 |
| C.V. % | | | | 0.8 | 7.6 | 1.6 | 1.8 | 1.1 | 9.7 | -- |
| LSD 5% | | | | 1.3 | 2.9 | 0.8 | 0.4 | 0.5 | 2.9 | -- |
| LSD 10% | | | | 1.1 | 2.4 | 0.7 | 0.4 | 0.4 | 2.4 | -- |

Planting Date: May 19
Harvest Date: September 16
Previous Crop: Spring Wheat

**Soybean - Roundup Ready - 2020** **Mandan, ND**

| Company/Brand | Variety | Maturity | Plant Height | Test Weight | Seed Oil | Seed Protein | Seed Yield 2020 | Seed Yield 2-Yr |
|---|---|---|---|---|---|---|---|---|
| | | | inches | lbs/bu | % | % | -----Bu/ac----- | |
| NDSU | ND17009GT | 00.9 | 38 | 59.3 | 17.0 | 36.1 | 38.6 | -- |
| Proseed | XT80-20N | 0.2 | 35 | 57.2 | 17.7 | 30.7 | 35.0 | -- |
| INTEGRA | 50309N | 0.3 | 33 | 57.2 | 17.7 | 30.6 | 37.6 | 38.7 |
| INTEGRA | 40300N | 0.3 | 32 | 57.2 | 17.7 | 30.6 | 40.4 | -- |
| REA Hybrids | RX0411 | 0.4 | 38 | 56.9 | 18.6 | 29.5 | 34.9 | -- |
| Proseed | XT60-40 | 0.4 | 29 | 56.8 | 18.5 | 31.1 | 32.0 | 35.9 |
| REA Hybrids | RX0520 | 0.5 | 36 | 57.4 | 17.1 | 32.7 | 33.6 | 38.1 |
| REA Hybrids | RX0721 | 0.7 | 34 | 57.1 | 17.6 | 32.3 | 36.4 | -- |
| | | | 34 | 57.2 | 17.9 | 31.8 | 34.6 | 37.6 |
| C.V. % | | | 7.2 | 0.6 | 2.2 | 1.1 | 6.6 | -- |
| LSD 5% | | | 3.4 | 0.5 | 0.5 | 0.6 | 3.2 | -- |
| LSD 10% | | | 2.9 | 0.4 | 0.4 | 0.5 | 2.7 | -- |

Planting Date: May 20
Harvest Date: September 24
Previous Crop: Spring Wheat

**Soybean - Conventional/LibertyLink - 2020** **Hettinger, ND**

| Company/Brand | Variety | Maturity | Mature Date | Plant Height | Test Weight | Seed Oil | Seed Protein | Seed Yield 2020 | Seed Yield 2-Yr |
|---|---|---|---|---|---|---|---|---|---|
| | | | | inches | lbs/bu | % | % | -----Bu/ac----- | |
| ***Conventional*** | | | | | | | | | |
| NDSU | ND Benson | 0.4 | 9/10 | 26 | 53.0 | 16.2 | 36.4 | 19.0 | 28.6 |
| NDSU | ND Dickey | 0.7 | 9/13 | 27 | 52.6 | 15.0 | 36.5 | 19.0 | -- |
| RR Check #1 | | 0.8 | 9/15 | 31 | 52.2 | 15.7 | 36.5 | 21.1 | 35.2 |
| RR Check #2 | | 0.8 | 9/13 | 29 | 53.1 | 15.6 | 36.5 | 19.6 | -- |
| ***LibertyLink*** | | | | | | | | | |
| Proseed | BX20-65 | 0.8 | 9/14 | 27 | 51.7 | 16.5 | 36.1 | 13.4 | -- |
| Trial Mean | | | 9/13 | 28 | 52.6 | 15.6 | 36.7 | 18.5 | 31.9 |
| C.V. % | | | 0.1 | 10.8 | 1.6 | 2.2 | 1.1 | 13.3 | -- |
| LSD 5% | | | 1.1 | 4.6 | 2.1 | 0.5 | 0.6 | 3.0 | -- |
| LSD 10% | | | 0.9 | 3.8 | 1.6 | 0.4 | 0.5 | 2.3 | -- |

Planting Date: May 19
Harvest Date: September 16
Previous Crop: Spring Wheat

**Soybean - Conventional/LibertyLink - 2020** **Mandan, ND**

| Company/Brand | Variety | Maturity | Plant Height | Test Weight | Seed Oil | Seed Protein | Seed Yield 2020 | Seed Yield 2-Yr |
|---|---|---|---|---|---|---|---|---|
| | | | inches | lbs/bu | % | % | -----Bu/ac----- | |
| ***Conventional*** | | | | | | | | |
| NDSU | ND Benson | 0.4 | 32 | 57.5 | 16.9 | 35.0 | 31.9 | -- |
| NDSU | ND Dickey | 0.7 | 32 | 57.5 | 16.2 | 34.7 | 36.5 | -- |
| RR Check #1 | | 0.8 | 32 | 56.1 | 16.2 | 35.2 | 31.7 | -- |
| RR Check #2 | | 0.8 | 31 | 56.7 | 16.5 | 34.4 | 30.2 | -- |
| ***LibertyLink*** | | | | | | | | |
| Proseed | BX20-65 | 0.8 | 28 | 57.5 | 16.5 | 34.6 | 26.7 | -- |
| Trial Mean | | | 32 | 57.1 | 16.3 | 35.1 | 30.7 | -- |
| C.V. % | | | 5.2 | 0.6 | 2.1 | 1.3 | 9.8 | -- |
| LSD 5% | | | 2.5 | 0.6 | 0.5 | 0.7 | 4.5 | -- |
| LSD 10% | | | 2.0 | 0.5 | 0.4 | 0.6 | 3.7 | -- |

Planting Date: May 20
Harvest Date: September 24
Previous Crop: Spring Wheat

**Industrial Hemp Variety Trial - 2020** **Hettinger, ND**

| Variety | Plant Stand | PLSE[1] | Seedling Mortality | Flower Date | Height | Lodging[2] | Test Weight | Oil Content |
|---|---|---|---|---|---|---|---|---|
| | plants/ft$^2$ | % | % | | inches | 0-9 | lbs/bu | % |
| CRS-1 | 11.1 | 70 | 30 | 7/1 | 41 | 0 | * | 32.3 |
| CFX-2 | 10.4 | 65 | 35 | 7/2 | 34 | 0 | | 33.3 |
| Grandi | 9.3 | 58 | 42 | 7/1 | 31 | 0 | | 34.2 |
| Katani | 10.2 | 64 | 36 | 7/2 | 32 | 0 | | 33.5 |
| X-59 | 6.1 | 38 | 62 | 7/2 | 40 | 0 | | 30.4 |
| NWG Abound | 7.1 | 44 | 56 | 7/18 | 54 | 0 | | 30.9 |
| NWG Elite | 10.7 | 67 | 33 | 7/16 | 59 | 0 | | 32.8 |
| | | | | | | | | |
| | 9.3 | 58 | 42 | | 42 | 0 | | 32.5 |
| C.V. % | 22.4 | 22.4 | 31.0 | -- | 12.2 | -- | | 2.3 |
| LSD 5% | 3.1 | 19 | 19 | -- | 7.5 | -- | | 1.1 |
| LSD 10% | 2.6 | 16 | 16 | -- | 6.2 | -- | | 0.9 |

[1] Pure live seed emergence.

[2] Lodging: 0 = none, 9 = lying flat on ground.

[*] Not enough sample to obtain a test weight.

Planting Date:May 27

Harvest Date: September 17

Trial suffered from significant bird feeding which drastically reduced yields before harvest, therefore yields are not being reported.

**2020 Industrial Hemp - Recrop** **Dickinson, ND**

| Variety | Plant Stand | 1000 KWT | PLSE[1] | Seedling Mortality | Seeds per Pound | Plant Stand niformity | Test Weight | Oil Content[3] | -- Grain Yield-- 2019 | 2020 | 2 Year Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ft$^2$ | g | % | % | | | lbs/bu | % | lbs/ac | | lbs/ac |
| Altair | 7.7 | 15.1 | 48 | 52 | 30,098 | 3.0 | 38.9 | 30.8 | 860 | 384 | 622 |
| CFX-2 | 7.1 | 14.8 | 45 | 55 | 30,612 | 2.5 | 41.1 | 33.6 | 722 | 451 | 586 |
| CRS-1 | 7.1 | 15.7 | 44 | 56 | 29,014 | 3.3 | 41.3 | 33.6 | 744 | 569 | 657 |
| Canda | 7.7 | 16.8 | 48 | 52 | 27,018 | 4.3 | 39.4 | 30.8 | 897 | 415 | 656 |
| Grandi | 7.7 | 14.0 | 48 | 52 | 32,322 | 2.0 | 41.0 | 33.5 | 653 | 397 | 525 |
| Joey | 8.7 | 16.0 | 54 | 46 | 28,301 | 3.0 | 40.4 | 31.3 | -- | 426 | -- |
| Katani | 7.1 | 13.0 | 44 | 56 | 35,002 | 2.0 | 41.4 | 32.8 | 671 | 435 | 553 |
| Vega | 6.9 | 15.3 | 43 | 57 | 29,709 | 2.8 | 39.7 | 30.9 | -- | 483 | -- |
| Trial Mean | 7.0 | 15 | 44 | 56 | 30,782 | 3.1 | 40.0 | 31.6 | 697 | 427 | -- |
| CV % | 20.1 | 3.2 | 20.1 | 15.8 | 3.6 | 15.7 | 0.8 | 1.4 | 13.8 | 17.3 | -- |
| LSD 0.05 | 2.1 | 0.7 | 13 | 13 | 1,620 | 0.7 | 0.5 | 0.7 | 136 | 108 | -- |
| LSD 0.10 | 1.7 | 0.6 | 11 | 11 | 1,343 | 0.6 | 0.4 | 0.5 | 114 | 89 | -- |

[1] Pure live seed emergence

[3] oil content reported as is basis (uniformly dried to approximately 3% moisture)

[4] Stand Uniformity: 1 = plants are uniform height at harvest, 5 = very non-uniform plant height

Target seeding rate was 12 seeds/ft2 + additional 25% for expected mortality loss.

Planting Date May 28, 2020

Harvest Date: September 4, 2020

Previous Crop: wheat

**Corn - 2020** **Hettinger, ND**

| Company | Hybrid | Relavtive Maturity[1] | Plant Height | Ear Height | Stalk Lodge | Moisture Content | Test Weight | Grain Yield 2020 | Grain Yield 2-Yr |
|---|---|---|---|---|---|---|---|---|---|
| | | days | inches | inches | % | % | lbs/bu | ------bu/ac------ | |
| Integra | 3282 | 82 | 77 | 87 | 0 | 14.7 | 50.4 | 52.0 | 89.8 |
| Integra | 3431 | 84 | 75 | 80 | 0 | 15.5 | 49.7 | 53.9 | -- |
| Integra | 3537 | 85 | 77 | 86 | 0 | 16.1 | 48.3 | 47.8 | 91.3 |
| Proseed | 1974 | 74 | 70 | 85 | 0 | 16.6 | 58.6 | 61.8 | -- |
| Proseed | 2078 | 78 | 74 | 87 | 0 | 12.8 | 48.3 | 46.3 | -- |
| Proseed | 1980 | 80 | 70 | 80 | 0 | 14.3 | 52.7 | 64.7 | -- |
| Proseed | 1882 | 82 | 75 | 86 | 0 | 15.1 | 52.4 | 51.7 | 81.9 |
| Proseed | 1984 | 84 | 74 | 85 | 0 | 14.8 | 50.6 | 59.3 | -- |
| Trial Mean | | | 74 | 85 | 0 | 15.4 | 51.1 | 53.6 | 87.7 |
| C.V. % | | | 1.2 | 9.6 | -- | 10.0 | 2.8 | 10.8 | -- |
| LSD 5% | | | 3.3 | 3.0 | -- | 1.5 | 1.4 | 4.8 | -- |
| LSD 10% | | | 2.8 | 2.5 | -- | 1.3 | 1.2 | 3.7 | -- |

[1] Relavtive maturity provided by company.

Planting Date: May 18

Harvest Date: October 7

## Hettinger Soybean Seeding Rate Study

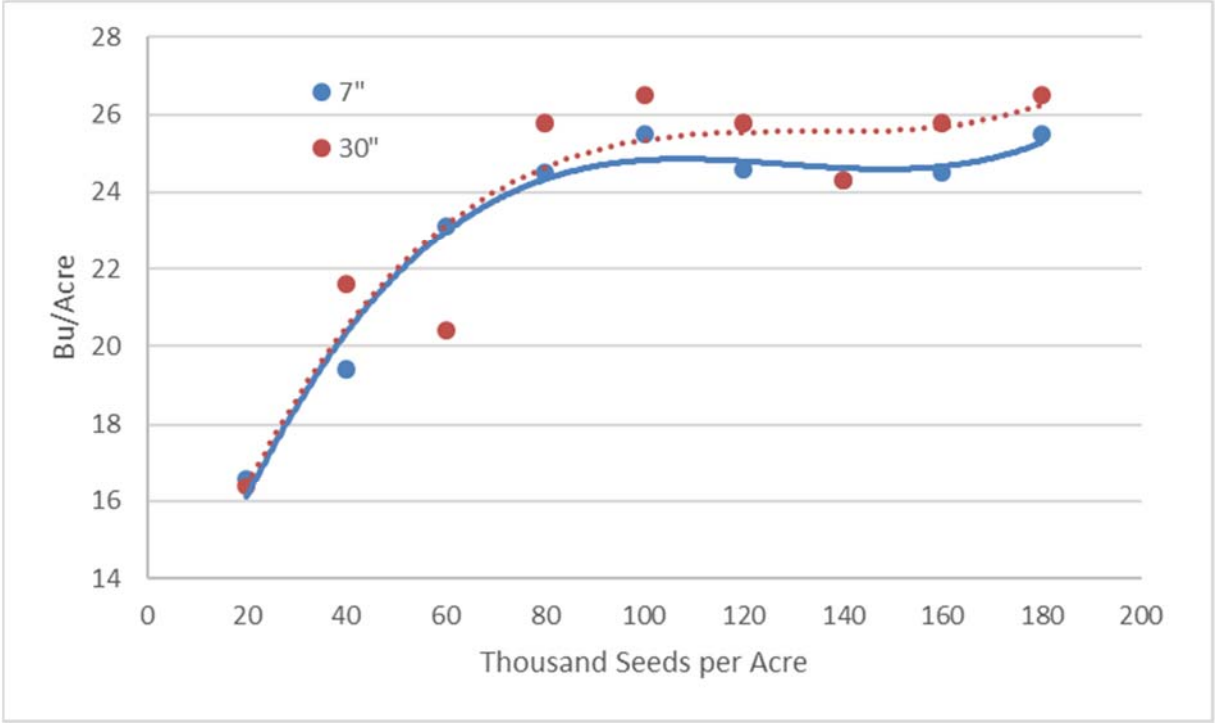
John Rickertsen & Michael Wells, Hettinger Research Extension Center, 2018 - 2020

Over the past decade soybean seeding rate recommendations in the corn-soybean belt have been reduced from 180,00 - 240,000 seeds per acre to 125,000 - 170,000. Much of this is due to increasing cost of soybean seed and soybeans tremendous ability to compensate for lower densities with increased branching and pod number. Yield per acre for soybeans remains relatively constant across population. This is because the number of seeds produced per plant is inversely related to the number of plants per acre. In general, numerous studies in the Midwest have shown 100,000 relatively uniformly spaced plants at harvest will produce the maximum economic return under most conditions. There have been many studies on soybean seeding rates in the Midwest, but there is little information on seeding rates for dryland soybeans in the semi-arid high plains.

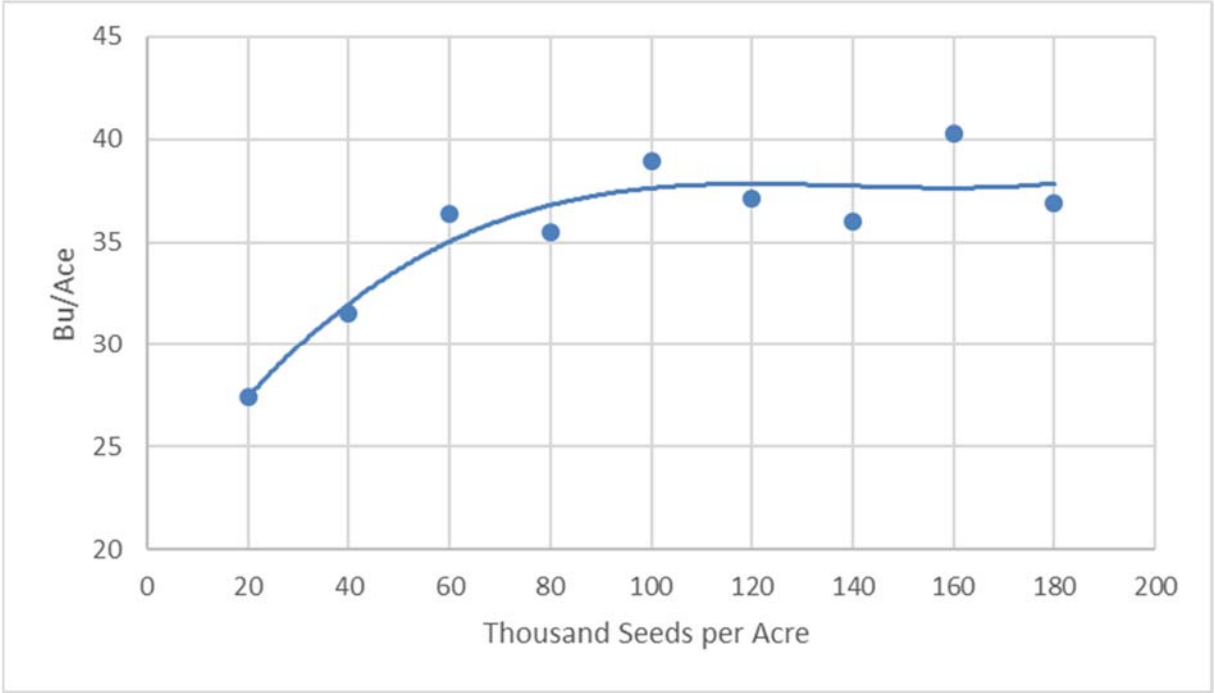
A study was initiated in 2018 with nine seeding rates, 20,000 to 180,000 in 20,000 increments in both drilled (7”) and row (30”) configurations at Hettinger, ND and just 30” rows at Mandan, ND. In 2020 the Hettinger trial was planted on May 19 and Mandan on May 20. The soybean variety ND19009GT was used at both locations. Trials were no-till planted with a 7 row 7” inch spacing plot drill equipped with Acra Plant ADU double disk openers and a two row plot planter equipped with John Deere 1700 row units on 30” inch spacing. Weed control was obtained by a pre-emergence herbicide application of BroadAxe and post-emergence application of glyphosate. The trials were harvested with a Kincaid 8XP small plot combine on September 16 at Hettinger and September 26 at Mandan. Data was recorded on flowering, height, maturity date, yield, test weight, seed protein and seed oil content.

The results showed that seeding rates of 100,000 – 180,000 were not significantly different in yield and even the extremely low rate of 20,000 yielded 65% of the 100,000 - 180,000 seeding rates. For seed protein and oil content, as seeding rate increased, oil content decreased and protein increased. At the very lowest populations, seed size increased and test weight decreased, but there was no significant difference in the 100,000 to 180,000 rates for seed size and no significant difference in 40,000 to 180,000 rates for test weight. In 2018 and 2020, there was no difference in yield between 7” and 30” rows, while in 2019, 7” rows yielded 5.5 Bu/Acre higher than 30” rows. Over the past three years the 120,000 seeds/acre rate has been the optimal seeding rate for southwest North Dakota.

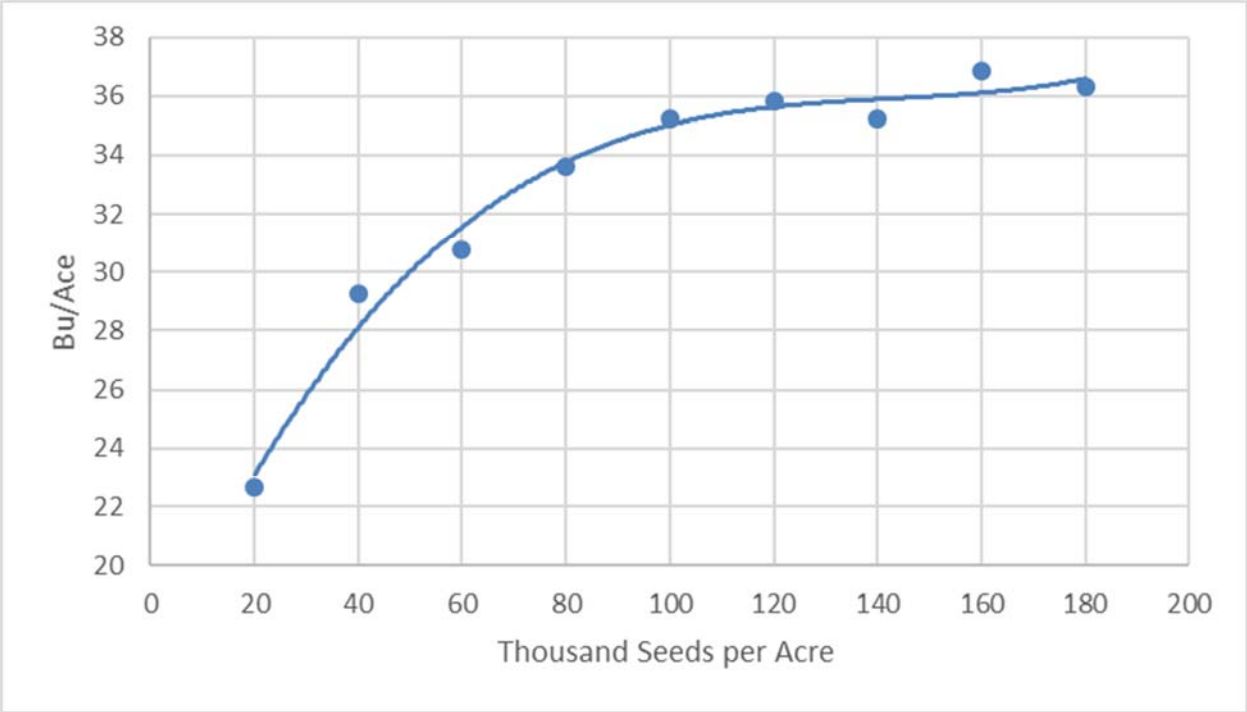
Soybean Seeding Rate Study Yields by Seeding Rate at Hettinger, ND in 2020.



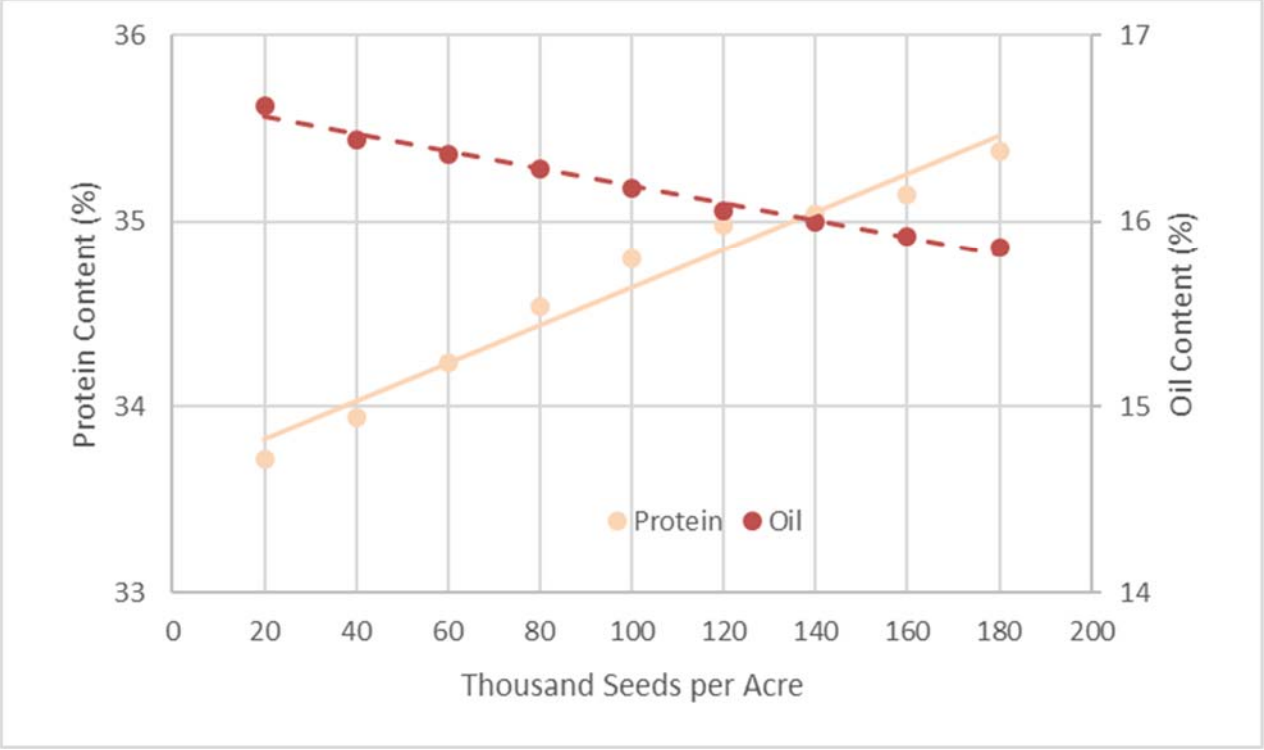

Soybean Seeding Rate Study Yields by Seeding Rate at Mandan, ND in 2020.



Soybean Seeding Rate Study Yields by Seeding Rate Averaged Over All Trials, 2018 - 2020.




Soybean Seeding Rate Study Protein and Oil Content by Seeding Rate, Averaged Over All Trials, 2018 - 2020.



# Alternative Soybean Production Management Options in Acidic Soils

Ryan Buetow, Dickinson Research Extension Center

## *Introduction*

Many fields in western North Dakota are having issues with pH values below 5.5. When the pH drops below these levels it impacts nutrient availability, activity of bacteria in the soil, and reduce yield from Aluminum toxicity. The best management practice for these situations in no-till is a surface application of lime, however it takes a large amount of product to change soil chemistry to adequate levels and a surface application can take time to adjust pH levels. Producers are searching for less costly short term options, especially for rented land. Work done in Oklahoma and Montana has shown phosphorous applied with the seed in wheat and durum can help growth in acidic environments and some producers in southwestern ND have applied lime directly with the seed. A comparison of lime and phosphorous treatments applied with the seed in acidic soil was conducted to observe impact on growth and yield in soybean.

## *Past Research*

Liming the soil can be costly and surface application can often be variable in coverage. Work has been conducted in small grains applying phosphorus (P) at high rates. In the short term, high rates of phosphorus fertilizer placed in seed furrows have been found to reduce the impact of Al toxicity in winter wheat in Oklahoma (Kaitibie et al., 2002). A similar effect was observed in Montana for durum wheat seeded in a field with a soil pH of 4.4. Even though the field site tested very high in available P (Olsen P = 49 ppm; Bray P = 105 ppm), triple superphosphate (0- 45-0) improved vegetative growth and grain yield in non-limed soil. How seed-placed P helps is currently not known, but the theory is that P binds with aluminum within roots; P did not improve yields on a similar field site with a pH of 4.8 (Jones et al., 2019). Some producers in Stark and Hettinger counties have tried P as well as pelletized lime with the seed on small grains with anecdotal evidence showing a yield increase.

## *References*

Jones, C., R. Engel, K. Olson-Rutz. 2019. Soil acidification in the semiarid regions of North America's Great Plains. Crops & Soils magazine. March-April 2019. 28-31, 56.

Kaitibie, S., F.M. Epplin, E.G. Krenzer, Jr., and H. Zhang. 2002. Economics of lime and phosphorus application for dual purpose winter wheat production on low-pH soils. Agron. J. 94:1139–1145. doi:10.2134/agronj2002.1139

## *Materials and Methods*

The research included two variables in a factorial arrangement. The experiment was managed based off of prior research in the region to decide soybean maturity, seeding rate, and inoculation. Four lime treatments and a control were applied with 0 lbs of pelletized lime with the seed, 50 lbs, 75 lbs, and 100 lbs per acre along with a treatment of 2 tons/acre surface applied. Each of the lime treatments were treated with 3 phosphorus treatments of 0 lbs/ac, 30 lbs/ac, and 60 lbs/ac of P as MAP. The treatments are listed in Table 1.

**Table 1. Treatments that will be included in the experiment.**

| Lime | Phosphorous (MAP) |
|---|---|
| 0 lbs | 0 lbs |
| | 30 lbs |
| | 60 lbs |
| 50 lbs | 0 lbs |
| | 30 lbs |
| | 60 lbs |
| 75 lbs | 0 lbs |
| | 30 lbs |
| | 60 lbs |
| 100 lbs | 0 lbs |
| | 30 lbs |
| | 60 lbs |
| Surface Applied 2 tons | 0 lbs |
| | 30 lbs |
| | 60 lbs |

***Results***

As seen in Table 2 and Table 3 both lime and P rates had a significant impact on soybean yield. There was no significance on the interaction between the two treatments. Lime showed a significant yield bump at 75 lbs in furrow with no difference between 75 and 100. This yield increase aligns with a difference in amount of aluminum found in the tissue samples for these treatments. While we can see some differences the yield of the crop was majorly impacted by dry weather conditions in 2020. Further research is being requested for 2021 to confirm these findings. It is important to remember that these small rates of lime in furrow is not enough to have a major impact on soil pH levels.

**Table 2. Yield and Al levels across lime treatments.**

| Lime applied in furrow | Yield | Aluminum from tissue samples |
|---|---|---|
| lbs/ac of product | bu/ac | % |
| 0 | 13.9 | 45.6 |
| 50 | 13.9 | 40.9 |
| 75 | 15.7 | 31.8 |
| 100 | 15.8 | 31.4 |
| 4000 (surface applied) | 14.5 | 51.2 |

Phosphorous treatments had a visible impact on plant stand, however this was aggravated further with dry conditions at and following planting. As P rates go up, the yield goes down as seen in Table 3. These treatments did not have a significant impact on Aluminum levels in 2020. Further research is needed, but a reduction in plant stand was expected, however with soybeans especially, stand loss doesn't always necessarily mean yield loss. More data is needed to see how much of the impact on stand loss and yield reduction was from drought and how much was from the treatments and soil pH.

**Table 3. Yield across P treatments.**

| Phosphorous in furrow | Yield |
|---|---|
| lbs/ac | bu/ac |
| 0 | 16.2 |
| 30 | 14.5 |
| 60 | 13.5 |

## Weed Control with Preplant Burndown Herbicide Application prior to Planting Spring Wheat

Caleb Dalley and Daniel Guimaraes Abe, Hettinger Research Extension Center

A trial was conducted to evaluate preplant burndown herbicides applied to control emerged winter annual weeds prior to planting spring wheat. Herbicide treatments (see Table 1) were applied on April 30, 2020 using a tractor mounted research sprayer at a spray volume of 15 gallons per acre using XR8002 flat fan nozzles. Environmental conditions at time of application was; air temperature, 60 F; humidity, 36%, wind speed 8 mph from south; soil temperature, 49 F; the soil surface was dry; no dew was present on leaves; 10% cloud cover. No rainfall occurred after treatment application until May 5 (5 days after treatment application). Weeds present at time of application included downy brome, prickly lettuce, flixweed, and shepherds purse. Spring wheat 'Shelly' was planted at a rate of 120 lbs seed per acre on May 1, 2020 using a no-till drill at a depth of 2.5 inches.

Weed control was evaluated 15 and 32 days after treatment (DAT). Downy brome control at 15 DAT was best with most treatments containing glyphosate (Roundup PowerMAX). Tank mixing saflufencil (Sharpen) with glyphosate increased downy brome control compared with glyphosate alone. All other treatment combinations were statistically similar to glyphosate alone. At 32 DAT, downy brome control was 100% with all treatments containing glyphosate. Treatments containing paraquat (Gramoxone) controlled downy brome 84 to 89% 32 DAT. The treatment containing clethodim (Section Three) controlled downy brome 88% 32 DAT. Prickly lettuce was controlled 88% by glyphosate alone and 87% with paraquat alone 15 DAT. Addition al 2,4-D as a tank-mix with paraquat improved prickly lettuce control to 97. Additional of 2,4-D, saflufencil, or carfentrazone (Aim) as a tank-mix with glyphosate improved prickly lettuce control to 96, 100, and 95%, respectively. Other treatments did not significantly improve prickly lettuce control compare with either paraquat or glyphosate alone. Flixweed was control 61% 32 DAT with paraquat alone. Addition of 2,4-D or saflufencil increased control to 100% and 72%, respectively. All treatments containing glyphosate controlled flixweed 100% 32 DAT, including glyphosate alone. Clethodim plus fluroxypyr (Starane Ultra) plus halauxifen (Elevore) controlled flixweed 98% 32 DAT. Shepherdspurse control was 98% or greater at 32 DAT for all herbicide treatments. Applying herbicides for burndown of weeds prior to planting is necessary when using no-till production practices. Tank-mixing herbicides with glyphosate or paraquat can sometimes reduce the timing required for weed control. For example, prickly lettuce control 15 DAT with glyphosate alone was 88%, compared with 96% with the addition of 2,4-D, 100% with the addition of saflufencil, and 95% with the addition of carfentrazone. However, over time glyphosate was just as successful at controlling the weeds evaluated in this trial as when tank-mixes were used. However, the addition of 2,4-D to paraquat increased control of both prickly lettuce and flixweed compared with paraquat alone.

Table 1. Weed control with preplant burndown in spring wheat.

| Treatment | | | Downy brome | | Prickly Lettuce | | Flixweed | | Shepherdspurse | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Product name | Rate | 15DAT | 32DAT | 15DAT | 32DAT | 15DAT | 32DAT | 15DAT | 32DAT |
| | | (oz/A) | % | | | | | | | |
| 1 | Gramoxone SL 2.0 | 32 | 73 e | 88 cd | 87 def | 89 cd | 69 c | 61 b | 88 c | 100 a |
| 2 | Gramoxone SL 2.0<br>2,4-D LV-6 | 32<br>16 | 84 cd | 89 cd | 97 ab | 100 a | 100 a | 100 a | 93 abc | 100 a |
| 3 | Gramoxone SL 2.0<br>Sharpen | 32<br>2 | 77 de | 84 d | 92 a-f | 84 d | 91 b | 72 b | 95 abc | 100 a |
| 4 | Roundup PowerMAX | 24 | 91 bc | 100 ab | 88 def | 100 a | 100 a | 100 a | 93 abc | 100 a |
| 5 | Roundup PowerMAX<br>2,4-D LV-6 | 24<br>16 | 89 bc | 100 ab | 96 abc | 100 a | 99 ab | 100 a | 94 abc | 100 a |
| 6 | Roundup PowerMAX<br>Sharpen | 24<br>2 | 100 a | 100 a | 100 a | 100 a | 100 a | 100 a | 100 a | 100 a |
| 7 | Roundup PowerMAX<br>Aim | 24<br>2 | 98 ab | 100 ab | 95 a-d | 92 abc | 100 a | 100 a | 96 ab | 100 a |
| 8 | Roundup PowerMAX<br>Anthem Flex | 24<br>4 | 92 abc | 100 ab | 91 b-f | 97 ab | 100 a | 100 a | 98 ab | 100 a |
| 9 | Roundup PowerMAX<br>Quelex | 24<br>0.75 | 88 c | 100 ab | 90 b-f | 93 abc | 100 a | 100 a | 98 ab | 100 a |
| 10 | Roundup PowerMAX<br>Elevore | 24<br>1 | 90 bc | 100 ab | 87 ef | 100 a | 95 ab | 100 a | 92 bc | 100 a |
| 11 | Roundup PowerMAX<br>Starane Ultra<br>Elevore | 24<br>4.5<br>1 | 90 bc | 100 ab | 93 a-e | 100 a | 100 a | 100 a | 97 ab | 100 a |
| 12 | Section Three<br>Starane Ultra<br>Elevore | 5.33<br>4.5<br>1 | 73 e | 88 cd | 85 f | 90 bcd | 36 d | 98 a | 80 d | 98 b |
| LSD P=.10 | | | 8.05 | 6.80 | 7.97 | 7.85 | 8.92 | 21.86 | 7.27 | 1.66 |
| CV | | | 8.43 | 6.39 | 8.13 | 7.85 | 8.75 | 22.01 | 7.04 | 1.57 |
| Treatment F | | | 49.000 | 78.987 | 57.546 | 89.570 | 55.569 | 12.449 | 65.871 | 1961.97 |
| Treatment Prob(F) | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |

Treatments were applied on April 30, 2020.
NIS (0.5% v/v) was added to treatments 1 and 2.
AMS (17 lb/100 gallons) was added to treatments 3-13.
MSO Destiny HSOC (1% v/v) was added to treatments 3, and 7-13.

## Evaluation of No-Till Spring Wheat Response to Preemergence, Delayed Preemergence, and Early Postemergence Applications of Pyroxasulfone

Caleb Dalley, Daniel Guimaraes Abe, Hettinger Research Extension Center

A trial was conducted to evaluate the response of spring wheat to pyroxasulfone applied at different timings after planting. The hard red spring wheat 'Shelly' was planted into safflower stubble on May 1, 2020 using a no-till drill at a depth of 2.5 inches. The herbicide Zidua SC (pyroxasulfone) was applied at 1.75, 2.5, 3.25, and 4 oz/A at three timings. Treatments were applied preemergence (PRE) on May 2; delayed preemergence (DPRE) on May 11, and early postemergence to 1-leaf wheat on May 22. Treatments were applied using a tractor-mounted research sprayer at a spray volume of 10 gallons per acre using XP8002 flat fan nozzles. The herbicide glyphosate was applied to the entire field site to control weeds that had emerged prior to planting. Between planting and wheat emergence on May 14, rainfall of 0.39 inches occurred with 0.11 inches on May 5, 0.23 inches on May 7, 0.03 inches on May 9, and 0.02 inches on May 12. Wheat was evaluated for injury on May 22 and on June 1 (8 and 18 days after crop emergence. Wheat was harvested and yield measured on August 31 using a small plot combine with a 5-foot header (Kincaid 8 XP).

There was no visual injury to wheat from any of the herbicide treatments regardless of treatment rate or timing at either evaluation dates. The label for Zidua SC described increased risks for applying Zidua as a preplant or preemergence application and recommends a delayed preemergence timing to reduce risk for injury. A delayed preemergence application is defined as an application following wheat planting when 80% of germinated wheat seeds have a shoot at least one-half inch long and prior to wheat spiking. The risk for injury is greater when higher rainfall occurs in-between planting and wheat emergence or when seed furrow remains open after planting that allows herbicide to directly contact seed. In this trial, there was only 0.39 inches of rainfall and a maximum daily rainfall of 0.23 inches. Perhaps under a higher rainfall environment, injury to wheat would have occurred, but this was not observed in this trial. Pyroxasulfone is not highly mobile in the soil and generally needs an inch of rainfall for adequate incorporation into the soil as a herbicide for weed control. Wheat yields were similar between all treatments regardless of rate of pyroxasulfone applied or the timing of application.

While there was no injury to wheat in this trial and no reduction in wheat yield due to herbicide treatment, caution should be taken when using this herbicide prior to the delayed preemergence wheat stage as described earlier. When using under no-till conditions, ensure seed drill is set up properly to fully close seed furrow during planting. Also realize that seed drills that leave a deep seed furrow during planting increase the risk of crop injury. Also check weather for predicted rainfall as higher rainfall increases risk of crop injury although this rainfall will also increase weed control with this herbicide.

Table 1. Spring wheat response to the herbicide pyroxasulfone (Zidua) at four rates and three application timings.

| Treatment | | | Wheat Injury | | | |
|---|---|---|---|---|---|---|
| Product name | Rate | Timing | 8 DAE | 18 DAE | Yield | Test wt |
| | (oz/A) | | % | | | |
| 1 Zidua SC | 1.75 | PRE | 0 - | 0 - | 40.1 - | 59.00 - |
| 2 Zidua SC | 2.5 | PRE | 0 - | 0 - | 42.0 - | 59.18 - |
| 3 Zidua SC | 3.25 | PRE | 0 - | 0 - | 42.7 - | 59.08 - |
| 4 Zidua SC | 4.0 | PRE | 0 - | 0 - | 37.7 - | 59.08 - |
| 5 Zidua SC | 1.75 | DPRE | 0 - | 0 - | 36.1 - | 58.90 - |
| 6 Zidua SC | 2.5 | DPRE | 0 - | 0 - | 40.8 - | 59.08 - |
| 7 Zidua SC | 3.25 | DPRE | 0 - | 0 - | 39.5 - | 59.15 - |
| 8 Zidua SC | 4.0 | DPRE | 0 - | 0 - | 43.0 - | 59.35 - |
| 9 Zidua SC | 1.75 | EPOST | 0 - | 0 - | 39.0 - | 58.98 - |
| 10 Zidua SC | 2.5 | EPOST | 0 - | 0 - | 44.2 - | 59.25 - |
| 11 Zidua SC | 3.25 | EPOST | 0 - | 0 - | 40.2 - | 58.90 - |
| 12 Zidua SC | 4.0 | EPOST | 0 - | 0 - | 45.3 - | 59.38 - |
| 13 Weed Free | | | 0 - | 0 - | 39.5 - | 59.36 - |
| LSD P=.10 | | | . | . | 5.86 | 0.382 |
| CV | | | 0.0 | 0.0 | 12.05 | 0.54 |
| Treatment F | | | 0.000 | 0.000 | 1.111 | 0.920 |
| Treatment Prob(F) | | | 1.0000 | 1.0000 | 0.3813 | 0.5376 |

-Spring wheat ‘Shelly’ was planted on May 1, 2020 and emerged on May 14.
-Treatment timings were: preemergence (PRE), applied on May 2, 2020; delayed preemergence (DPRE), applied on May 11; early postemergence (EPOST) applied to 1-leaf wheat on May 21.
-Wheat was evaluated for injury on May 22 and June 1 (8 and 18 days after wheat emergence).
-Wheat was harvested on August 31 using a small plot combine (Kincaid 8XP).

## Spring Wheat and Weed Control Response to Postemergence Herbicides

Caleb Dalley, Daniel Guimaraes Abe, Hettinger Research Extension Center

A trial was conducted to evaluate different postemergence herbicide combinations for broadleaf weed control in spring wheat. Prior to planting, the field site was treated with glyphosate to control existing weeds on April 29 and urea fertilizer (50 lbs N/acre) was applied on April 15, 2020. The hard red spring wheat 'Shelly' was planted at a rate of 120 lbs seed per acre on May 1 using a no-till drill set to a depth of 2.5 inches. Wheat emerged on May 14. Weeds that emerged after planting were allowed to grow with the wheat crop until either the 3-leaf or jointing stage of wheat was reached. Herbicide treatments were applied using a tractor-mounted research sprayer at a spray volume of 10 gallons per acre using XR8002 flat fan nozzles. Herbicides were applied at the 3-leaf stage on June 5, 2020. Air temperature at time of application was 67 F, relative humidity was 40%, wind speed was 5 mph from the east, soil temperature was 46 F, and no dew was present on leaves. Weeds present at time of application included: kochia, 738/$m^2$, 3 cm in height; common lambsquarters, 121/$m^2$, 3.5 cm in height; bindweed, 12/$m^2$, 24 cm runners. The second application timing was at the wheat jointing stage. These treatments were applied on June 17. Environmental conditions at time of application were: air temperature, 84 F; relative humidity, 41%; wind speed, 5 mph from north northwest; soil temperature, 58 F; no dew was present. Treatments were evaluated on June 24 (19 days after the first application timing and 7 days after the second application timing) and July 9 (34 days after the first and 22 days after the second application timing). Wheat was harvested on August 31 using a small plot combine (Kincaid 8XP).

Due to the dry conditions that occurred during the spring of 2020 where from May 1 through June 27 only 1.11 inches of rainfall occurred in Hettinger. During the final week of June and first week of July, 3.16 inches of rainfall occurred which saved the crop from complete failure. However, lack of rainfall resulted in poor incorporation of the applied urea fertilizer resulting in nitrogen deficiencies in some area and weed control was not as good as would be expected due to the drought stress. Also, wheat yields were highly variable and there was no clear response to the herbicide treatments. Kochia was best control with 3-leaf application of PerfectMatch (clopyralid+fluroxypyr+pyroxsulam) at 83%. Treatments similar to PerfectMatch were 3-leaf and jointing application of Quelex plus Starane Flex plus TeamMate (halauxifen+florasulam plus fluroxypyr+florasulam plus pyroxsulam) at 81 and 74%, respectively; 3-leaf and jointing application of Starane Ultra plus Varro (halauxifen plus thifencarbazone-methyl) at 80 and 77%, respectively; 3-leaf application of Talinor (bicycolpyrone+bromoxynil) at 80%; 3-leaf and jointing application of Starane Ultra plus Axial XL (fluroxypyr plus pinoxaden) at 78 and 75%, respectively; jointing application of OpenSky (flyroxypry+pyroxsulam) at 77%; and jointing application of PerfectMatch at 75%. Common lambsquarters was best control with the 3-leaf application of Talinor or Supremacy (fluroxypyr+thifensulfuron-methyl+tribenuron) both at 99%. Similar to these were 3-leaf applications of OpenSky at 92%; Quelex+TeamMate at 92%; Qulex plus Starane Flex + TeamMate at 95%; PerfectMatch at 92%. The only treatment that was similar when applied at the jointing stage was Supremacy at 96%. Field bindweed was best controlled with Starane Ultra plus Varro at 82 to 83%; Quelex plus Starane Flex plus TeamMate at 75 to 80%; and PerfectMatch at 76 to 80%. Wheat yield was highly variable and no differences in yield or test weight were found.

Table 1. Weed control and spring wheat response to postemergence herbicides applied at either the 3-leaf stage or at jointing.

| Treatment | | | | Kochia | | Lambsquarters | | Bindweed | Wheat | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Product name | Rate | Timing | 19DAA | 34DAA | 19DAA | 34DAA | 34DAA | Yield | Test |
| | | (oz/A) | | % control | | | | | Bu/A | LB/Bu |
| 1 | Untreated | | | 0 h | 0 f | 0 f | 0 f | 0 g | 12.9 - | 49.7 - |
| 2 | OpenSky | 16 | 3-lf | 82 ab | 66 cd | 89 ab | 92 ab | 64 bcd | 18.3 - | 56.3 - |
| 3 | Quelex<br>TeamMate | 0.75<br>1 | 3-lf | 76 bcd | 71 bcd | 82 bc | 91 ab | 60 d | 21.7 - | 51.5 - |
| 4 | Quelex<br>Starane Flex<br>TeamMate | 0.75<br>13.5<br>1 | 3-lf | 79 a-d | 81 ab | 74 cd | 95 ab | 80 a | 19.8 - | 54.4 - |
| 5 | PerfectMatch | 16 | 3-lf | 76 bcd | 83 a | 78 bc | 92 ab | 80 a | 17.5 - | 49.6 - |
| 6 | Starane Ultra<br>Axial XL | 5.3<br>16.4 | 3-lf | 80 abc | 78 ab | 36 e | 0 f | 63 cd | 25.3 - | 56.5 - |
| 7 | Starane Ultra<br>Varro | 5.3<br>6.85 | 3-lf | 78 a-d | 80 ab | 80 bc | 85 bc | 82 a | 24.7 - | 58.3 - |
| 8 | Supremacy | 4 | 3-lf | 65 f | 61 de | 79 bc | 99 a | 46 ef | 18.8 - | 46.7 - |
| 9 | Talinor | 13.7 | 3-lf | 85 a | 80 ab | 97 a | 99 a | 43 f | 19.0 - | 52.8 - |
| 10 | OpenSky | 16 | JNT | 72 def | 77 ab | 71 cd | 72 d | 74 abc | 18.9 - | 52.2 - |
| 11 | Quelex<br>Starane Flex<br>TeamMate | 0.75<br>13.5<br>1 | JNT | 72 def | 74 abc | 75 c | 77 cd | 75 ab | 17.3 - | 48.7 - |
| 12 | Quelex<br>TeamMate | 0.75<br>1 | JNT | 66 f | 53 e | 68 cd | 81 cd | 57 de | 20.0 - | 55.1 - |
| 13 | PerfectMatch | 16 | JNT | 71 def | 75 abc | 73 cd | 78 cd | 76 ab | 13.8 - | 49.2 - |
| 14 | Starane Ultra<br>Axial XL | 5.3<br>16.4 | JNT | 74 cde | 75 abc | 25 e | 0 f | 83 a | 19.4 - | 56.5 - |
| 15 | Starane Ultra<br>Varro | 5.3<br>6.85 | JNT | 67 ef | 77 ab | 63 d | 56 e | 83 a | 15.8 - | 51.6 - |
| 16 | Supremacy | 4 | JNT | 67 def | 77 ab | 66 cd | 96 a | 55 de | 14.7 - | 45.0 - |
| LSD P=.10 | | | | 7.61 | 10.08 | 10.47 | 10.63 | 11.86 | 7.26 | 9.922 |
| CV | | | | 9.34 | 12.29 | 13.55 | 13.08 | 15.75 | 33.06 | 16.02 |
| Treatment F | | | | 37.453 | 22.493 | 30.070 | 63.770 | 18.234 | 1.216 | 0.799 |
| Treatment Prob(F) | | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.2920 | 0.6793 |

-Spring wheat ‘Shelly’ was planted on May 1, 2020.
-Treatments were applied was either at 3-leaf on June 5 or at jointing on June 17.
-NIS (0.25% v/v) was included with treatments 2-8, 9-16; AMS (15 lb/gal) was included with treatments 2, 5-8, 10, 13-16; COC (1% v/v) and (CoAct+ 2.5 oz/A) was included with treatment 9.
-Kochia, common lambsquarters, and field bindweed were evaluated on June 24 [19 days after the application (DAA) to 3-leaf wheat or 7 DAA to wheat at jointing stage] and on July 9 (34 DAA to 3-leaf wheat or 22 DAA to wheat at jointing stage).
-Wheat was harvested on August 31 using a small plot combine (Kincaid 8-XP).

**Field Pea and Green Foxtail Response to Spring-Applied Preemergence Herbicides**

Caleb Dalley, Daniel Abe, Hettinger Research Extension Center

A trial was conducted to evaluate field pea response and resulting weed control from spring application of soil active preemergence herbicides. Field pea 'Salamanca' was planted on May 5, 2020 using a no till drill at a rate of 120 lbs seed per acre at a depth of 2.5 inches. On May 6, herbicide treatments were applied using a tractor-mounted research sprayer at a spray volume of 10 gallons per acre using 8002XP flat fan nozzles. All treatments were tank-mixed with glyphosate (Roundup PowerMAX at 22 oz/acre) + AMS (8.5 lbs/100 gallons) + Destiny HSOC (1% v/v) to control weeds that had emerged prior to planting. The herbicide carfentrazone (Aim) was added at 1 oz/acre to improve control of winter annual weeds in all treatments except Spartan Charge (carfentrazone plus sulfentrazone), Sharpen (saflufencil), and Anthem Flex (carfentrazone plus pyroxasulfone).

Crop stand was measured using two 0.5 $m^2$ quadrats per plot on June 3, two weeks after crop emergence. Of the herbicide treatments, sulfentrazone plus carfentrazone (Spartan Charge) and saflufencil (Sharpen) resulted in stand counts greater than what was recorded in the untreated control. Stand counts for all other treatments were similar to the untreated control. Field pea height was measured on June 23, by measuring the height of 10 random plants per plot. Pea height was less following application of sulfentrazone plus pyroxasulfone (Authority Edge). All other treatments resulted in pea height that was similar to what was found in the untreated control. The months of May and June were very dry in 2020 and few weeds emerged with the crop. When significant rainfall did occur during the last week of June and first week of July, this rain resulted in the emergence of green foxtail. Control of green foxtail was evaluated on July 10, 65 days after herbicide application. Even with the lack of rainfall early in the growing season, the herbicide treatment that provided good or excellent control of green foxtail included Authority Supreme (sulfentrazone plus pyroxasulfone) with 93% control, Spartan Elite (sulfentrazone plus metolachlor) with 90% control, and Anthem Flex (carfentrazone plus pyroxasulfone) with 86% control. Other treatments resulted in fair or poor control of green foxtail. While both Spartan Elite and Authority Edge contain sulfentrazone plus pyroxasulfone, better control of green foxtail with Authority Supreme was likely due to the higher amount of pyroxasulfone in this herbicide formulation. Field pea was harvested on August 12 using a small plot combine (Kincaid XP). Yield of field pea was greater, compared with the untreated control (1008 lbs/acre), following application of sulfentrazone plus pyroxasulfone (Authority Supreme) at 1932 lbs/acre; sulfentrazone plus carfentrazone (Spartan Charge) at 1605 lbs/acre, saflufencil (Sharpen) at 2043 lbs/acre, and pyroxasulfone plus carfentrazone (Anthem Flex) at 1694 lbs/acre. All other treatments yielded similar to the untreated control.

Table 1. Field pea and lentil and weed control response to fall application of preemergence herbicides.

| Treatment<br>Product name | Rate | Green foxtail control | Stand count | Height | Yield |
|---|---|---|---|---|---|
| | (oz/A) | —%— | —#/$m^2$— | —cm— | lbs/acre |
| 1 Authority Supreme<br>Aim | 5.8<br>1 | 93 a | 59 abc | 34 a | 1932 a |
| 2 Spartan Elite<br>Aim | 19<br>1 | 90 a | 57 bcd | 29 bc | 1460 bc |
| 3 Spartan Charge | 3.75 | 63 c | 62 ab | 32 ab | 1605 ab |
| 4 Sharpen | 2 | 20 d | 64 a | 33 a | 2043 a |
| 5 Authority Edge<br>Aim | 4.4<br>1 | 73 b | 57 bcd | 26 c | 1341 bc |
| 6 Anthem Flex | 4 | 86 a | 52 d | 33 ab | 1694 ab |
| 7 Untreated control | | 0 e | 54 cd | 31 ab | 1008 c |
| LSD P=.10 | | 9.84 | 7.15 | 3.91 | 462.7 |
| CV | | 13.26 | 10.12 | 10.32 | 23.83 |
| Treatment F | | 82.804 | 2.303 | 3.314 | 3.514 |
| Treatment Prob(F) | | 0.0001 | 0.0795 | 0.0223 | 0.0177 |

Field pea were planted on May 5, 2020
Treatments were applied on May 6, 2020.
All treatments were tank mixed with glyphosate (Roundup PowerMAX at 22 oz/acre) plus AMS (8.5 lb/100 gal) and HSOC (1% v/v).
Green foxtail control was evaluated on July 10, 2020, 65 days after treatment application.
Crop stand was measured using two 0.5 $m^2$ quadrats per plot and was measured on July 3, at 2 weeks after crop emergence.
Crop height was average of 10 random plants per plot and was measured on June 23, at 5 weeks after crop emergence.
Field pea were harvested on August 7 using a small plot combine.

**Field Pea and Lentil Response to Fall-Applied Preemergence Herbicides**

Caleb Dalley, Daniel Abe, Hettinger Research Extension Center

A trial was conducted to evaluate field pea and lentil response and resulting weed control from fall application of soil active preemergence herbicides. On October 8, 2019, herbicide treatments were applied (see table) using a tractor-mounted research sprayer at a spray volume of 10 gallons per acre using 8002XP flat fan nozzles. All treatments were tank-mixed with glyphosate (Roundup PowerMAX at 22 oz/acre) + AMS (8.5 lbs/100 gallons) + Destiny HSOC (1% v/v) to control weeds that had emerged prior to planting. Field pea and lentil were planted on May 5, 2020 using a no till drill. Field pea 'Salamanca' were planted at a rate of 120 lbs seed per acre at a depth of 2.5 inches. Lentil 'Imvincible' was planted at a rate of 15 seeds per square foot at a depth of 1.5 inches. No additional herbicides were applied after planting.

Injury to pea and lentil were evaluated 8 days after crop emergence. No injury was observed for any herbicide treatment in field pea. In lentil, injury occurred with herbicide treatments containing sulfentrazone (Spartan Charge and Spartan Elite). This injury was visible as necrotic lesions (dead tissue) on leaves and stems. Crop stand was measured using two 0.5 $m^2$ quadrats per plot on June 9, three weeks after crop emergence. No herbicide treatment affected crop stand within each crop. Control of three weed species, kochia, common lambsquarters, and green foxtail, was evaluated on June 23, five weeks after crop emergence. Kochia control was 95 to 100% for all herbicide treatments. Common lambsquarters was controlled 95 to 100% with herbicides containing sulfentrazone (Spartan Charge and Spartan Elite). Control of common lambsquarters with other herbicide treatments was poor and ranged from 18 to 38%. Control of green foxtail was best at 78-81% with application of sulfentrazone plus metolachlor (Spartan Elite). Control was fair 56-61% with carfentrazone+pyroxasulfone (Anthem Flex) and was poor with pyroxasulfone+flumioxazin (Fierce). All other treatments provided no control of green foxtail. Better control of green foxtail with Anthem Flex versus Fierce, both of which contain the herbicide pyroxasulfone, was related to the higher rate of pyroxasulfone in the Anthem Flex application (2.1 oz of pyroxasulfone active per acre) compared with Fierce (1.3 oz of pyroxasulfone active per acre). Crop height was measured on June 23 by measuring the height of 10 random plants per plot. There were a few differences in the height of field pea but there were no differences in lentil height. The differences in the height of field pea was small and is not easily explained as there was no visual injury and it did not appear related to differences in weed control. Field pea and lentil were both harvest on August 12 using a small plot combine (Kincaid XP). Yield of field pea was increased, compared with the untreated control (1597 lbs/acre), following application of sulfentrazone plus carfentrazone (Spartan Charge), 1904 lbs/acre; and sulfentrazone plus metolachlor (Spartan Elite), 1872 lbs/acre. All other treatments yielded similar to the untreated control. Lentil yield was increased compared to the untreated control (1665 lbs/acre) only with application of pyroxasulfone plus flumioxazin (Fierce), 1996 lbs/acre. While some treatments yielded numerically less than the untreated control, no treatment resulted in yields that were statistically different. These trials show the value of fall application of preemergence herbicide for improved efficacy of spring weed control.

Table 1. Field pea and lentil and weed control response to fall application of preemergence herbicides.

| Treatment | | | Injury | Control | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Product name | Rate | Crop | 8 DAE | Kochia | Lamb | G. fox | Stand | Height | Yield |
| | (oz/A) | | —————————%————————— | | | | #/m$^2$ | cm | lb/acre |
| 1 Untreated | | Pea | 0 c | 0 b | 0 e | 0 e | 58 b | 37 bcd | 1597 de |
| 2 Valor | 2 | Pea | 0 c | 100 a | 19 d | 0 e | 62 b | 39 ab | 1552 de |
| 3 Valor | 3 | Pea | 0 c | 95 a | 25 cd | 0 e | 69 b | 39 ab | 1656 cde |
| 4 Spartan Charge | 10 | Pea | 0 c | 100 a | 98 a | 0 e | 71 b | 41 a | 1904 abc |
| 5 Anthem Flex | 4.5 | Pea | 0 c | 96 a | 35 bc | 56 b | 69 b | 37 bc | 1797 a-d |
| 6 Fierce | 3 | Pea | 0 c | 100 a | 28 bcd | 23 d | 66 b | 35 d | 1682 b-e |
| 7 Spartan Elite | 32 | Pea | 0 c | 100 a | 95 a | 78 a | 61 b | 36 cd | 1872 abc |
| 8 Untreated | | Lentil | 0 c | 0 b | 0 e | 0 e | 250 a | 20 e | 1665 b-e |
| 9 Valor | 2 | Lentil | 0 c | 100 a | 18 d | 0 e | 249 a | 20 e | 1509 e |
| 10 Valor | 3 | Lentil | 0 c | 96 a | 38 b | 0 e | 268 a | 21 e | 1518 e |
| 11 Spartan Charge | 10 | Lentil | 13 b | 100 a | 96 a | 3 e | 254 a | 19 e | 1574 de |
| 12 Anthem Flex | 4.5 | Lentil | 0 c | 95 a | 38 b | 61 b | 260 a | 19 e | 1916 ab |
| 13 Fierce | 3 | Lentil | 0 c | 100 a | 30 bc | 41 c | 254 a | 20 e | 1996 a |
| 14 Spartan Elite | 32 | Lentil | 23 a | 100 a | 100 a | 81 a | 250 a | 19 e | 1664 cde |
| LSD P=.10 | | | 4.29 | 5.70 | 10.28 | 7.92 | 20.13 | 2.31 | 252.56 |
| CV | | | 142.0 | 5.66 | 19.56 | 27.84 | 10.67 | 6.73 | 12.42 |
| Treatment F | | | 14.13 | 224.44 | 72.47 | 89.55 | 134.49 | 92.15 | 2.31 |
| Treatment Prob(F) | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0218 |

Treatments were applied on Oct 8, 2019.
All treatments were tank mixed with glyphosate (Roundup PowerMAX at 22 oz/acre) plus AMS (8.5 lb/100 gal) and HSOC (1% v/v).
Weeds evaluated were kochia, common lambsquarters, and green foxtail
Crop stand was measured using two 0.5 m$^2$ quadrats per plot and was measured on Jun 9, at 3 weeks after crop emergence.
Crop height was average of 10 random plants per plot and was measured on June 23, at 7 weeks after crop emergence.
Field pea and lentil were planted on May 5, 2020.

## Lentil Response to Spring Preemergence Herbicides

Caleb Dalley, Daniel Guimaraes Abe, Hettinger Research Extension Center

A trial was conducted to evaluate lentil response and resulting weed control from spring application of various preemergence herbicides applied at planting. Lentil 'Imvincible CL' was planted on May 5, 2020 using a no till drill at a rate of 25 seed per square foot at a depth of 1.5 inches. On May 6, herbicide treatments were applied using a tractor-mounted research sprayer at a spray volume of 10 gallons per acre using 8002XP flat fan nozzles. All treatments were tank-mixed with glyphosate (Roundup PowerMAX at 22 oz/acre) + AMS (8.5 lbs/100 gallons) + Destiny HSOC (1% v/v) to control weeds that had emerged prior to planting (including the weed free control). Lentil emergence occurred on May 19. Between planting and lentil emergence rainfall of 0.23 inched occurred (May 7). During the first six weeks after planting, other substantial rainfall (> 0.05 inches) events occurred on June 2 (0.12 inches), June 4 (0.09 inches), and June 6 (0.16 inches). During the last week of June and first week of July, 3.14 inches of rainfall occurred. Lack of rainfall during the first six weeks of growth limited activation of the applied preemergence herbicides and also limited the germination and growth of summer annual weeds. Due to limited and inconsistent emergence of weeds in this trial, weed control was not evaluated.

Lentil was evaluated for injury at 8 and 14 days after emergence. No herbicide treatment resulted in visible injury to lentil at either evaluation. Lack of lentil response may be due to the limited rainfall that occurred in the months of May and June. Results may have been different with normal or above average rainfall. Stand count were measured by counting the number of lentil plants within two 0.5 $m^2$ quadrats in each plot. No differences in lentil stand was found regardless of herbicide treatment. Lentil height was measured on July 1 (6 weeks after emergence). No differences in lentil height was found regardless of herbicide treatment. Similarly, lentil were harvested on August 12 using a small plot combine, and no differences in lentil yield was found. Under the environmental conditions that occurred during the spring of 2020, none of the applied herbicides had a negative impact of lentil. Under conditions with higher amounts of rainfall these results may have been different. Further investigation is needed under different environments to verify the safety of the herbicide treatments applied in this trial.

Table 1. Lentil response to spring preemergence herbicide application.

| Treatment | | | | | | |
|---|---|---|---|---|---|---|
| | Product name | Rate | Lentil Injury | Stand count | Height | Yield |
| | | (oz/A) | —%— | —#/$m^2$— | —cm— | lbs/acre |
| 1 | Sharpen | 0.75 | 0 - | 244 - | 25 - | 1536 - |
| | Outlook | 21 | | | | |
| | Metribuzin DF | 4 | | | | |
| 2 | Anthem Flex | 4 | 0 - | 265 - | 25 - | 1531 - |
| | Metribuzin DF | 4 | | | | |
| 3 | Sharpen | 0.75 | 0 - | 267 - | 24 - | 1579 - |
| | Metribuzin DF | 4 | | | | |
| | Prowl H2O | 32 | | | | |
| 4 | Sharpen | 0.75 | 0 - | 240 - | 25 - | 1430 - |
| | Dual II Magnum | 26.7 | | | | |
| | Metribuzin | 4 | | | | |
| 5 | Sharpen | 0.75 | 0 - | 244 - | 25 - | 1589 - |
| | Metribuzin DF | 4 | | | | |
| | Zidua SC | 3.25 | | | | |
| 6 | Sharpen | 0.75 | 0 - | 248 - | 24 - | 1765 - |
| | Metribuzin | 4 | | | | |
| | Zidua SC | 5 | | | | |
| 7 | Spartan Charge | 3.75 | 0 - | 232 - | 25 - | 1557 - |
| | Dual II Magnum | 26.7 | | | | |
| 8 | Spartan Charge | 5 | 0 - | 248 - | 25 - | 1545 - |
| | Dual II Magnum | 26.7 | | | | |
| 9 | Weed Free | | 0 - | 249 - | 26 - | 1514 - |
| 10 | Untreated | | 0 - | 251 - | 24 - | 1467 - |
| LSD P=.10 | | | NS | 23.35 | 1.2 | 231.8 |
| CV | | | 0.0 | 7.8 | 3.85 | 12.41 |
| Treatment F | | | 0.000 | 1.189 | 1.463 | 0.864 |
| Treatment Prob(F) | | | 1.0000 | 0.3414 | 0.2119 | 0.5672 |

Lentil (Imvincible) were planted using a no-till planter on May 5, 2020.
Herbicides were applied on May 6, 2020.
Glyphosate (Roundup PowerMAX) plus AMS plus MSO (Denstiny HSOC) was tank mixed with all herbicide treatment (including the Weed Free treatment) to control weeds that were present at time of application.
Lentil injury was evaluated 8 and 14 days after emergence; no injury was observed at either evaluation.
Lentil stand count was measured (two 0.5 $m^2$ quadrats per plot) on June 8, 2020.
Lentil height was measured (10 random plants per plot) on July 1, 2020.
Lentil were harvested and yield recorded on August 12, 2020.

## Comparing Rates of Carfentrazone plus Pyroxasulfone (Anthem Flex) with and without Metribuzin for Weed Control in Lentil

**Caleb Dalley and Daniel Guimaraes Abe, Hettinger Research Extension Center**

A trial was conducted to evaluate lentil response and resulting weed control from spring application of carfentrazone plus pyroxasulfone (Anthem Flex) applied as a spring preemergence application at planting. Lentil 'Imvincible CL' was planted on May 5, 2020 using a no till drill at a rate of 25 seed per square foot at a depth of 1.5 inches. On May 6, herbicide treatments were applied using a tractor-mounted research sprayer at a spray volume of 10 gallons per acre using 8002XP flat fan nozzles. All treatments were tank-mixed with glyphosate (Roundup PowerMAX at 22 oz/acre) + AMS (8.5 lbs/100 gallons) + Destiny HSOC (1% v/v) to control weeds that had emerged prior to planting. Lentil emergence occurred on May 19. Between planting and lentil emergence rainfall of 0.23 inched occurred (May 7). During the first six weeks after planting, other substantial rainfall (> 0.05 inches) events occurred on June 2 (0.12 inches), June 4 (0.09 inches), and June 6 (0.16 inches). During the last week of June and first week of July, 3.14 inches of rainfall occurred. Lack of rainfall during the first six weeks of growth limited activation of the applied preemergence herbicides and also limited the germination and growth of summer annual weeds. The rainfall that occurred at the end of June and first of July allowed for herbicide activation and encouraged crop growth and emergence of green foxtail. No other weeds were evaluated due to low and uneven emergence rates.

Lentil injury was evaluated 8 and 14 days after emergence; no injury was observed during either evaluation. It is possible that the lack of substantial rainfall during May and early June limited lentil response to applied herbicides. Under normal or above normal rainfall conditions, results would possibly have been different. Stand counts were measured on June 8 using two randomly placed 0.5 $m^2$ quadrats placed in each plot and then counting numbers of lentil plants. There were no differences in lentil stand counts due to herbicide application. Lentil height was measured on June 29 (6 weeks after lentil emergence) by measuring height of 10 random plants within each plot. No difference in lentil height was found. Green foxtail control was evaluated on July 10 (65 days after treatment application). Green foxtail control increased with increasing rates of carfentrazone plus pyroxasulfone (Anthem Flex). The addition of metribuzin did not consistently improve foxtail control. The herbicide pyroxasulfone is a preemergence herbicide that is active on grass seedling weeds as well as some small seeded broadleaf weed; it has little or no postemergence activity. Pyroxasulfone required a half inch or more of rainfall to be properly incorporated and activated within the soil profile where weed seeds are germinating. Where green foxtail is a summer annual grass that emerges during the summer months, often coinciding with rainfall events, the application of a preemergence herbicide, such as pyroxasulfone, will help to control this weed as it is emerging. Lentil yield was measured on August 12 using a small plot combine. All carfentrazone plus pyroxasulfone treatments, with and without metribuzin yield greater than the untreated control and most yielded greater than the pendimethalin control treatment.

Table 1. Comparison of Anthem Flex with and without metribuzin for weed control in lentil.

| Treatment | | Lentil | | | Green foxtail | |
|---|---|---|---|---|---|---|
| Product name | Rate | Injury | Stand count | Height | control | Yield |
| | (oz/A) | —%— | —#/$m^2$— | —cm— | —%— | lbs/acre |
| 1 Anthem Flex | 3.5 | 0 - | 276.5 - | 25.3 - | 69.3 d | 1695 a-d |
| 2 Anthem Flex | 4 | 0 - | 234.5 - | 25.6 - | 76.3 cd | 1945 a |
| 3 Anthem Flex | 3.5 | 0 - | 264.0 - | 25.3 - | 69.3 d | 1524 cd |
| Metribuzin DF | 2 | | | | | |
| 4 Anthem Flex | 4 | 0 - | 265.0 - | 24.8 - | 84.0 abc | 2018 a |
| Metribuzin | 2 | 0 - | | | | |
| 5 Anthem Flex | 3.5 | 0 - | 262.5 - | 25.7 - | 87.5 abc | 1923 abc |
| Metribuzin | 4 | | | | | |
| 6 Anthem Flex | 4 | 0 - | 262.0 - | 25.6 - | 84.8 abc | 1821 abc |
| Metribuzin | 4 | 0 - | | | | |
| 7 Anthem Flex | 3.5 | 0 - | 266.8 - | 25.0 - | 78.0 bcd | 1567 bcd |
| Metribuzin | 5.3 | | | | | |
| 8 Anthem Flex | 4 | 0 - | 253.3 - | 24.3 - | 87.0 abc | 1699 a-d |
| Metribuzin | 5.3 | | | | | |
| 9 Anthem Flex | 6 | 0 - | 259.3 - | 25.1 - | 91.8 a | 1927 ab |
| 10 Prowl H2O | 40 | 0 - | 263.3 - | 25.6 - | 89.5 ab | 1406 d |
| 11 Untreated | | 0 - | 256.0 - | 24.5 - | 0 e | 954 e |
| LSD P=.10 | | NS | 31.68 | 1.65 | 11.78 | 367.3 |
| CV | | 0.0 | 10.14 | 5.46 | 13.21 | 18.01 |
| Treatment F | | 0.000 | 0.627 | 0.457 | 27.676 | 3.424 |
| Treatment Prob(F) | | 1.0000 | 0.7793 | 0.9044 | 0.0001 | 0.0049 |

Lentil injury was evaluated on May 27 and June 8; no injury was observed at either date.
Stand count of lentil was measured on June 8 using two 0.5 $m^2$ quadrats per plot.
Lentil height was measured on June 29 (6 weeks after emergence) by measuring height of 10 random plants per plot.
Green foxtail control was evaluated on July 10 (65 days after treatment application).

## Chickpea Response to Preemergence Herbicides at Hettinger, ND

Caleb Dalley, Daniel Abe, Hettinger Research Extension Center

A trial was conducted to evaluate chickpea response to various preemergence herbicide combinations. Chickpea was planted at a rate of 40 seeds per $m^2$ (174,000 seeds per acre) into wheat stubble on May 8, 2020, using a no-till drill. After planting, herbicide treatments were applied using a tractor mounted research sprayer at a spray volume of 10 gallons per acre using 8002XP flat fan nozzles. All preemergence herbicide treatments were tank-mixed with glyphosate (Roundup PowerMAX at 22 oz/A plus AMS at 8.5 lb/100 gallons) to control weeds that had emerged prior to planting.

Due to lack of rainfall during the months of May and June, few weeds emerged with the crop and weed control could not be evaluated. Chickpea stand counts were measured on June 8 (2 weeks after chickpea emergence) using two 0.5 $m^2$ quadrats per plot. No differences in chickpea stand was observed due to herbicide treatment. Chickpea height was measured (10 random plants per plot) on July 2. No differences in chickpea height was observed due to herbicide treatment. Chickpea were harvested on September 1 using a small plot combine (Kincaid XP). Three of the seven treatments yielded greater than the untreated control with the highest yield (1820 lbs/acre) following application of sulfentrazone plus metolachlor (Spartan Elite). Chickpea yield was also greater than in the control following application of sulfentrazone plus pyroxasulfone (Authority Edge) and carfentrazone plus pyroxasulfone (Anthem Flex). Due to dry conditions in the seven weeks following planting, herbicide activation was less than ideal. Rainfall that occurred during the last week of June and the first week of July resulted in emergence of green foxtail in plots where no preemergence grass herbicide was applied.

Table 1. Response of chickpea to preemergence herbicides at Hettinger, ND in 2020.

| Treatment<br>Product name | Rate | Stand count<br>#/m$^2$ | Height<br>cm | Yield<br>lbs/acre |
|---|---|---|---|---|
| 1Authority Supreme | 5.8oz/a | 39.0- | 35.9- | 1345bcd |
| Aim | 1oz/a | | | |
| MSO | 1%v/v | | | |
| 2Spartan Elite | 19oz/a | 41.0- | 36.7- | 1820a |
| Aim | 1oz/a | | | |
| MSO | 1%v/v | | | |
| 3Spartan Charge | 3.75oz/a | 41.0- | 33.8- | 1326cd |
| MSO | 1%v/v | | | |
| 4Authority Edge | 4.4oz/a | 37.8- | 35.4- | 1732a |
| Aim | 1oz/a | | | |
| MSO | 1%v/v | | | |
| 5Anthem Flex | 4oz/a | 38.5- | 36.0- | 1650ab |
| Aim | 0.47oz/a | | | |
| MSO | 1%v/v | | | |
| 6Sharpen | 1oz/a | 39.3- | 34.0- | 1157d |
| MSO | 1%v/v | | | |
| 7Sharpen | 2oz/a | 40.8- | 35.5- | 1422bcd |
| MSO | 1%v/v | | | |
| 8Untreated | | 39.0- | 35.1- | 1253cd |
| LSD P=.10 | | 6.82 | 2.12 | 320.0 |
| CV | | 14.1 | 4.97 | 17.85 |
| Treatment F | | 0.573 | 1.134 | 3.167 |
| Treatment Prob(F) | | 0.8070 | 0.3741 | 0.0097 |

Herbicide treatments were applied directly after planting on May 8, 2020.
Glyphosate was tank-mixed with all herbicide treatments.
Stand counts were measured on June 8 and heights were measured on July 2, 2020.
Chickpea was harvested on September 1, 2020.
Means followed by same letter or symbol do not significantly differ (P=.10, LSD).
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison.

## Chickpea Response to Pyridate (Tough) Herbicide treatments with Preemergence Herbicides Applied at Planting or as a Tank-Mix partner.

Caleb Dalley, Daniel Abe, Hettinger Research Extension Center

Chickpea 'Frontier' was planted on May 8, 2020 using a no-till drill at a rate of 40 seeds per square meter (174,000 seeds per acre) with granular chickpea inoculum at 4 lbs per acre. After planting, planned preemergence (PRE) herbicide treatments were applied using a tractor-mounted research plot sprayer using 8002 flat fan nozzles with a spray volume of 15 gallons per acre at a spray pressure of 38 PSI. PRE treatments included sulfentrazone plus carfentrazone (Spartan Charge), sulfentrazone plus metolachlor (BroadAxe XC), metolachlor (Dual II Magnum), sulfentrazone plus pyroxasulfone (Authority Supreme), imazethapyr (Pursuit), and saflufencil (Sharpen). Glyphosate was applied across the entire plot area to control existing weeds. Chickpea emerged on May 27. Postemergence application of pyridate (Tough) herbicide alone and tank-mixed with either pendimethalin (Prowl H2O) or metolachlor (Dual II Magnum) were applied on June 17, 2020 using the same methods described earlier. All treatments were compared with an untreated control (no herbicides other than the glyphosate applied at planting) and a weed free control (which was hand weeded). Stand counts were measured on June 8 using two quadrats (0.5 $m^2$) per plot. Chickpea height (10 random plants per plot) was measured on July 17. Chickpea were harvest on September 1.

Compared with both the untreated and weed free controls, no PRE herbicide treatment resulted in a reduction of chickpea stand which ranged from 30.3 to 41.8 plants per square meter. Plant heights were measure on July 2, two weeks after POST herbicide application. The combination of Tough plus Prowl H2O resulted in injury in the form of abnormal growth (elongated leaves and stems). No other treatment resulted in visual injury (data not shown). Few weeds emerged in this trial due to the dry conditions that occurred following planting and weed control was not evaluated. Yield was greatest in the weed free control, but yield with herbicide treatments was similar to the hand-weeded control with the exception of Dual II Magnum (PRE) followed by Tough (POST), Sharpen (PRE) followed by Tough (POST), and Tough plus Prowl H2O (POST).

The herbicide pyridate (Tough) has now been labelled for use in chickpea in North Dakota. It is a POST herbicide that can be used to control broadleaf weeds. However, applications must be applied when weeds are small 1-2 inches for control. Pyridate is a contact herbicide and as such spray coverage is critical for controlling weeds. Applications should be applied at no less than 15 gallons per acre of spray solution. As pyridate will only control emerged weeds, a PRE herbicide with activity on broadleaf weeds should be applied at planting. However, the results from this trial suggest that combinations of Tough plus Prowl H2O should be avoided due to potential for crop injury.

Table 1. Response of chickpea to preemergence and postemergence herbicides at Hettinger, ND.

| Treatment<br>Product name | Rate | Timing | Stand count<br>#/m$^2$ | Height<br>cm | Yield<br>lbs/acre |
|---|---|---|---|---|---|
| 1Untreated | | | 31.3cd | 34.9- | 1718de |
| 2Tough | 20oz/a | POST | 38.3ab | 35.1- | 1934a-e |
| COC | 1% v/v | POST | | | |
| 3Spartan Charge | 5oz/a | PRE | 36.3abc | 35.3- | 2234ab |
| Tough | 20oz/a | POST | | | |
| COC | 1% v/v | POST | | | |
| 4Broadaxe XC | 2pt/a | PRE | 33.0bcd | 35.6- | 2158abc |
| Tough | 20oz/a | POST | | | |
| COC | 1% v/v | POST | | | |
| 5Dual II Magnum | 1.5pt/a | PRE | 38.5ab | 34.9- | 1842b-e |
| Tough | 20oz/a | POST | | | |
| COC | 1% v/v | POST | | | |
| 6Authority Supreme | 8oz/a | PRE | 34.8bcd | 34.0- | 2099a-d |
| Tough | 20oz/a | POST | | | |
| COC | 1% v/v | POST | | | |
| 7Pursuit | 2oz/a | PRE | 38.3ab | 34.5- | 2299a |
| Tough | 20oz/a | POST | | | |
| COC | 1% v/v | POST | | | |
| 8Sharpen | 2oz/a | PRE | 41.8a | 33.9- | 1680e |
| Tough | 20oz/a | POST | | | |
| COC | 1% v/v | POST | | | |
| 9Prowl H2O | 32oz/a | PRE | 30.3d | 33.8- | 2119a-d |
| Tough | 20oz/a | POST | | | |
| COC | 1% v/v | POST | | | |
| 10Tough | 20oz/a | POST | 31.5cd | 33.5- | 2260a |
| Dual II Magnum | 1.5pt/a | POST | | | |
| COC | 1% v/v | POST | | | |
| 11Tough | 20oz/a | POST | 36.3abc | 32.9- | 1805cde |
| Prowl H2O | 32oz/a | POST | | | |
| COC | 1% v/v | POST | | | |
| 12Weed Free (hand weeded) | | | 36.0bc | 35.4- | 2315a |
| LSD P=.10 | | | 5.56 | 1.96 | 395.5 |
| CV | | | 13.09 | 4.75 | 16.18 |
| Treatment F | | | 2.241 | 1.063 | 1.916 |
| Treatment Prob(F) | | | 0.0363 | 0.4187 | 0.0761 |

PRE herbicide treatments were applied directly after planting on May 8, 2020.
POST herbicide treatments were applied on June 17, 2020, 3 weeks after chickpea emergence when chickpea were 3 to 4 inches in height.
Stand counts were measured on June 8 and heights were measured on July 2, 2020.
Chickpea was harvested on September 1, 2020.
Means followed by same letter or symbol do not significantly differ (P=.10, LSD).
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison.

## Evaluation of Postemergence Herbicides on Flax

Caleb Dalley and Daniel Guimaraes Abe, Hettinger Research Extension Center

A trial was conducted to evaluate potential of various postemergence applied herbicides for use in flax. Herbicides applied in this trial are not labelled for use in flax, with the exception of Bison (MCPA plus bromoxynil) and cannot be applied to flax grown for commercial production as this would result in illegal crop residue. Flax 'York' was planted on May 2, 2020 into canola stubble using a no-till drill at a rate of 28 lb/acre and at a depth of 1.5 inches. Flax emerged on May 19. Postemergence herbicides were applied 1 week after flax emergence on May 26 using a tractor-mounted research plot spray at a spray volume of 10 gallons per acre using 8002XP flat fan nozzles. Flax was evaluated for injury at 1, 2, 3, 4, and 5 weeks after treatment application. Flax stand was measured using two 0.5 $m^2$ quadrats per plot on June 4, at 9 days after treatment application. Flax height was measure on July 22, at 7 weeks after treatment. Flax was harvested using a small plot combine (Kincaid XP) on September 4.

At 7 days after treatment (DAT), most of the herbicides applied resulted in some injury to flax. Treatments resulting in little or no injury to flax included Bison (MCPA plus bromoxynil), Basagran (bentazon), and Basagran plus Raptor (bentazon plus imazapyr). Treatments that resulted in minor injury included Armezon (topramezone) at 0.5 and 0.75 oz/acre, with 9.3 and 11% injury, respectively. Treatments resulting in moderate injury (16.3 to 18.3%) included Armezon plus Bison (topramezone plus MCPA plus bromoxynil), Raptor (imazapyr), Laudis (tembotrione) and Laudis plus Bison (tembotrione plus MCPA plus bromoxynil). Injury for most of the treatments lessened over time, with the exception of Raptor applied alone in which injury increased to 27.5% at 14 DAT, then reduced to 16.5% at 28 DAT, and then to 11.3% at 36 DAT. Injury to flax from Armezon plus Bison remained greater than 10% until after 28 DAT. While Raptor alone resulted in the greatest injury to flax, the combination of Raptor plus Basagran resulted in little or no injury. The type of injury that resulted from herbicide treatments varied. Raptor treatments resulted in stunted growth. Armezon and Laudis treatments resulted in bleaching injury as these herbicides inhibit pigment production in plants.

Stand counts taken one week after treatment did not show any difference between herbicide treatments. Crop heights measured 35 DAT showed a reduction in flax height compared to both the untreated control and to the Bison treatment following application of Armezon plus Bison, Raptor alone, Laudis, and Laudis plus Bison. Even while application of Raptor resulted in the greatest amount of injury and reduced flax height, seed yield of flax was greatest in this treatment and yield was similar to the Bison treatment. Flax yield was least in the untreated control. Flax is a very adaptable crop that is able to recover from early season injury from herbicides. This season most of the rainfall occurred during the last week of June and the first week of July. Prior to this rainfall, flax was extremely drought stressed and had limited growth. The timing of this rainfall allowed for flax growth after most of the injury to the flax had diminished and didn't give an advantage to herbicide treatments that didn't cause injury to the flax. On a year with more normal rainfall distribution, this early-season crop injury that occurred may have resulted in reduced yields. Further evaluations are needed under different environments to verify the results of this trial.

Table 1. Response of flax to postemergence herbicides.

| Treatment | | Injury | | | | | |
|---|---|---|---|---|---|---|---|
| Product name | Rate | 7 DAT | 14 DAT | 28 DAT | Stand Count | Height | Yield |
| | | —————%————— | | | #/m$^2$ | cm | lb/acre |
| 1Armezon | 0.5fl oz/a | 9.3b | 4.8d | 0.0c | 314.3- | 34.1ab | 455c |
| COC | 1% v/v | | | | | | |
| 2Armezon | 0.75fl oz/a | 11.0b | 4.5d | 1.8bc | 246.8- | 34.0ab | 466bc |
| COC | 1% v/v | | | | | | |
| 3Bison | 1pt/a | 0.0c | 3.5de | 0.0c | 277.0- | 35.4a | 601ab |
| 4Armezon | 0.75fl oz/a | 18.3a | 18.8b | 13.0a | 293.8- | 30.4cd | 497bc |
| Bison | 1pt/a | | | | | | |
| COC | 1% v/v | | | | | | |
| 5Basagran | 1pt/a | 0.0c | 0.0e | 0.0c | 219.0- | 36.4a | 453c |
| COC | 1% v/v | | | | | | |
| 6Raptor | 4oz/a | 16.3a | 27.5a | 16.5a | 292.3- | 28.8d | 693a |
| NIS | 0.25% v/v | | | | | | |
| 28% N | 2.5gal/100 gal | | | | | | |
| 7Basagran | 1pt/a | 0.0c | 4.8d | 0.0c | 304.5- | 34.9a | 596ab |
| Raptor | 4oz/a | | | | | | |
| MSO | 1% v/v | | | | | | |
| 8Basagran | 1pt/a | 1.3c | 4.0de | 0.0c | 291.3- | 35.1a | 500bc |
| Raptor | 6oz/a | | | | | | |
| MSO | 1% v/v | | | | | | |
| 9Laudis | 3oz/a | 17.8a | 10.0c | 4.5b | 262.8- | 32.1bc | 476bc |
| MSO | 1% v/v | | | | | | |
| 10Laudis | 3oz/a | 18.0a | 11.0c | 5.5b | 265.3- | 31.7bc | 431c |
| Bison | 1pt/a | | | | | | |
| MSO | 1% v/v | | | | | | |
| 11Untreated | | 0.0 | 0.0 | 0.0 | 269.0- | 36.4a | 427c |
| LSD P=.10 | | 2.64 | 4.14 | 3.95 | 60.64 | 2.72 | 137.89 |
| CV | | 26.39 | 42.79 | 87.84 | 18.31 | 6.76 | 22.59 |
| Treatment F | | 56.073 | 23.708 | 12.539 | 1.180 | 4.858 | 2.016 |
| Treatment Prob(F) | | 0.0001 | 0.0001 | 0.0001 | 0.3418 | 0.0004 | 0.0703 |

**Note: all of the above treatments, with the exception of Bison, are experimental and are not labelled for use in flax. Application of these treatments to flax is against the label and would result in illegal residues on the crop seed that could result in rejection of harvested seed by the purchaser.**

Flax was planted on May 2 and emerged on May 19, 2020.
POST herbicide treatments were applied on May 26, 2020, 1 weeks after flax emergence.
Stand counts were measured on June 4 and heights were measured on June 23, 2020.
Flax was harvested on September 4, 2020.
Means followed by same letter or symbol do not significantly differ (P=.10, LSD).
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison.

# NOTES

# NOTES

# NOTES

# NOTES

# NOTES

# NOTES

# NOTES

**Disclaimer:** The information given herein is for educational purposes only. Any reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement is implied by the Hettinger Research Extension Center Staff.