Ag. Report No. 38

# Thirty-Eighth Annual Western Dakota Crops Day Research Report 2021


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# 38th Annual Western Dakota Crops Day

December 16, 2021

Hettinger Armory

## MST

**9:30 AM Registration**

Coffee and doughnuts. Free time to view exhibits and visit with Program Sponsors.

**10:00 Early Bird Drawing and Opening Announcements**

**10:05 Crop Variety Updates and Highlights of Ongoing Regional Crop Production Research**

Dr. Caleb Dalley, Weed Scientist, NDSU Hettinger Research Extension Center.
- Herbicide and weed research.

Ryan Buetow, Extension Agronomist, NDSU Dickinson Research Extension Center.
- Dickinson REC agronomy update.

Dr. Chris Agustin, Director & Soil Scientist, NDSU Dickinson Research Extension Center.
- Dickinson REC soils research update.

John Rickertsen, Research Agronomist, NDSU Hettinger Research Extension Center.
- Variety updates and agronomy research.

**12:00 Lunch**

Provided by Program Sponsors. Free time to visit with sponsors.

**12:50 Adams County Commodity Elections**

**1:00 Alfalfa Pests**

Patrick Wagner, SDSU Extension Entomology Field Specialist, Rapid City, SD

**1:45 Cover Crops for the Western Dakota's**

Ryan Beers, Lemmon South Dakota

**2:45 Conclusion**

Drawing for door prizes, coffee and opportunity to visit with sponsors.

**3:00 West River Breeders Annual Meeting**

# Acknowledgments

The Hettinger and Dickinson Research Extension Centers gratefully acknowledges and thanks the following companies and organizations for their financial support and participation in this year's Western Dakota Crops Day. Those listed below have provided for the noon meal and have made this event possible. We greatly appreciate their commitment and support.

## 2021 Western Dakota Crops Day Sponsors

Hettinger Area Chamber of Commerce
AGT Foods
Agtegra
Calcium Products
Farm Credit Services of Mandan
Helena Chemical Company
Minn-Dak Growers
North Dakota Grain Growers Association
North Dakota Soybean Council
Proseed
Scranton Equity
Southwest Ag
Southwest Grain
Stone Mill LLC

The Hettinger and Dickinson Research Extension Centers 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.

Dr. Clair Keene, NDSU, Fargo
Dr. Hans Kandel, NDSU, Fargo
Eric Eriksmoen, NDSU NCREC Minot
Neal and Justin Freitag, Scranton
August and Perry Kirschmann, Regent
Dan Christman, Hettinger
USDA – ARS Northern Great Plains Research Center, Mandan
Ben Kuhn, Dickinson
Matt Biel, Lefor
Nathan Thomas, Mott
Keith Gietzen, Glen Ullin
Ed and Ron Kessel, Belfield

This work is supported by the USDA National Institute of Food and Agriculture, Hatch projects ND06282 & ND06280.

# 2021 Table of Contents

## Grain Legumes



## Industrial Hemp



## Fungicide Trials



## Special Reports



## Weed Control



**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 Canola VT's | 200 lb/ac |
| Hettinger Industrial Hemp VT | Not harvested due to bird damage |

# 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 2021 Hettinger HRSW variety trial was 7.4% meaning that there was a 7.4 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 Hettinger, the variety “Lanning” averaged 48.6 bu/ac in 2021 compared to “Bolles” at 42.7 bu/ac. Did the yield difference between these varieties differ significantly? Compare the yield difference of 5.9 bu/ac between the varieties (48.6 – 42.7) to the LSD 5% value of 3.8 bu/ac. Since the 5.9 bu/ac difference is more than the LSD value of 3.8 bu/a, the varieties do differ significantly in yield. If the difference between these two varieties would have been 3.0 bu/ac, their difference would have been less than 3.8 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 | October 20 | September 24 | September 16 |
| **Frost Free Days** | **162** | **136** | **119** |

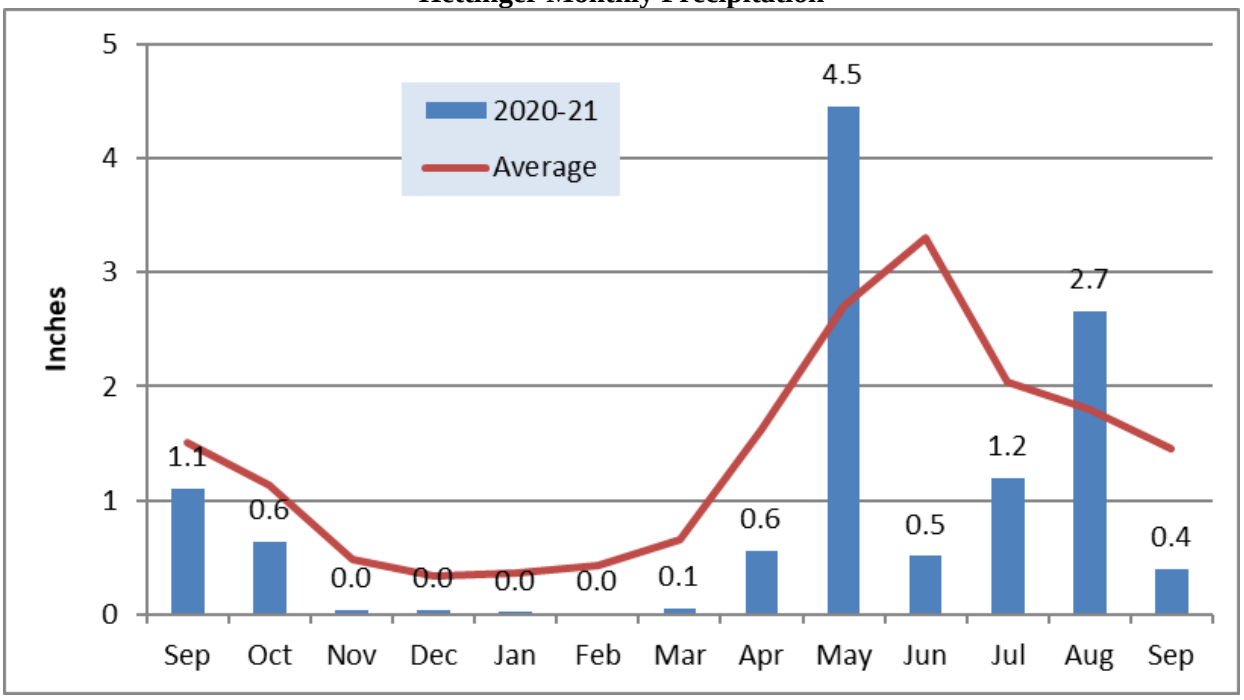
**Precipitation (inches)**

| Month | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 66 Year Average |
|---|---|---|---|---|---|---|
| October | 0.9 | 0.0 | 0.6 | 2.2 | 0.6 | 1.1 |
| November | 0.4 | 0.2 | 0.7 | 0.6 | 0.0 | 0.5 |
| December | 0.1 | 0.2 | 0.4 | 0.3 | 0.0 | 0.3 |
| January | 0.6 | 0.3 | 0.4 | 0.1 | 0.0 | 0.4 |
| February | 0.2 | 0.6 | 1.1 | 0.2 | 0.0 | 0.4 |
| March | 0.9 | 0.3 | 0.3 | 0.1 | 0.1 | 0.7 |
| April | 1.2 | 1.6 | 1.3 | 0.2 | 0.6 | 1.6 |
| May | 0.6 | 1.7 | 4.0 | 0.5 | 4.5 | 2.7 |
| June | 0.3 | 3.7 | 3.9 | 1.7 | 0.5 | 3.3 |
| July | 1.7 | 2.7 | 2.1 | 2.5 | 1.2 | 2.0 |
| August | 1.8 | 0.9 | 3.0 | 1.9 | 2.7 | 1.8 |
| September | 1.9 | 1.7 | 4.1 | 1.1 | 0.4 | 1.5 |
| **April-August** | **5.6** | **10.6** | **14.4** | **6.7** | **9.4** | **11.4** |
| **Total** | **10.6** | **13.9** | **21.9** | **11.2** | **10.6** | **16.3** |

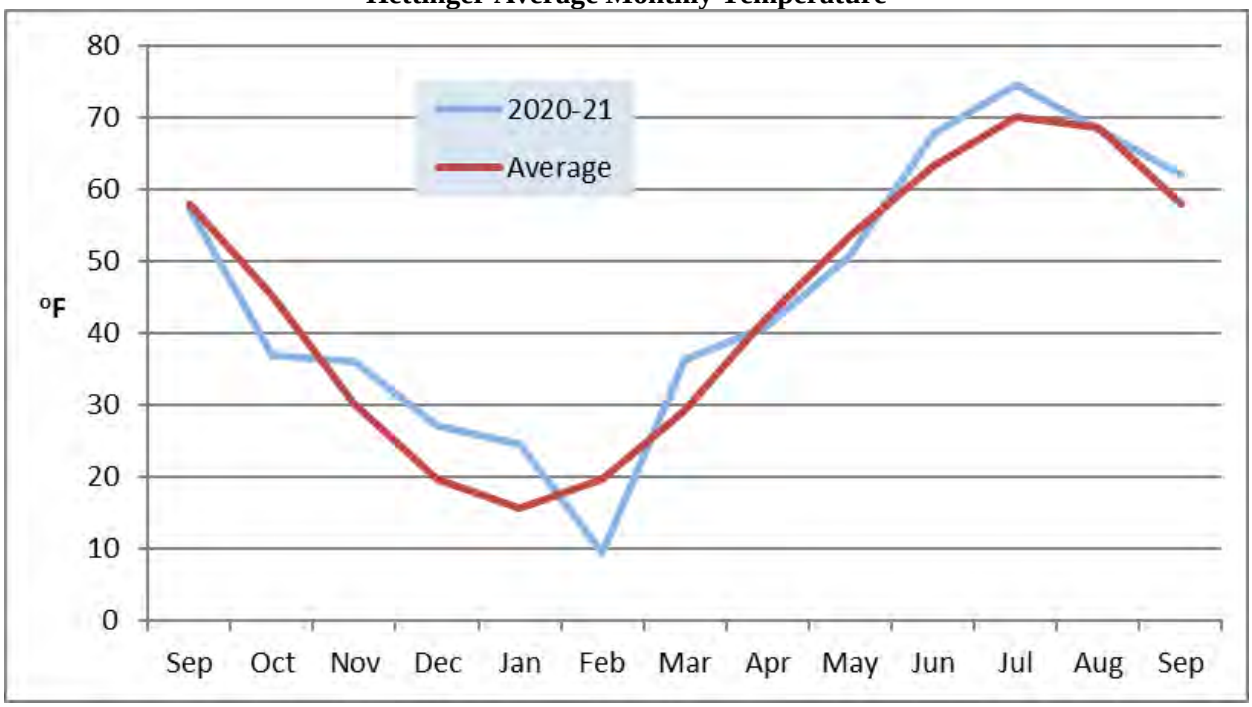
**Air Temperature (ºF)**

| Month | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 66 Year Average |
|---|---|---|---|---|---|---|
| October | 48.1 | 44.9 | 40.5 | 36.3 | 37.0 | 45.2 |
| November | 39.5 | 32.4 | 27.7 | 27.9 | 36.1 | 30.1 |
| December | 10.1 | 19.0 | 24.0 | 21.6 | 27.3 | 19.7 |
| January | 11.8 | 17.1 | 17.8 | 19.5 | 24.7 | 15.7 |
| February | 24.6 | 6.0 | -0.6 | 22.8 | 9.4 | 19.7 |
| March | 34.1 | 27.4 | 20.3 | 33.3 | 36.3 | 29.3 |
| April | 43.6 | 35.1 | 42.0 | 37.5 | 40.9 | 42.4 |
| May | 55.2 | 58.7 | 47.2 | 51.3 | 50.8 | 53.6 |
| June | 66.1 | 65.4 | 61.9 | 65.7 | 67.7 | 63.3 |
| July | 76.3 | 69.1 | 68.8 | 69.4 | 74.6 | 70.2 |
| August | 66.8 | 67.8 | 65.4 | 69.5 | 68.5 | 68.6 |
| September | 58.2 | 56.3 | 58.3 | 57.4 | 62.2 | 58.0 |
| **Average** | **44.5** | **41.6** | **39.4** | **42.7** | **44.6** | **43.0** |

**Hettinger Monthly Precipitation**




**Hettinger Average Monthly Temperature**



## 2021 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 | 1983 - 2021 | Current Year | 1983 - 2021 | Current Year | 1983 - 2021 | Current year | 1983 - 2021 | Current year | 1983 - 2021 | Current year |
| | ----------°F ---------- | | ----------°F ---------- | | ----- inches ----- | | | | | |
| November - 20 | 39.7 | 46.2 | 19.0 | 21.8 | 0.55 | 0.00 | | | | |
| December - 20 | 27.1 | 36.4 | 8.0 | 15.8 | 0.44 | 0.52 | | | | |
| January | 25.1 | 33.2 | 5.9 | 13.4 | 0.42 | 0.34 | | | | |
| February | 28.2 | 20.8 | 8.3 | -3.5 | 0.44 | 0.47 | | | | |
| March | 40.3 | 51.0 | 18.8 | 20.5 | 0.73 | 0.25 | | | | |
| April | 54.3 | 53.6 | 29.0 | 26.2 | 1.38 | 0.26 | 340 | 330 | | |
| May | 66.2 | 64.5 | 40.6 | 37.6 | 2.64 | 5.07 | 664 | 611 | 252 | 237 |
| June | 76.2 | 81.9 | 50.7 | 52.3 | 3.07 | 1.07 | 943 | 1054 | 411 | 510 |
| July | 83.8 | 88.9 | 55.7 | 57.7 | 2.28 | 1.03 | 1170 | 1273 | 612 | 650 |
| August | 82.7 | 83.0 | 53.9 | 53.3 | 2.00 | 1.63 | 1126 | 1113 | 568 | 539 |
| September | 71.6 | 79.3 | 44.0 | 46.8 | 1.66 | 0.14 | 774 | 932 | 324 | 443 |
| October | 56.0 | 59.6 | 31.3 | 36.9 | 1.21 | 2.70 | | | | |
| Mean | 54.3 | 58.2 | 30.4 | 31.6 | | | | | | |
| Total | | | | | 16.82 | 13.48 | 5019 | 5312 | 2168 | 2377 |

[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, 2021.**

| Variety | Agent or Origin[1] | Year Released | Height (inches)[2] | Straw Strength[3] | Days to Head[4] | Reaction to Disease[5,6] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Leaf Rust | Stripe Rust | Tan Spot | Bact. Leaf Streak | Head Scab |
| Ambush | Dyna-Gro | 2016 | 24 | 5 | 60 | 4 | 3 | 4 | 6 | 5 |
| **AP Gunsmoke CL2** | Syngenta/AgriPro | **2021** | **23** | **6** | **60** | **NA** | **NA** | **4** | **8** | **3** |
| AP Murdock | Syngenta/AgriPro | 2019 | 22 | 4 | 60 | NA | NA | 4 | 6 | 6 |
| **AP Smith** | Syngenta/AgriPro | **2021** | **21** | **3** | **61** | **NA** | **NA** | **3** | **4** | **4** |
| Ballistic | Dyna-Gro | 2018 | 25 | 3 | 61 | 5 | NA | 6 | 5 | 3 |
| Bolles | MN | 2015 | 26 | 4 | 62 | 3 | 5 | 4 | 6 | 5 |
| **CAG-Justify** | **Champions Alliance Grp** | **2021** | **25** | **6** | **62** | **NA** | **NA** | **8** | **6** | **3** |
| **CAG-Reckless** | **Champions Alliance Grp** | **2021** | **25** | **4** | **60** | **NA** | **NA** | **6** | **6** | **4** |
| Commander | Dyna-Gro | 2019 | 23 | 3 | 59 | 4 | NA | 3 | 5 | 5 |
| **CP3099A** | **Croplan** | **2020** | **25** | **5** | **64** | **NA** | **NA** | **4** | **6** | **4** |
| **CP3119A** | **Croplan** | **2021** | **24** | **3** | **64** | **NA** | **NA** | **6** | **5** | **3** |
| **CP3188** | **Croplan** | **2020** | **25** | **6** | **61** | **NA** | **NA** | **6** | **5** | **4** |
| CP3530 | Croplan | 2015 | 27 | 5 | 62 | 2 | 8 | 6 | 5 | 5 |
| CP3915 | Croplan | 2019 | 23 | 3 | 61 | 1 | NA | 7 | 4 | 5 |
| Dagmar[7] | MT | 2019 | 24 | 6 | 59 | 7 | NA | 4 | 7 | 7 |
| Driver | SD | 2019 | 26 | 4 | 61 | 1 | NA | 7 | 7 | 3 |
| Faller | ND | 2007 | 27 | 5 | 62 | 7 | 8 | 7 | 5 | 4 |
| Glenn | ND | 2005 | 25 | 4 | 59 | 6 | 4 | 6 | 4 | 4 |
| Lang-MN | MN | 2017 | 24 | 5 | 61 | 2 | 1 | 4 | 3 | 3 |
| Lanning | MT | 2017 | 23 | 4 | 60 | 7 | NA | 4 | 8 | 6 |
| **LCS Buster** | **Limagrain** | **2020** | **24** | **4** | **63** | **NA** | **NA** | **4** | **4** | **5** |
| LCS Cannon | Limagrain | 2018 | 23 | 4 | 58 | 7 | NA | 5 | 7 | 6 |
| LCS Rebel | Limagrain | 2017 | 26 | 6 | 59 | 7 | 4 | 3 | 4 | 5 |
| LCS Trigger | Limagrain | 2016 | 24 | 5 | 64 | 1 | 2 | 6 | 3 | 3 |
| MN-Torgy | MN | 2020 | 23 | 3 | 61 | 4 | NA | 3 | 3 | 3 |
| MN-Washburn | MN | 2019 | 22 | 3 | 61 | 1 | NA | 6 | 5 | 5 |
| MS Barracuda | Meridian Seeds | 2018 | 22 | 4 | 58 | 2 | NA | 7 | 7 | 6 |
| **MS Cobra** | **Meridian Seeds** | **2022** | **23** | **3** | **60** | **NA** | **NA** | **4** | **8** | **5** |
| MS Ranchero | Meridian Seeds | 2020 | 24 | 5 | 61 | 4 | NA | 5 | 6 | 6 |
| ND Frohberg | ND | 2020 | 25 | 4 | 61 | 5 | NA | 8 | 4 | 5 |
| ND VitPro | ND | 2016 | 24 | 3 | 59 | 4 | 3 | 6 | 5 | 4 |
| **PFS Buns** | **Peterson Farms Seed** | **2021** | **23** | **3** | **65** | **NA** | **NA** | **6** | **4** | **5** |
| SY 611CL2 | Syngenta/AgriPro | 2019 | 22 | 5 | 60 | 6 | NA | 4 | 6 | 5 |
| SY Ingmar | Syngenta/AgriPro | 2014 | NA | 3 | NA | 3 | 6 | 6 | 4 | 5 |
| SY Longmire[7] | Syngenta/AgriPro | 2019 | 23 | 4 | 61 | 7 | NA | 2 | 6 | 7 |
| SY McCloud | Syngenta/AgriPro | 2019 | 24 | 4 | 60 | 5 | NA | 7 | 8 | 5 |
| SY Soren | Syngenta/AgriPro | 2011 | 22 | 3 | 60 | 2 | 7 | 2 | 7 | 7 |
| SY Valda | Syngenta/AgriPro | 2015 | 22 | 4 | 61 | 2 | 7 | 6 | 6 | 5 |
| TCG-Heartland | 21st Century Genetics | 2019 | 22 | 3 | 59 | 2 | NA | 5 | 7 | 6 |
| TCG-Spitfire | 21st Century Genetics | 2015 | 24 | 3 | 63 | 5 | 4 | 6 | 4 | 6 |
| TCG-Wildcat | 21st Century Genetics | 2020 | 21 | 3 | 61 | 5 | NA | 6 | 7 | NA |
| WB9479 | WestBred | 2017 | 21 | **2** | 59 | 1 | NA | 4 | 8 | 6 |
| WB9590 | WestBred | 2017 | 20 | **3** | 59 | 3 | NA | 8 | 8 | 6 |

[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]Height data averaged from multiple locations in 2021; note, state-wide drought conditions generally resulted in shorter wheat.

[3]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.

[4]Days to Head = the number of days from planting to head emergence from the boot, averaged based on data from several locations in 2021.

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

[6]All wheat varieties are resistant to moderately resistant to stem rust when screened using *Puccinia graminis* f. sp. *tritici* races TPMK, TMLK, RTQQ, QFCQ and QTHJ.

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

**Quality data from 2020. The Wheat Quality Index is a weighted average developed to summarize the relative milling and baking quality of lines in the trial. Data below are from 2020 for all varieties which were tested in the 2021 trial. Data were collected from Gwinner, Langdon, Minot and Williston.**

| Variety | Test Weight[1] | Vitreous Kernels[2] | Wheat Protein[3] | Farinograph Absorption[4] | Flour Extraction[5] | Farinograph Stability[6] | Loaf Volume[7] | WQI RANK[8] |
|---|---|---|---|---|---|---|---|---|
| | lb/bu | % | 12% m.b. | % | % | min | $cm^3$ | |
| Bolles | 59.8 | 75.3 | 17.1 | 63.6 | 62.6 | 22.6 | 953.8 | 1 |
| Glenn | 62.4 | 72.9 | 15.6 | 63.8 | 64.2 | 12.8 | 930.5 | 2 |
| ND Frohberg | 61.4 | 56.0 | 15.0 | 65.2 | 65.3 | 11.2 | 932.3 | 3 |
| ND VitPro | 62.2 | 66.3 | 15.4 | 64.4 | 66.4 | 9.2 | 928.6 | 4 |
| Sy Ingmar | 61.6 | 58.6 | 15.6 | 63.0 | 66.0 | 10.8 | 920.2 | 5 |
| Lang-MN | 61.0 | 74.5 | 15.8 | 63.7 | 65.0 | 10.3 | 903.5 | 6 |
| SY McCloud | 61.5 | 59.4 | 15.3 | 64.9 | 64.6 | 9.2 | 927.7 | 7 |
| CP3915 | 61.7 | 53.5 | 15.1 | 63.9 | 66.8 | 9.9 | 921.2 | 8 |
| Lanning | 59.8 | 64.4 | 16.1 | 63.0 | 62.8 | 8.7 | 972.4 | 9 |
| LCS Rebel | 61.9 | 54.8 | 15.3 | 64.1 | 66.4 | 10.2 | 904.4 | 10 |
| MS Barracuda | 60.4 | 56.3 | 15.5 | 63.9 | 64.9 | 10.0 | 927.7 | 11 |
| MN-Washburn | 61.0 | 68.1 | 14.8 | 60.4 | 67.8 | 13.2 | 937.0 | 12 |
| Dagmar | 60.7 | 75.7 | 15.8 | 63.6 | 64.3 | 9.8 | 900.7 | 13 |
| TCG-Heartland | 61.7 | 60.2 | 15.6 | 62.9 | 65.8 | 11.0 | 885.8 | 14 |
| Ballistic | 60.2 | 63.8 | 14.9 | 63.7 | 65.9 | 10.4 | 916.5 | 15 |
| SY Soren | 61.0 | 50.6 | 15.8 | 63.2 | 63.8 | 9.4 | 913.7 | 16 |
| Faller | 60.2 | 50.7 | 14.8 | 63.2 | 67.0 | 8.9 | 930.5 | 17 |
| MS Ranchero | 58.9 | 60.4 | 15.1 | 64.4 | 62.7 | 11.8 | 896.0 | 18 |
| AP Murdock | 60.6 | 45.9 | 14.8 | 64.1 | 66.4 | 11.1 | 876.4 | 19 |
| SY Longmire | 61.0 | 62.8 | 15.5 | 63.9 | 64.8 | 7.8 | 900.7 | 20 |
| SY 611CL2 | 61.5 | 56.9 | 15.2 | 66.7 | 64.3 | 7.2 | 865.3 | 21 |
| Ambush | 61.4 | 68.0 | 15.4 | 62.1 | 64.4 | 9.9 | 906.3 | 22 |
| CP3530 | 61.1 | 52.1 | 14.7 | 64.1 | 65.7 | 7.8 | 916.5 | 23 |
| Commander | 60.9 | 61.9 | 15.6 | 62.9 | 65.0 | 8.8 | 889.5 | 24 |
| TCG-Wildfire | 61.5 | 59.6 | 15.3 | 63.4 | 64.8 | 8.8 | 888.5 | 25 |
| LCS Cannon | 61.5 | 52.7 | 14.6 | 61.9 | 66.5 | 10.6 | 881.1 | 26 |
| TCG-Spitfire | 60.7 | 54.3 | 14.7 | 63.6 | 62.2 | 10.8 | 892.3 | 27 |
| MN-Torgy | 61.0 | 46.7 | 15.3 | 61.2 | 63.1 | 11.3 | 894.1 | 28 |
| Driver | 61.2 | 62.8 | 15.2 | 61.0 | 64.4 | 9.2 | 849.4 | 29 |
| SY Valda | 61.1 | 68.7 | 14.7 | 62.4 | 63.8 | 7.2 | 865.3 | 30 |
| LCS Trigger | 61.5 | 68.3 | 13.5 | 65.1 | 65.8 | 6.9 | 815.9 | 31 |
| LCS Buster | 58.8 | 54.5 | 13.7 | 58.7 | 66.6 | 12.9 | 839.2 | 32 |
| Mean | 61.0 | 60.5 | 15.2 | 63.3 | 65.0 | 10.3 | 902.6 | |

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

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

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

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

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

[8]Adjusted means across locations were calculated for each trait. These means were standardized (mean=0 and standard deviation=1) to remove effect of scale, which varies between traits. The standardized means were used to calculate the Wheat Quality Index (WQI). The WQI is a weighted index using 7 key traits with the following weights: Test Weight (5%); Vitreous kernel (5%); Wheat Protein (15%); Flour Extraction (10%); Farinograph Absorption (21.66%); Loaf Volume (21.66%).

**Hard Red Spring Wheat - 2021** **Hettinger, ND**

| Variety | Days to Head | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AAC Brandon | 62 | 27 | 0 | 59.6 | 15.7 | -- | -- | 49.8 | -- | -- |
| AAC Concord | 62 | 22 | 0 | 55.9 | 15.7 | -- | 23.4 | 42.3 | 32.9 | -- |
| AAC Starbuck | 62 | 24 | 0 | 59.3 | 15.8 | -- | -- | 46.6 | -- | -- |
| AAC Wheatland | 62 | 24 | 0 | 58.2 | 15.1 | -- | -- | 44.0 | -- | -- |
| Ambush | 61 | 22 | 0 | 60.7 | 15.3 | 61.6 | 23.0 | 43.1 | 33.1 | 42.6 |
| AP Gunsmoke CL2 | 61 | 23 | 0 | 58.5 | 16.2 | -- | 24.2 | 48.4 | 36.3 | -- |
| AP Murdock | 61 | 21 | 0 | 57.9 | 16.1 | 70.0 | 22.7 | 39.5 | 31.1 | 44.1 |
| AP Smith | 63 | 19 | 0 | 58.1 | 15.5 | -- | 18.1 | 38.0 | 28.1 | -- |
| Ballistic | 62 | 23 | 0 | 57.9 | 14.7 | 57.4 | 29.7 | 45.7 | 37.7 | 44.3 |
| Bolles | 62 | 26 | 0 | 58.8 | 17.1 | 65.1 | 16.2 | 42.7 | 29.5 | 41.3 |
| CAG-Justify | 63 | 26 | 0 | 55.4 | 15.8 | -- | -- | 48.0 | -- | -- |
| CAG-Reckless | 62 | 26 | 0 | 59.7 | 15.4 | -- | -- | 49.9 | -- | -- |
| Commander | 61 | 23 | 0 | 59.0 | 15.2 | 69.0 | 19.8 | 48.4 | 34.1 | 45.7 |
| CP3099A | 64 | 24 | 0 | 55.8 | 14.5 | -- | -- | 41.9 | -- | -- |
| CP3119A | 64 | 21 | 0 | 52.5 | 15.2 | -- | -- | 42.8 | -- | -- |
| CP3188 | 62 | 23 | 0 | 56.5 | 14.8 | -- | -- | 43.7 | -- | -- |
| CP3530 | 62 | 25 | 0 | 55.8 | 16.4 | 66.9 | 27.9 | 40.3 | 34.1 | 45.0 |
| CP3915 | 62 | 23 | 0 | 58.7 | 15.3 | 65.8 | 30.0 | 43.4 | 36.7 | 46.4 |
| Dagmar | 61 | 25 | 0 | 58.5 | 15.2 | -- | 24.3 | 48.4 | 36.3 | -- |
| Driver | 62 | 24 | 0 | 60.8 | 14.8 | -- | 28.5 | 45.9 | 37.2 | -- |
| Faller | 62 | 26 | 0 | 58.1 | 15.1 | 71.8 | 28.1 | 45.1 | 36.6 | 48.3 |
| Glenn | 61 | 26 | 0 | 60.5 | 15.8 | 57.6 | 23.0 | 41.6 | 32.3 | 40.7 |
| Lang MN | 62 | 25 | 0 | 59.0 | 15.4 | 68.7 | 23.2 | 49.4 | 36.3 | 47.1 |
| Lanning | 61 | 22 | 0 | 56.2 | 15.5 | 64.5 | 20.9 | 48.6 | 34.8 | 44.7 |
| LCS Buster | 64 | 22 | 0 | 56.5 | 13.9 | -- | 27.9 | 43.5 | 35.7 | -- |
| LCS Cannon | 59 | 23 | 0 | 60.1 | 14.0 | 63.5 | 24.0 | 48.5 | 36.3 | 45.3 |
| LCS Rebel | 61 | 26 | 0 | 59.6 | 15.5 | 63.7 | 25.5 | 49.4 | 37.4 | 46.2 |
| LCS Trigger | 64 | 22 | 0 | 57.6 | 15.1 | 70.0 | 30.9 | 43.1 | 37.0 | 48.0 |
| MN Torgy | 62 | 24 | 0 | 61.5 | 15.3 | 68.3 | 24.8 | 45.2 | 35.0 | 46.1 |
| MN Washburn | 62 | 21 | 0 | 56.3 | 15.4 | 64.7 | 26.6 | 39.8 | 33.2 | 43.7 |
| MS Barracuda | 60 | 24 | 0 | 58.6 | 14.8 | 66.9 | 20.2 | 45.0 | 32.6 | 44.0 |
| MS Cobra | 61 | 23 | 0 | 59.1 | 15.6 | -- | -- | 42.3 | -- | -- |
| MS Ranchero | 61 | 24 | 0 | 57.7 | 14.7 | -- | 25.5 | 49.3 | 37.4 | -- |
| ND Frohberg | 62 | 26 | 0 | 58.7 | 15.5 | 62.9 | 22.2 | 46.0 | 34.1 | 43.7 |
| ND VitPro | 61 | 22 | 0 | 57.7 | 15.8 | 61.5 | 21.1 | 39.4 | 30.3 | 40.7 |
| PFS-Buns | 66 | 21 | 0 | 54.0 | 15.8 | -- | -- | 39.9 | -- | -- |
| SK Rush | 62 | 24 | 0 | 58.3 | 15.2 | -- | -- | 43.5 | -- | -- |

***Table continued on next page***

**Hard Red Spring Wheat - 2021** **Hettinger, ND**

| Variety | Days to Head | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| ***Table continues from previous page*** | | | | | | | | | | |
| SY 611 CL2 | 62 | 22 | 0 | 59.0 | 14.9 | 73.8 | 24.9 | 44.6 | 34.7 | 47.8 |
| SY Ingmar | 63 | 23 | 0 | 58.1 | 16.0 | 62.7 | 18.2 | 42.6 | 30.4 | 41.2 |
| SY Longmire | 62 | 22 | 0 | 57.0 | 15.8 | 69.0 | 26.1 | 40.2 | 33.1 | 45.1 |
| SY McCloud | 62 | 24 | 0 | 59.3 | 15.2 | 62.8 | 20.4 | 46.5 | 33.4 | 43.2 |
| SY Rockford | 63 | 22 | 0 | 57.7 | 15.8 | 70.9 | 20.5 | 43.5 | 32.0 | 44.9 |
| SY Soren | 62 | 21 | 0 | 58.1 | 15.7 | 67.9 | 17.1 | 44.2 | 30.7 | 43.1 |
| SY Valda | 62 | 21 | 0 | 58.7 | 15.5 | 68.7 | 26.4 | 43.3 | 34.8 | 46.1 |
| TCG Heartland | 61 | 21 | 0 | 58.6 | 16.0 | 65.5 | 20.7 | 45.7 | 33.2 | 44.0 |
| TCG Spitfire | 64 | 22 | 0 | 56.3 | 15.7 | 69.4 | 30.3 | 42.6 | 36.4 | 47.4 |
| TCG Wildcat | 63 | 21 | 0 | 58.6 | 15.8 | -- | 19.1 | 44.9 | 32.0 | -- |
| WB9479 | 61 | 19 | 0 | 59.5 | 16.3 | -- | -- | 45.9 | -- | -- |
| WB9590 | 61 | 20 | 0 | 58.2 | 16.0 | -- | -- | 43.2 | -- | -- |
| Trial Mean | 62 | 23 | 0 | 58.1 | 15.4 | 66.0 | 23.6 | 44.2 | 34.0 | 44.7 |
| C.V. % | 0.7 | 9.6 | -- | 1.8 | 2.7 | 7.1 | 9.2 | 7.4 | -- | -- |
| LSD 5% | 0.6 | 3.0 | -- | 1.4 | 0.5 | 6.6 | 2.5 | 3.8 | -- | -- |
| LSD 10% | 0.5 | 2.5 | -- | 1.2 | 0.4 | 5.5 | 2.0 | 3.0 | -- | -- |

[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 22

Harvest Date: July 29

Previous Crop: Canola

## NDSU Hettinger Research Extension Center

**Hard Red Spring Wheat - 2021** **Scranton, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AP Murdock | 20 | 0 | 55.2 | 17.0 | -- | 35.7 | 19.2 | 27.5 | -- |
| AP Smith | 20 | 0 | 54.4 | 16.7 | -- | -- | 20.8 | -- | -- |
| Ballistic | 23 | 0 | 55.9 | 16.8 | -- | -- | 22.0 | -- | -- |
| Bolles | 23 | 0 | 56.9 | 18.5 | 18.9 | 39.6 | 23.2 | 31.4 | 27.2 |
| Commander | 22 | 0 | 56.6 | 16.7 | -- | 38.5 | 21.4 | 30.0 | -- |
| CP3915 | 21 | 0 | 54.8 | 17.1 | -- | 41.4 | 20.5 | 31.0 | -- |
| Dagmar | 24 | 0 | 56.7 | 17.1 | -- | 45.4 | 18.7 | 32.1 | -- |
| Driver | 23 | 0 | 57.7 | 16.2 | -- | -- | 21.1 | -- | -- |
| Glenn | 22 | 0 | 57.8 | 16.8 | 21.2 | 40.2 | 19.0 | 29.6 | 26.8 |
| Lang-MN | 22 | 0 | 57.9 | 17.4 | 29.5 | 45.3 | 18.1 | 31.7 | 31.0 |
| Lanning | 21 | 0 | 55.5 | 16.9 | 25.0 | 50.3 | 19.9 | 35.1 | 31.7 |
| LCS Buster | 19 | 0 | 53.9 | 16.0 | -- | -- | 20.6 | -- | -- |
| LCS Cannon | 21 | 0 | 59.7 | 15.9 | 27.8 | 44.0 | 21.8 | 32.9 | 31.2 |
| LCS Trigger | 20 | 0 | 54.4 | 16.2 | 39.1 | 50.6 | 18.4 | 34.5 | 36.0 |
| MN Torgy | 20 | 0 | 58.2 | 17.2 | -- | 45.8 | 20.1 | 33.0 | -- |
| MN Washburn | 20 | 0 | 54.7 | 16.6 | 29.0 | 43.0 | 18.4 | 30.7 | 30.1 |
| ND Frohberg | 22 | 0 | 55.2 | 17.4 | 19.9 | 40.4 | 20.1 | 30.3 | 26.8 |
| ND VitPro | 23 | 0 | 55.5 | 17.1 | 24.1 | 43.6 | 20.0 | 31.8 | 29.2 |
| SY Longmire | 22 | 0 | 54.9 | 17.2 | 35.7 | 41.3 | 19.6 | 30.5 | 32.2 |
| SY McCloud | 21 | 0 | 58.6 | 16.7 | -- | 42.7 | 21.8 | 32.3 | -- |
| SY Rockford | 22 | 0 | 56.2 | 17.4 | 29.5 | 43.2 | 19.4 | 31.3 | 30.7 |
| TCG Heartland | 20 | 0 | 55.9 | 17.2 | -- | 40.2 | 23.5 | 31.9 | -- |
| TCG Spitfire | 21 | 0 | 54.3 | 17.2 | 36.0 | 43.6 | 21.3 | 32.5 | 33.6 |
| TCG Wildcat | 20 | 0 | 56.7 | 16.9 | -- | -- | 19.2 | -- | -- |
| WB9479 | 19 | 0 | 57.6 | 17.6 | -- | -- | 20.4 | -- | -- |
| WB9590 | 19 | 0 | 56.5 | 17.6 | -- | -- | 20.5 | -- | -- |
| Trial Mean | 21 | 0 | 56.2 | 17.0 | 28.1 | 43.5 | 20.4 | 31.8 | 30.6 |
| C.V. % | 5.6 | -- | -- | 1.6 | 16.8 | 9.6 | 13.8 | -- | -- |
| LSD 5% | 1.7 | -- | -- | 0.4 | 6.6 | 5.9 | 4.0 | -- | -- |
| LSD 10% | 1.4 | -- | -- | 0.3 | 5.6 | 4.9 | 3.3 | -- | -- |

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

Planting Date: April 28

Harvest Date: August 2

## NDSU Hettinger Research Extension Center

**Hard Red Spring Wheat - 2021** **Regent, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AP Murdock | 24 | 0 | 59.8 | 15.7 | -- | 21.3 | 39.3 | 30.3 | -- |
| AP Smith | 22 | 0 | 60.4 | 16.1 | -- | -- | 37.4 | -- | -- |
| Ballistic | 27 | 0 | 59.6 | 15.7 | -- | -- | 44.1 | -- | -- |
| Bolles | 26 | 0 | 59 | 17.9 | 41.5 | 16.4 | 36.3 | 26.4 | 31.4 |
| Commander | 26 | 0 | 60.8 | 16.0 | -- | 19.3 | 40.7 | 30.0 | -- |
| CP3915 | 25 | 0 | 61.1 | 16.1 | -- | 29.0 | 41.7 | 35.4 | -- |
| Dagmar | 26 | 0 | 60.3 | 16.4 | -- | 28 | 38.6 | 33.3 | -- |
| Driver | 27 | 0 | 62.2 | 15.5 | -- | -- | 38.8 | -- | -- |
| Glenn | 29 | 0 | 61.5 | 16.1 | 39.0 | 21.6 | 39.4 | 30.5 | 33.3 |
| Lang-MN | 27 | 0 | 60 | 16.5 | 47.7 | 28.4 | 41.5 | 35.0 | 39.2 |
| Lanning | 26 | 0 | 58.1 | 16.3 | 46 | 21.3 | 41.3 | 31.3 | 36.2 |
| LCS Buster | 25 | 0 | 58.4 | 14.2 | -- | -- | 45.0 | -- | -- |
| LCS Cannon | 27 | 0 | 62.6 | 15.2 | 37.5 | 19.6 | 48.7 | 34.2 | 35.3 |
| LCS Trigger | 26 | 0 | 57.6 | 15.0 | 58.8 | 38.2 | 44.2 | 41.2 | 47.1 |
| MN Torgy | 27 | 0 | 62.4 | 15.6 | -- | 22.4 | 44.1 | 33.3 | -- |
| MN Washburn | 27 | 0 | 59 | 15.5 | 44.6 | 26.9 | 41.2 | 34.1 | 37.6 |
| ND Frohberg | 29 | 0 | 59.8 | 16.7 | 43.1 | 14.7 | 40.8 | 27.8 | 32.9 |
| ND VitPro | 28 | 0 | 61.4 | 16.5 | 38.0 | 24.5 | 42.6 | 33.6 | 35.0 |
| SY Longmire | 26 | 0 | 60.6 | 16.2 | 49.6 | 27.8 | 44.2 | 36.0 | 40.5 |
| SY McCloud | 26 | 0 | 61.8 | 15.9 | -- | 20.9 | 37.5 | 29.2 | -- |
| SY Rockford | 26 | 0 | 58.3 | 16.4 | 44.0 | 20.4 | 42.6 | 31.5 | 35.7 |
| TCG Heartland | 24 | 0 | 57.9 | 16.8 | -- | 18.4 | 41.5 | 30.0 | -- |
| TCG Spitfire | 25 | 0 | 59.5 | 16.0 | 51.9 | 26.8 | 40.2 | 33.5 | 39.6 |
| TCG Wildcat | 25 | 0 | 60.9 | 16.3 | -- | -- | 37.7 | -- | -- |
| WB9479 | 23 | 0 | 60.9 | 16.9 | -- | -- | 40.1 | -- | -- |
| WB9590 | 24 | 0 | 60.4 | 16.6 | -- | -- | 40.7 | -- | -- |
| Trial Mean | 26 | 0 | 60.1 | 16.1 | 44.2 | 23.2 | 41.2 | 32.4 | 37.0 |
| C.V. % | 8.0 | -- | 2.0 | 3.2 | 6.9 | 16.7 | 12.7 | -- | -- |
| LSD 5% | 2.9 | -- | 1.7 | 0.7 | 4.3 | 5.5 | 7.3 | -- | -- |
| LSD 10% | 2.4 | -- | 1.4 | 0.6 | 3.6 | 4.6 | 6.2 | -- | -- |

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

Planting Date: April 28

Harvest Date: August 11

Prvious Crop: Canola

**Hard Red Spring Wheat - 2021** **Mandan, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | ---------- Bushels per acre ---------- | | | | |
| AAC Brandon | 19 | 0 | 59.4 | -- | -- | 26.5 | -- | -- |
| AAC Concord | 20 | 0 | 59.0 | -- | 45.5 | 21.4 | 33.5 | -- |
| AAC Starbuck VB | 18 | 0 | 55.9 | -- | -- | 20.1 | -- | -- |
| AAC Wheatland VB | 17 | 0 | 59.1 | -- | -- | 22.5 | -- | -- |
| Ambush | 17 | 0 | 58.6 | 36.2 | 42.9 | 16.6 | 29.8 | 31.9 |
| AP Gunsmoke CL2 | 14 | 0 | 61.5 | -- | 45.3 | 19.8 | 32.6 | -- |
| AP Murdock | 17 | 0 | 59.5 | 40.6 | 44.7 | 16.7 | 30.7 | 34.0 |
| AP Smith | 17 | 0 | 60.2 | | 43.9 | 23.7 | 33.8 | -- |
| Ballistic | 16 | 0 | 57.0 | 31.9 | 52.6 | 21.3 | 37.0 | 35.3 |
| Bolles | 18 | 0 | 59.4 | 35.6 | 40.7 | 18.4 | 29.5 | 31.6 |
| CAG-Justify | 17 | 0 | 58.6 | -- | -- | 20.8 | -- | -- |
| CAG-Reckless | 16 | 0 | 59.9 | -- | -- | 19.0 | -- | -- |
| Commander | 18 | 0 | 58.2 | 35.0 | 44.5 | 19.1 | 31.8 | 32.9 |
| CP3099A | 15 | 0 | 55.7 | -- | -- | 15.1 | -- | -- |
| CP3119A | 16 | 0 | 55.3 | -- | -- | 26.2 | -- | -- |
| CP3188 | 17 | 0 | 59.8 | -- | -- | 24.3 | -- | -- |
| CP3530 | 19 | 0 | 59.1 | 38.8 | 45.9 | 19.1 | 32.5 | 34.6 |
| CP3915 | 15 | 0 | 60.3 | 36.2 | 47.9 | 19.4 | 33.7 | 34.5 |
| Dagmar | 17 | 0 | 58.4 | -- | 40.5 | 18.8 | 29.6 | -- |
| Driver | 18 | 0 | 61.8 | -- | 50.7 | 23.3 | 37.0 | -- |
| Faller | 19 | 0 | 57.4 | 42.1 | 48.3 | 23.4 | 35.9 | 37.9 |
| Glenn | 15 | 0 | 58.8 | 34.8 | 42.0 | 19.1 | 30.5 | 32.0 |
| Lang MN | 18 | 0 | 59.9 | 40.0 | 48.8 | 21.8 | 35.3 | 36.9 |
| Lanning | 16 | 0 | 55.7 | 36.7 | 47.4 | 22.4 | 34.9 | 35.5 |
| LCS Buster | 20 | 0 | 60.5 | -- | 54.0 | 22.2 | 38.1 | -- |
| LCS Cannon | 17 | 0 | 61.2 | 37.1 | 41.5 | 18.1 | 29.8 | 32.2 |
| LCS Rebel | 18 | 0 | 55.6 | 36.8 | 46.8 | 17.1 | 31.9 | 33.6 |
| LCS Trigger | 17 | 0 | 61.0 | 41.7 | 50.2 | 22.2 | 36.2 | 38.0 |
| MN Torgy | 16 | 0 | 60.4 | 40.7 | 48.2 | 21.4 | 34.8 | 36.8 |
| MN Washburn | 18 | 0 | 61.0 | 35.4 | 40.4 | 20.8 | 30.6 | 32.2 |
| MS Barracuda | 14 | 0 | 57.4 | 34.7 | 43.6 | 12.1 | 27.8 | 30.1 |
| MS Cobra | 17 | 0 | 58.0 | -- | -- | 17.1 | -- | -- |
| MS Ranchero | 16 | 0 | 54.0 | -- | 49.1 | 27.0 | 38.1 | -- |
| ND Frohberg | 18 | 0 | 57.7 | 32.1 | 45.2 | 18.8 | 32.0 | 32.0 |
| ND VitPro | 16 | 0 | 57.7 | 36.9 | 46.1 | 16.8 | 31.4 | 33.3 |
| PFS-Buns | 17 | 0 | 56.4 | -- | -- | 22.2 | -- | -- |
| SK Rush | 18 | 0 | 58.4 | -- | -- | 24.3 | -- | -- |

***Table continued on next page***

**Hard Red Spring Wheat - 2021** **Mandan, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | ---------- Bushels per acre ---------- | | | | |
| ***Table continues from previous page*** | | | | | | | | |
| SY 611 CL2 | 15 | 0 | 60.8 | 40.7 | 44.3 | 20.0 | 32.2 | 35.0 |
| SY Ingmar | 17 | 0 | 60.9 | 33.0 | 39.9 | 21.5 | 30.7 | 31.5 |
| SY Longmire | 17 | 0 | 59.6 | 32.6 | 45.1 | 19.6 | 32.4 | 32.4 |
| SY McCloud | 16 | 0 | 60.2 | 32.5 | 41.5 | 17.5 | 29.5 | 30.5 |
| SY Rockford | 17 | 0 | 56.5 | 38.2 | 49.6 | 20.7 | 35.1 | 36.2 |
| SY Soren | 17 | 0 | 60.4 | 30.4 | 39.4 | 18.3 | 28.9 | 29.4 |
| SY Valda | 15 | 0 | 59.7 | 41.5 | 51.5 | 21.4 | 36.5 | 38.1 |
| TCG Heartland | 16 | 0 | 56.0 | 30.9 | 42.1 | 15.4 | 28.7 | 29.5 |
| TCG Sptifire | 19 | 0 | 57.1 | 38.5 | 48.7 | 25.5 | 37.1 | 37.6 |
| TCG Wildcat | 16 | 0 | 59.9 | -- | 38.9 | 21.6 | 30.2 | -- |
| WB9479 | 14 | 0 | 55.8 | -- | -- | 15.4 | -- | -- |
| WB9590 | 15 | 0 | 60.2 | -- | -- | 17.5 | -- | -- |
| Trial Mean | 17 | 0 | 58.5 | 49.3 | 44.8 | 20.3 | 32.8 | 33.7 |
| C.V. % | 8.9 | -- | 2.3 | 12.2 | 14.0 | 7.2 | -- | -- |
| LSD 5% | 1.7 | -- | 1.6 | 8.4 | 8.8 | 3.0 | -- | -- |
| LSD 10% | 1.4 | -- | 1.2 | 7.0 | 7.4 | 2.5 | -- | -- |

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

Planting Date: April 29

Harvest Date: August 9

Previous Crop: Soybean

**2021 Hard Red Spring Wheat - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Protein | Grain Yield 2019 | Grain Yield 2020 | Grain Yield 2021 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | % | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| AAC Concord | 67 | 15,977 | 18 | 58.7 | 18.0 | -- | 43.5 | 19.8 | 31.6 | -- |
| AP Gunsmoke CL2 | 65 | 16,849 | 18 | 58.5 | 18.3 | -- | 45.8 | 22.7 | 34.3 | -- |
| AP Murdock | 65 | 18,307 | 16 | 57.5 | 18.3 | -- | 42.0 | 15.9 | 28.9 | -- |
| AP Smith | 68 | 16,465 | 16 | 59.7 | 17.9 | -- | 43.8 | 19.5 | 31.6 | -- |
| Bolles | 67 | 15,626 | 20 | 59.9 | 20.3 | 38.4 | 38.6 | 14.3 | 26.5 | 30.4 |
| CAG-Justify | 67 | 15,840 | 19 | 56.8 | 19.7 | -- | -- | 16.1 | -- | -- |
| CAG-Reckless | 66 | 15,955 | 19 | 60.3 | 18.8 | -- | -- | 19.0 | -- | -- |
| CP 3099A | 69 | 12,645 | 16 | 59.3 | 18.5 | -- | -- | 12.6 | -- | -- |
| CP 3119A | 70 | 12,991 | 15 | 56.1 | 17.4 | -- | -- | 17.4 | -- | -- |
| CP 3188 | 66 | 15,838 | 18 | 59.4 | 17.0 | -- | -- | 24.4 | -- | -- |
| CP 3530 | 68 | 16,188 | 20 | 58.4 | 18.8 | 52.0 | 44.4 | 19.8 | 32.1 | 38.7 |
| CP 3915 | 65 | 16,416 | 18 | 60.3 | 17.9 | 51.5 | 44.5 | 21.7 | 33.1 | 39.2 |
| Dagmar | 64 | 14,866 | 17 | 59.0 | 18.1 | -- | 44.8 | 22.3 | 33.6 | -- |
| Driver | 67 | 15,892 | 20 | 61.4 | 17.9 | -- | 45.4 | 21.0 | 33.2 | -- |
| Dyna-Gro Ambush | 65 | 16,112 | 18 | 60.0 | 17.6 | 46.5 | 40.8 | 17.6 | 29.2 | 34.9 |
| Dyna-Gro Ballistic | 66 | 16,050 | 18 | 58.8 | 18.1 | -- | 48.5 | 17.6 | 33.0 | -- |
| Dyna-gro Commander | 66 | 16,195 | 17 | 59.0 | 17.8 | 47.2 | 40.7 | 18.8 | 29.7 | 35.6 |
| Elgin-ND | 65 | 17,639 | 18 | 59.0 | 18.0 | 47.3 | 43.8 | 18.4 | 31.1 | 36.5 |
| Faller | 67 | 15,488 | 19 | 58.7 | 17.9 | 51.2 | 46.8 | 18.1 | 32.4 | 38.7 |
| Glenn | 65 | 17,062 | 19 | 60.8 | 17.5 | 44.8 | 37.3 | 19.6 | 28.4 | 33.9 |
| LCS Buster | 69 | 15,285 | 18 | 59.6 | 18.7 | -- | 52.2 | 12.2 | 32.2 | -- |
| LCS Cannon | 63 | 17,629 | 20 | 60.0 | 16.7 | 47.3 | 44.4 | 21.0 | 32.7 | 37.5 |
| LCS Rebel | 64 | 14,973 | 19 | 59.7 | 18.4 | 48.9 | 44.4 | 23.2 | 33.8 | 38.8 |
| LCS Trigger | 69 | 16,470 | 17 | 59.9 | 18.4 | 47.1 | 51.6 | 14.7 | 33.2 | 37.8 |
| Lang-MN | 67 | 19,178 | 18 | 58.2 | 18.7 | 51.2 | 42.6 | 18.3 | 30.5 | 37.4 |
| Lanning | 65 | 16,551 | 18 | 56.7 | 18.2 | 49.2 | 44.4 | 19.4 | 31.9 | 37.6 |
| MN Washburn | 67 | 16,866 | 17 | 58.8 | 18.0 | 48.6 | 40.1 | 19.5 | 29.8 | 36.1 |
| MN Torgy | 66 | 16,461 | 17 | 60.2 | 19.1 | -- | 45.4 | 17.3 | 31.3 | -- |
| MS Barracuda | 63 | 14,632 | 18 | 58.4 | 18.3 | 36.8 | 36.4 | 23.0 | 29.7 | 32.1 |
| MS Cobra | 66 | 16,300 | 18 | 60.2 | 18.6 | -- | -- | 20.3 | -- | -- |
| MS Ranchero | 63 | 16,490 | 18 | 57.4 | 17.4 | -- | 47.5 | 19.3 | 33.4 | -- |
| ND Frohberg | 67 | 15,385 | 20 | 59.5 | 18.6 | 48.2 | 41.2 | 16.8 | 29.0 | 35.4 |
| ND-VitPro | 65 | 16,124 | 18 | 60.5 | 18.0 | 44.7 | 38.9 | 19.2 | 29.0 | 34.2 |
| PFS Buns | 70 | 16,216 | 15 | 54.8 | 21.1 | -- | -- | 5.0 | -- | -- |

***Table continued on next page***

**2021 Hard Red Spring Wheat - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Protein | Grain Yield 2019 | Grain Yield 2020 | Grain Yield 2021 | 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 611 CL2 | 65 | 17,530 | 16 | 58.8 | 17.7 | 49.8 | 44.2 | 20.8 | 32.5 | 38.3 |
| SY Ingmar | 68 | 17,569 | 16 | 59.4 | 18.8 | 46.8 | 43.3 | 16.2 | 29.7 | 35.4 |
| SY Longmire | 67 | 15,729 | 17 | 59.6 | 18.8 | 49.8 | 43.0 | 15.0 | 29.0 | 35.9 |
| SY McCLoud | 67 | 15,170 | 17 | 60.0 | 18.4 | 46.2 | 39.9 | 16.9 | 28.4 | 34.3 |
| SY Rockford | 68 | 15,583 | 16 | 57.6 | 18.9 | 54.0 | 47.5 | 12.5 | 30.0 | 38.0 |
| SY Soren | 66 | 18,056 | 17 | 58.2 | 19.0 | 48.6 | 40.5 | 12.6 | 26.5 | 33.9 |
| SY Valda | 67 | 16,513 | 16 | 59.3 | 18.8 | 47.0 | 46.6 | 15.5 | 31.0 | 36.3 |
| TCG-Heartland | 65 | 15,719 | 16 | 59.6 | 18.5 | 43.9 | 41.0 | 15.6 | 28.3 | 33.5 |
| TCG-Spitfire | 69 | 14,083 | 15 | 59.7 | 18.5 | 52.6 | 47.7 | 13.0 | 30.3 | 37.8 |
| TCG-Wildcat | 68 | 15,551 | 16 | 59.9 | 18.3 | -- | 47.3 | 19.0 | 33.2 | -- |
| WB 9479 | 66 | 16,317 | 15 | 59.4 | 19.1 | -- | -- | 13.4 | -- | -- |
| WB 9590 | 64 | 15,670 | 15 | 59.2 | 18.6 | -- | -- | 19.8 | -- | -- |
| Trial Mean | 66 | 16,194 | 17 | 59.1 | 18.4 | 47.6 | 43.3 | 17.9 | -- | -- |
| CV % | 1.5 | 3.8 | 6.8 | 0.9 | 2.1 | 8.1 | 7.6 | 20.9 | -- | -- |
| LSD 0.05 | 1 | 861 | 2 | 0.7 | 0.6 | 5.4 | 4.6 | 5.2 | -- | -- |
| LSD 0.10 | 1 | 721 | 1 | 0.6 | 0.5 | 4.5 | 3.8 | 4.4 | -- | -- |

Planting Date: April 19, 2021
Harvest Date: August 3, 2021
Protein adjusted to 12% moisture
Previous Crop: Oat Hay
Seeding Rate: 1.2 million live seeds/ac

**2021 Glen Ullin Spring Wheat - Recrop** **Dickinson, ND**

| Variety | Seeds per Pound | Test Weight | Protein | Grain Yield 2018* | Grain Yield 2020 | Grain Yield 2021 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|
| | | lbs/bu | % | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| CP 3915 | 14,026 | 61.9 | 14.0 | -- | 51.1 | 41.2 | 46.1 | -- |
| Dagmar | 14,254 | 61.6 | 13.5 | -- | -- | 39.8 | -- | -- |
| Driver | 14,099 | 62.1 | 14.2 | -- | 50.9 | 40.9 | 45.9 | -- |
| Dyna-Gro Ballistic | 13,908 | 62.4 | 14.2 | -- | -- | 39.1 | -- | -- |
| LCS Buster | 14,419 | 62.1 | 14.1 | -- | -- | 41.5 | -- | -- |
| Lanning | 14,157 | 61.8 | 13.8 | -- | 46.1 | 41.2 | 43.7 | -- |
| MN Washburn | 13,793 | 61.6 | 13.6 | -- | 49.5 | 43.5 | 46.5 | -- |
| MN-Torgy | 13,975 | 61.7 | 14.3 | -- | 57.7 | 39.2 | 48.5 | -- |
| MS Ranchero | 13,422 | 61.1 | 13.8 | -- | -- | 43.1 | -- | -- |
| ND Frohberg | 14,325 | 61.7 | 14.2 | -- | 47.0 | 40.4 | 43.7 | -- |
| ND VitPro | 14,345 | 61.6 | 14.3 | 71.5 | 43.6 | 39.4 | 41.5 | 51.5 |
| SY Longmire | 14,084 | 60.8 | 12.7 | -- | 48.9 | 44.7 | 46.8 | -- |
| Trial Mean | 14,067 | 61.7 | 13.9 | 75.0 | 48.1 | 41.2 | -- | -- |
| CV % | 5.8 | 1.7 | 6.2 | 6.6 | 8.1 | 8.2 | -- | -- |
| LSD 0.05 | 1,168 | 1.5 | 1.2 | 7.1 | 5.6 | 4.9 | -- | -- |
| LSD 0.10 | 971 | 1.2 | 1.0 | 5.9 | 4.6 | 4.1 | -- | -- |

Planting Date: April 27, 2021
Harvest Date: August 11, 2021
Seeding Rate: 1.2 million live seeds/ac
2019 Crop was lost due to hail

**2021 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 |
| **Draper** | **SD** | **2019** | **4** | **7** | **4** | **4** | **5** | **-2** | **NA** | **28** | **NA** |
| 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 |
| **MS Iceman** | **Meridian** | **2021** | **7** | **8** | **5** | **6** | **8** | **0** | **NA** | **26** | **NA** |
| 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 |
| **Ray[7]** | **MT** | **2018** | **1** | **8** | **NA** | **NA** | **NA** | **4** | **NA** | **33** | **NA** |
| **SD Andes** | **SD** | **2020** | **2** | **6** | **NA** | **5** | **6** | **0** | **NA** | **29** | **NA** |
| SY Monument | Agripro | 2014 | 3 | 3 | 1 | 6 | 5 | -2 | 4 | 27 | 3 |
| 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 |
| **WB 4309** | **WB** | **2019** | **4** | **6** | **4** | **7** | **7** | **-2** | **NA** | **29** | **NA** |
| WB4462 | WB | 2016 | 7 | 3 | NA | 8 | 6 | -5 | 4 | 31 | 4 |
| Winner | SD | 2019 | NA | NA | NA | NA | NA | -2 | NA | 29 | NA |

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

[2]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.

[7]Developed primarily for use as a forage winter wheat.

Bold varieties are those recently released or the first time tested, so data are limited and rating values may change.

**Hard Red Winter Wheat - 2021** **Hettinger, ND**

| Variety | Heading Date | Plant Height | Plant Lodge | Test Weight | Grain Protein | ---- Grain Yield ---- 2018 | 2019 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | Julian | inches | 0-9[1] | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AAC Wildfire | 166 | 22 | 0 | 52.0 | 17.3 | -- | -- | 26.6 | -- | -- |
| AC Emerson | 165 | 23 | 0 | 54.1 | 16.3 | 30.6 | 60.9 | 27.1 | 44.0 | 39.5 |
| CP7017AX | 159 | 23 | 0 | 52.5 | 15.3 | -- | -- | 28.7 | -- | -- |
| CP7050AX | 157 | 24 | 0 | 57.1 | 15.5 | -- | -- | 28.5 | -- | -- |
| Draper | 160 | 23 | 0 | 53.6 | 15.7 | -- | -- | 29.4 | -- | -- |
| Ideal | 163 | 22 | 0 | 53.6 | 16.7 | 26.6 | 66.0 | 25.5 | 45.8 | 39.4 |
| Jerry | 164 | 25 | 0 | 53.6 | 16.9 | 29.7 | 64.8 | 28.0 | 46.4 | 40.8 |
| Keldin | 165 | 23 | 0 | 52.5 | 16.5 | 37.2 | 70.6 | 30.0 | 50.3 | 45.9 |
| MS Iceman | 162 | 22 | 0 | 54.8 | 16.3 | -- | -- | 28.7 | -- | -- |
| ND Noreen | 163 | 24 | 0 | 56.1 | 16.9 | -- | 65.1 | 27.5 | 46.3 | -- |
| Northern | 166 | 22 | 0 | 54.2 | 16.8 | 33.7 | 74.5 | 31.6 | 53.0 | 46.6 |
| Oahe | 162 | 26 | 0 | 54.3 | 16.0 | 28.2 | 69.5 | 29.9 | 49.7 | 42.5 |
| Ray | 167 | 24 | 0 | 51.5 | 17.1 | -- | -- | 30.1 | -- | -- |
| SD Andes | 161 | 23 | 0 | 53.7 | 16.5 | -- | -- | 30.3 | -- | -- |
| SY Monument | 162 | 23 | 0 | 52.1 | 15.6 | 27.6 | 71.6 | 30.4 | 51.0 | 43.2 |
| SY Wolf | 163 | 23 | 0 | 53.2 | 16.2 | 24.3 | 63.8 | 25.9 | 44.9 | 38.0 |
| SY Wolverine | 161 | 23 | 0 | 53.7 | 15.6 | -- | 62.1 | 28.2 | 45.2 | -- |
| TCG-Boomlock | 162 | 24 | 0 | 54.8 | 16.4 | -- | 65.3 | 30.8 | 48.0 | -- |
| WB4309 | 159 | 24 | 0 | 52.1 | 16.3 | -- | -- | 32.7 | -- | -- |
| WB4462 | 159 | 24 | 0 | 53.4 | 15.4 | 20.1 | 69.4 | 30.5 | 50.0 | 40.0 |
| Winner | 160 | 23 | 0 | 53.8 | 15.2 | -- | -- | 30.8 | -- | -- |
| Trial Mean | 162 | 23 | 0.0 | 53.7 | 16.2 | 30.3 | 65.4 | 29.1 | 47.9 | 41.8 |
| C.V. % | 0.6 | 4.2 | -- | 2.1 | 3.2 | 18.3 | 6.0 | 7.5 | -- | -- |
| LSD 0.05 | 1.4 | 1.4 | NS | 1.6 | 0.7 | 7.8 | 5.6 | 2.6 | -- | -- |
| LSD 0.10 | 1.1 | 1.1 | NS | 1.3 | 0.6 | 6.5 | 4.7 | 2.0 | -- | -- |

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

Previous Crop: Spring Wheat

Planting Date: September 24

Harvest Date: July 21

**2021 Winter Wheat - Recrop** **Dickinson, ND**

| Variety | Winter Survival | Heading Date | Seeds per Pound | Plant Height | Test Weight | Protein | Grain Yield 2019 | Grain Yield 2020 | Grain Yield 2021 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Julian | | in | lbs/bu | % | -----bu/ac----- | | | bu/ac | bu/ac |
| AAC-Wildfire | 77 | 173 | 16,615 | 20 | 55.9 | 16.4 | -- | 51.8 | 21.9 | 36.9 | -- |
| AC Emerson | 73 | 169 | 18,606 | 20 | 57.4 | 16.2 | 45.2 | 38.0 | 17.4 | 27.7 | 33.5 |
| CP7017AX | 72 | 167 | 17,076 | 18 | 56.1 | 13.9 | -- | -- | 17.0 | -- | -- |
| CP7050AX | 78 | 163 | 18,303 | 18 | 57.8 | 14.5 | -- | -- | 12.1 | -- | -- |
| Draper | 72 | 167 | 18,179 | 19 | 56.4 | 14.8 | -- | -- | 19.8 | -- | -- |
| Ideal | 72 | 168 | 17,165 | 20 | 56.7 | 15.3 | 49.6 | 45.5 | 18.8 | 32.1 | 37.9 |
| Jerry | 60 | 170 | 15,915 | 20 | 56.6 | 15.6 | 46.7 | 45.1 | 21.2 | 33.1 | 37.7 |
| Keldin | 68 | 170 | 14,482 | 21 | 57.0 | 15.4 | 53.9 | 38.2 | 22.1 | 30.1 | 38.0 |
| MS Iceman | 48 | 170 | 17,176 | 19 | 60.2 | 15.3 | -- | -- | 13.9 | -- | -- |
| ND Noreen | 70 | 170 | 14,594 | 22 | 59.8 | 15.5 | 48.9 | 44.6 | 22.6 | 33.6 | 38.7 |
| NE14696 | 67 | 168 | 15,670 | 21 | 57.1 | 15.1 | -- | 40.5 | 22.8 | 31.6 | -- |
| NNH17612 | 58 | 166 | 16,978 | 18 | 58.8 | 15.2 | -- | -- | 15.3 | -- | -- |
| Northern | 77 | 171 | 16,389 | 20 | 58.0 | 15.4 | 54.0 | 44.3 | 25.5 | 34.9 | 41.3 |
| Ray | 68 | 174 | 14,947 | 22 | 57.0 | 15.8 | -- | -- | 22.3 | -- | -- |
| SD Andes | 73 | 167 | 15,750 | 19 | 57.8 | 15.2 | -- | -- | 26.4 | -- | -- |
| SY Monument | 70 | 168 | 17,679 | 19 | 53.9 | 14.3 | 54.9 | 41.0 | 20.8 | 30.9 | 38.9 |
| SY Wolf | 52 | 168 | 17,141 | 18 | 58.1 | 15.3 | 60.4 | 42.1 | 12.9 | 27.5 | 38.5 |
| SY Wolverine | 45 | 168 | 16,805 | 19 | 57.2 | 14.8 | -- | 40.5 | 12.6 | 26.5 | -- |
| TCG Boomlock | 57 | 169 | 17,637 | 19 | 57.3 | 15.3 | 53.2 | 42.6 | 19.6 | 31.1 | 38.5 |
| WB4309 | 53 | 167 | 17,330 | 19 | 56.6 | 15.0 | -- | -- | 16.0 | -- | -- |
| WB4462 | 70 | 167 | 16,118 | 18 | 54.5 | 14.9 | 55.2 | 39.6 | 18.5 | 29.0 | 37.7 |
| Winner | 75 | 167 | 15,801 | 19 | 56.9 | 14.5 | -- | -- | 23.2 | -- | -- |
| Trial Mean | 67 | 169 | 16,634 | 19 | 57.0 | 15.2 | 53.0 | 42.9 | 19.3 | -- | -- |
| CV % | 20.8 | 0.5 | 3.4 | 6.7 | 1.5 | 2.5 | 8.5 | 8.1 | 18.1 | -- | -- |
| LSD 0.05 | 23 | 1 | 937 | 2 | 1.4 | 0.6 | 6.4 | 4.9 | 5.7 | -- | -- |
| LSD 0.10 | 19 | 1 | 782 | 2 | 1.2 | 0.5 | 5.3 | 4.1 | 4.8 | -- | -- |

Planting Date: September 18, 2020
Harvest Date: August 2, 2021
Protein adjusted to 12% moisture
Previous Crop: oat hay
Seeding Rate: 1 million live seeds/ac

**Winter Rye - 2021** **Hettinger, ND**

| Variety | Spring Stand | Heading Date | Plant Height | Plant Lodge | Test Weight | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | % | | inches | 0-9[1] | lbs/bu | ---------- Bushels per acre ---------- | | | | |
| Aroostok | | | | 0 | 51.2 | 54.1 | 36.6 | 28.4 | 32.5 | 39.7 |
| Bono (hybrid) | | | | 0 | 50.7 | 98.2 | 68.9 | 39.6 | 54.3 | 68.9 |
| Brasetto (hybrid) | | | | 0 | 50.9 | 89.9 | 64.3 | 39.5 | 51.9 | 64.6 |
| Danko | | | | 0 | 50.5 | -- | 45.5 | 31.8 | 38.7 | -- |
| Hazlet | | | | 0 | 50.4 | 68.6 | 50.1 | 29.7 | 39.9 | 49.5 |
| ND Dylan | | | | 0 | 49.6 | 69.5 | 50.5 | 28.4 | 39.5 | 49.5 |
| ND Gardner | | | | 0 | 51.6 | 61.7 | 38.3 | 32.1 | 35.2 | 44.0 |
| Rymin | | | | 0 | 50.6 | 65.0 | 44.6 | 29.7 | 37.2 | 46.4 |
| Serfanio (hybrid) | | | | 0 | 48.2 | -- | -- | 43.0 | -- | -- |
| Spooner | | | | 0 | 51.5 | 63.2 | 42.2 | 29.9 | 36.1 | 45.1 |
| Tayo | | | | 0 | 48.4 | -- | -- | 37.3 | -- | -- |
| Flex 719 (triticale) | | | | 0 | 45.0 | -- | -- | 23.6 | -- | -- |
| Trial Mean | | | | 0 | 50.1 | 62.6 | 47.9 | 32.7 | 40.6 | 51.0 |
| C.V. % | | | | -- | 2.3 | 6.9 | 15.0 | 9.0 | -- | -- |
| LSD 0.05 | | | | -- | 1.4 | 6.2 | 10.5 | 3.5 | -- | -- |
| LSD 0.10 | | | | -- | 1.1 | 5.2 | 8.7 | 2.7 | -- | -- |

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

Planting Date: September 24

Harvest Date: July 20

Previous Crop: HRSW

**Descriptions and agronomic traits of durum wheat varieties grown in North Dakota, 2021.**

| | 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 | 19 | 5 | 62 | 1 | 1 | 6 | NA | NA |
| Alkabo | ND | 2005 | 21 | 2 | 63 | 1 | 1 | 5 | 7 | 6 |
| Alzada | WB | 2004 | 20 | 6 | 62 | 1 | 1 | 8 | NA | 9 |
| Ben | ND | 1996 | 22 | 4 | 63 | 1 | 1 | 4 | 7 | 8 |
| Carpio | ND | 2012 | 22 | 5 | 64 | 1 | 1 | 5 | 6 | 5 |
| CDC Verona | Can. | 2010 | 22 | 5 | 64 | 1 | 1 | 4 | NA | 8 |
| Divide | ND | 2005 | 22 | 5 | 65 | 1 | 1 | 5 | 7 | 5 |
| Grenora | ND | 2005 | 22 | 5 | 64 | 1 | 1 | 5 | 7 | 6 |
| Joppa | ND | 2013 | 22 | 5 | 64 | 1 | 1 | 5 | 7 | 5 |
| Lebsock | ND | 1999 | 21 | 3 | 63 | 1 | 1 | 5 | 7 | 6 |
| Maier | ND | 1998 | 20 | 5 | 63 | 1 | 1 | 5 | NA | 8 |
| Mountrail | ND | 1998 | 20 | 5 | 63 | 1 | 1 | 5 | 7 | 8 |
| ND Grano[6] | ND | 2017 | 20 | 5 | 64 | 1 | 1 | 8 | 7 | 6 |
| ND Riveland[6] | ND | 2017 | 23 | 4 | 63 | 1 | 1 | 4 | 7 | 5 |
| **ND Stanley[6]** | **ND** | **2021** | **21** | **4** | **64** | **1** | **1** | **5** | **NA** | **5** |
| Pierce | ND | 2001 | 21 | 5 | 63 | 1 | 1 | 6 | 7 | 8 |
| Rugby | ND | 1973 | 22 | 5 | 63 | 1 | 1 | 4 | NA | 8 |
| Strongfield[6] | Can. | 2004 | 23 | 6 | 64 | 1 | 1 | 6 | NA | 8 |
| Tioga | ND | 2010 | 23 | 4 | 63 | 1 | 1 | 5 | 7 | 6 |
| VT Peak | Viterra | 2010 | 22 | 6 | 64 | 1 | NA | NA | NA | NA |

[1]Refers to agent or developer: Can. = Agriculture Canada, WB = Westbred, ND = North Dakota State University. Bold varieties are those recently released, so data are limited and rating values may change.

[2]Plant height was obtained from the average of six locations in 2021.

[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 six locations in 2021.

[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 - 2021** **Hettinger, ND**

| Variety | Days to Head | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AAC Grainland | 63 | 24 | 0 | 57.8 | 17.4 | -- | -- | 25.5 | -- | -- |
| AAC Spitfire | 64 | 24 | 0 | 56.4 | 16.6 | -- | -- | 31.0 | -- | -- |
| AAC Stronghold | 65 | 24 | 0 | 57.2 | 16.7 | -- | -- | 27.8 | -- | -- |
| AC Commander | 63 | 23 | 0 | 57.7 | 16.6 | 57.5 | 23.3 | 28.4 | 25.8 | 36.4 |
| Alkabo | 64 | 23 | 0 | 58.1 | 16.1 | 73.6 | 22.1 | 25.7 | 23.9 | 40.5 |
| Alzada | 63 | 25 | 0 | 56.3 | 15.0 | 48.2 | 16.7 | 29.5 | 23.1 | 31.5 |
| Ben | 64 | 20 | 0 | 57.4 | 16.8 | 60.3 | 20.4 | 25.5 | 23.0 | 35.4 |
| Carpio | 64 | 22 | 0 | 55.1 | 16.5 | 63.7 | 20.5 | 23.3 | 21.9 | 35.8 |
| CDC Defy | 63 | 24 | 0 | 58.9 | 15.6 | -- | -- | 33.5 | -- | -- |
| CDC Verona | 65 | 26 | 0 | 54.8 | 17.4 | 67.7 | 25.8 | 22.9 | 24.4 | 38.8 |
| Divide | 64 | 23 | 0 | 56.2 | 16.9 | 70.8 | 19.5 | 24.0 | 21.8 | 38.1 |
| Grenora | 64 | 27 | 0 | 56.8 | 15.8 | 67.9 | 22.9 | 27.5 | 25.2 | 39.4 |
| Joppa | 64 | 23 | 0 | 57.1 | 15.9 | 66.2 | 21.6 | 25.8 | 23.7 | 37.9 |
| Lebsock | 64 | 22 | 0 | 56.8 | 15.6 | 64.8 | 20.4 | 29.2 | 24.8 | 38.1 |
| Maier | 64 | 23 | 0 | 57.1 | 16.6 | 62.7 | 18.2 | 30.4 | 24.3 | 37.1 |
| Mountrail | 63 | 23 | 0 | 56.8 | 16.2 | 66.9 | 23.7 | 26.6 | 25.2 | 39.1 |
| ND Grano | 64 | 24 | 0 | 58.0 | 16.5 | 68.5 | 24.1 | 25.2 | 24.6 | 39.3 |
| ND Riveland | 64 | 25 | 0 | 57.4 | 15.5 | 73.0 | 22.5 | 30.3 | 26.4 | 41.9 |
| ND Stanley | 64 | 24 | 0 | 57.1 | 16.3 | 69.2 | 24.2 | 30.1 | 27.2 | 41.2 |
| Pierce | 64 | 25 | 0 | 58.0 | 15.9 | 69.6 | 21.5 | 28.6 | 25.0 | 39.9 |
| Rugby | 65 | 22 | 0 | 57.4 | 16.3 | 59.8 | 23.1 | 25.5 | 24.3 | 36.1 |
| Strongfield | 65 | 24 | 0 | 54.4 | 17.2 | 67.0 | 21.1 | 25.7 | 23.4 | 37.9 |
| Tioga | 64 | 26 | 0 | 57.5 | 16.9 | 64.5 | 20.5 | 27.9 | 24.2 | 37.6 |
| VT Peak | 63 | 24 | 0 | 57.7 | 15.8 | 72.4 | 24.2 | 26.7 | 25.4 | 41.1 |
| Trial Mean | 64 | 24 | 0 | 57.2 | 16.3 | 67.6 | 22.0 | 27.6 | 24.6 | 38.7 |
| C.V. % | 0.7 | 8.1 | -- | 1.8 | 3.7 | 7.6 | 10.6 | 13.3 | -- | -- |
| LSD 5% | 0.5 | 2.2 | -- | 1.2 | 0.7 | 7.2 | 3.3 | 4.3 | -- | -- |
| LSD 10% | 0.4 | 1.8 | -- | 0.9 | 0.4 | 6.1 | 2.7 | 3.3 | -- | -- |

[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 22

Harvest Date: July 31

Previous Crop: Canola

**Durum Wheat - 2021** **Scranton, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| Carpio | 21 | 0 | ** | 17.1 | 23.3 | 38.4 | 16.6 | 27.5 | 26.1 |
| Joppa | 22 | 0 | | 16.7 | 24.9 | 36.4 | 17.9 | 27.2 | 26.4 |
| ND Grano | 22 | 0 | | 16.9 | 22.0 | 37.0 | 18.5 | 27.8 | 25.8 |
| ND Riveland | 24 | 0 | | 16.8 | 21.6 | 42.0 | 16.5 | 29.3 | 26.7 |
| ND Stanley | 22 | 0 | | 17.3 | -- | -- | 17.4 | -- | -- |
| Tioga | 25 | 0 | | 17.7 | 26.3 | 35.9 | 17.1 | 26.5 | 26.4 |
| Trial Mean | 23 | 0 | | 17.1 | 23.6 | 38.5 | 17.4 | 27.6 | 26.3 |
| C.V. % | 5.4 | -- | | 1.4 | 14.4 | 6.3 | 5.5 | -- | -- |
| LSD 5% | 1.9 | -- | | 0.3 | 5.1 | 3.6 | 1.5 | -- | -- |
| LSD 10% | 1.5 | -- | | 0.3 | 4.2 | 3.0 | 1.2 | -- | -- |

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

** Not enough sample for an accurate test weight.

Planting Date: April 28

Harvest Date: August 2

**Durum Wheat - 2021** **Regent, ND**

| Variety | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| Carpio | 28 | 0 | 60.7 | 15.7 | 46.5 | 28.9 | 36.0 | 32.5 | 37.1 |
| Joppa | 27 | 0 | 61.1 | 15.6 | 38.1 | 25.8 | 37.1 | 31.5 | 33.7 |
| ND Grano | 29 | 0 | 59.6 | 15.6 | 44.1 | 24.8 | 36.6 | 30.7 | 35.2 |
| ND Riveland | 28 | 0 | 59.9 | 15.1 | 40.9 | 28.9 | 32.1 | 30.5 | 34.0 |
| ND Stanley | 28 | 0 | 59.0 | 15.3 | -- | -- | 33.7 | -- | -- |
| Tioga | 28 | 0 | 60.1 | 16.0 | 45.2 | 24.1 | 33.3 | 28.7 | 34.2 |
| Trial Mean | 28 | 0 | 60.1 | 15.5 | 43.1 | 26.5 | 34.8 | 30.8 | 34.8 |
| C.V. % | 6.6 | -- | 0.7 | 1.7 | 8.0 | 9.0 | 5.6 | -- | -- |
| LSD 5% | 2.8 | -- | 0.6 | 0.4 | 5.2 | 3.6 | 2.9 | -- | -- |
| LSD 10% | 2.3 | -- | 0.5 | 0.3 | 4.3 | 2.9 | 2.4 | -- | -- |

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

Planting Date: April 28

Harvest Date: August 11

Previous Crop: Canola

**2021 Durum - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Protein | Grain Yield 2019 | Grain Yield 2020 | Grain Yield 2021 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | % | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| AC Commander | 65 | 12,850 | 16 | 58.6 | 18.8 | 53.6 | 39.2 | 12.0 | 25.6 | 34.9 |
| Alkabo | 66 | 12,821 | 17 | 59.3 | 17.1 | 46.8 | 39.4 | 13.9 | 26.7 | 33.4 |
| Alzada | 63 | 11,740 | 18 | 58.9 | 16.5 | 50.2 | 35.4 | 13.4 | 24.4 | 33.0 |
| Ben | 66 | 13,265 | 19 | 58.7 | 18.7 | 52.7 | 36.1 | 11.1 | 23.6 | 33.3 |
| CDC Verona | 68 | 12,228 | 19 | 58.1 | 20.0 | 49.7 | 41.7 | 8.0 | 24.9 | 33.1 |
| Carpio | 68 | 13,048 | 20 | 57.1 | 18.4 | 47.0 | 36.4 | 12.9 | 24.7 | 32.1 |
| Divide | 67 | 13,241 | 19 | 58.5 | 18.4 | 49.7 | 38.3 | 12.4 | 25.3 | 33.4 |
| Grenora | 66 | 13,072 | 18 | 59.1 | 17.8 | 51.5 | 39.5 | 14.8 | 27.1 | 35.3 |
| Joppa | 67 | 13,008 | 18 | 59.3 | 17.3 | 51.0 | 41.5 | 11.5 | 26.5 | 34.7 |
| Lebsock | 65 | 13,477 | 19 | 59.3 | 16.9 | 53.9 | 38.0 | 16.6 | 27.3 | 36.2 |
| Maier | 66 | 13,510 | 19 | 58.6 | 19.4 | 47.7 | 35.1 | 13.5 | 24.3 | 32.1 |
| Mountrail | 67 | 13,633 | 17 | 58.1 | 18.2 | 52.1 | 40.9 | 11.4 | 26.1 | 34.8 |
| ND Grano | 68 | 13,792 | 18 | 58.6 | 18.5 | 53.9 | 38.7 | 11.3 | 25.0 | 34.6 |
| ND Riveland | 67 | 11,816 | 20 | 59.2 | 17.1 | 45.8 | 38.3 | 15.3 | 26.8 | 33.1 |
| ND Stanley | 66 | 12,393 | 18 | 60.0 | 18.2 | 52.7 | 40.0 | 13.8 | 26.9 | 35.5 |
| Pierce | 66 | 13,434 | 20 | 59.1 | 17.7 | 47.2 | 37.8 | 13.3 | 25.6 | 32.8 |
| Rugby | 67 | 14,275 | 20 | 59.1 | 17.6 | 44.5 | 36.9 | 12.7 | 24.8 | 31.4 |
| Strongfield | 67 | 12,545 | 19 | 58.1 | 20.6 | 49.8 | 36.2 | 9.9 | 23.0 | 32.0 |
| TCG-Bright | 66 | 13,093 | 18 | 58.9 | 18.2 | -- | -- | 14.5 | -- | -- |
| TCG-Webster | 62 | 13,736 | 18 | 59.3 | 15.6 | -- | -- | 16.1 | -- | -- |
| Tioga | 66 | 12,348 | 19 | 59.4 | 18.3 | 52.1 | 37.6 | 15.3 | 26.5 | 35.0 |
| VT Peak | 66 | 12,662 | 19 | 59.8 | 18.1 | 50.5 | 37.7 | 11.6 | 24.7 | 33.3 |
| Trial Mean | 66 | 12,826 | 18 | 59.0 | 18.1 | 51.1 | 37.9 | 12.7 | -- | -- |
| CV % | 1.3 | 4.6 | 8.2 | 0.8 | 2.5 | 9.3 | 7.4 | 19.0 | -- | -- |
| LSD 0.05 | 1 | 825 | 2 | 0.7 | 0.6 | 6.6 | 4.0 | 3.4 | -- | -- |
| LSD 0.10 | 1 | 691 | 2 | 0.5 | 0.5 | 5.6 | 3.3 | 2.8 | -- | -- |

Planting Date: April 21, 2021
Harvest Date: August 5, 2021
Previous Crop: Oat Hay
Seeding Rate: 1.2 million live seeds/ac

**2021 North Dakota barley variety descriptions.**

| Variety | Use[1] | Origin[2] | Year Released | Rachilla Awn[3] Type | Rachilla Hair[4] Length | Aleurone Color | Height (inch) | Days to Head | Straw[5] Strength | Reaction to Disease[6] Stem Rust | Spot-form Net Blotch | Spot Blotch | Net Blotch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Six-rowed** | | | | | | | | | | | | | |
| Tradition | M/F | BARI | 2003 | S | L | White | 29 | 28 | 3 | 8 | 6 | 3 | 7 |
| **Two-rowed** | | | | | | | | | | | | | |
| AAC Connect | M/F | Meridian | 2017 | R | L | White | 27 | 31 | 4 | 4 | 5 | 4 | 5 |
| AAC Synergy | M/F | Syngenta | 2015 | R | L | White | 27 | 32 | 4 | 4 | 3 | 4 | 4 |
| **ABI Cardinal** | **M/F** | **BARI** | **2019** | **R** | **S** | **White** | **27** | **31** | **4** | **NA** | **NA** | **4** | **6** |
| **Brewski** | **M** | **ND** | **2021** | **S** | **L** | **White** | **27** | **32** | **4** | **NA** | **NA** | **4** | **4** |
| **CDC Austenson** | **F** | **CDC** | **2009** | **R** | **S** | **White** | **27** | **35** | **2** | **NA** | **NA** | **2** | **2** |
| CDC Bow | M/F | CDC | 2016 | R | L | White | 27 | 33 | 2 | NA | NA | 6 | NA |
| **CDC Churchill** | **M/F** | **CDC** | **2019** | **R** | **L** | **White** | **26** | **31** | **3** | **NA** | **NA** | **NA** | **NA** |
| **CDC Fraser** | **M/F** | **CDC** | **2016** | **R** | **L** | **White** | **27** | **32** | **2** | **NA** | **NA** | **4** | **4** |
| Conlon[7] | M/F | ND | 1996 | S | L | White | 27 | 27 | 4 | 8 | 4 | 6 | 3 |
| **Esma** | **F** | **Ackermann** | **NA** | **R** | **L** | **White** | **26** | **30** | **2** | **NA** | **NA** | **NA** | **NA** |
| Explorer | M | Secobra | NA | R | L | White | 24 | 31 | 3 | NA | NA | 8 | 4 |
| ND Genesis | M/F | ND | 2015 | S | L | White | 28 | 30 | 4 | 8 | 4 | 4 | 6 |
| Pinnacle | M/F | ND | 2006 | S | L | White | 27 | 29 | 3 | 8 | 8 | 5 | 6 |

Bolded varieties were tested for the first time this year, so some ratings may change as new data become available.

[1]M = malting; F = feed.

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

[3]R = rough; S = smooth.

[4]L = long  S = short.

[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.

## NDSU Hettinger Research Extension Center

**Barley - 2021** **Hettinger, ND**

| Variety | Days to Head | Plant Height | Plant Lodge | Plump | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | % | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| **TWO ROW** | | | | | | | | | | | |
| AAC Connect | 62 | 20 | 0 | 80 | 45.2 | 17.4 | 109.8 | 43.0 | 46.4 | 44.7 | 66.4 |
| AAC Synergy | 63 | 20 | 0 | 80 | 44.0 | 17.1 | 117.4 | 41.3 | 47.5 | 44.4 | 68.7 |
| ABI Cardinal | 62 | 19 | 0 | 84 | 45.1 | 17.0 | 105.9 | 44.4 | 50.3 | 47.3 | 66.9 |
| Brewski | 61 | 22 | 0 | 80 | 44.5 | 15.7 | -- | 44.9 | 60.1 | 52.5 | -- |
| CDC Austenson | 64 | 17 | 0 | 76 | 46.5 | 16.7 | -- | -- | 44.7 | -- | -- |
| CDC Bow | 65 | 20 | 0 | 83 | 43.8 | 17.3 | -- | 48.7 | 46.4 | 47.6 | -- |
| CDC Churchill | 63 | 20 | 0 | 61 | 44.2 | 17.8 | -- | -- | 55.7 | -- | -- |
| CDC Fraser | 63 | 18 | 0 | 85 | 43.5 | 17.4 | -- | -- | 45.9 | -- | -- |
| Conlon | 57 | 23 | 0 | 93 | 44.1 | 16.3 | 89.0 | 26.5 | 43.9 | 35.2 | 53.1 |
| Esma | 62 | 20 | 0 | 68 | 44.7 | 17.7 | -- | -- | 57.3 | -- | -- |
| Explorer | 62 | 20 | 0 | 79 | 44.9 | 17.0 | 90.1 | 43.1 | 54.3 | 48.7 | 62.5 |
| ND Genesis | 61 | 23 | 0 | 85 | 45.0 | 14.3 | 124.7 | 47.6 | 57.5 | 52.5 | 76.6 |
| Pinnacle | 62 | 20 | 0 | 86 | 46.0 | 15.2 | 80.9 | 39.2 | 54.8 | 47.0 | 58.3 |
| **SIX ROW** | | | | | | | | | | | |
| Tradition | 62 | 21 | 0 | 56 | 43.8 | 16.7 | 113.2 | 34.4 | 50.4 | 42.4 | 66.0 |
| Trial Mean | 62 | 20 | 0 | 78 | 44.5 | 15.9 | 107.6 | 42.1 | 53.1 | 46.6 | 63.3 |
| C.V. % | 0.7 | 5.5 | -- | 7.4 | 2.1 | 4.9 | 4.4 | 11.5 | 9.4 | -- | -- |
| LSD 5% | 0.6 | 1.3 | -- | 8.2 | 1.3 | 0.9 | 6.7 | 6.8 | 5.9 | -- | -- |
| LSD 10% | 0.5 | 1.0 | -- | 6.9 | 1.1 | 0.6 | 5.6 | 5.7 | 4.6 | -- | -- |

[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 22

Harvest Date: July 31

Previous Crop: Soybean

**Barley - 2021** **Scranton, ND**

| Variety | Plant Height | Plant Lodge | Plump | Test Weight | Grain Protein | ----- Grain Yield ----- 2018 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | % | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| **TWO ROW** | | | | | | | | | | |
| AAC Connect | 19 | 0 | 57 | ** | 17.8 | -- | 78.5 | 17.5 | 48.0 | -- |
| AAC Synergy | 22 | 0 | 69 | | 17.3 | -- | 81.9 | 22.5 | 52.2 | -- |
| ABI Cardinal | 20 | 0 | 60 | | 17.9 | -- | -- | 17.2 | -- | -- |
| Brewski | 22 | 0 | 61 | | 15.8 | -- | -- | 21.3 | -- | -- |
| CDC Bow | 22 | 0 | 77 | | 16.8 | -- | -- | 18.8 | -- | -- |
| ND Genesis | 23 | 0 | 59 | | 15.1 | 52.7 | 72.9 | 20.9 | 46.9 | 48.8 |
| Trial Mean | 21 | 0 | 64 | | 16.8 | 50.7 | 74.6 | 19.7 | 35.7 | 51.3 |
| C.V. % | 4.0 | -- | 6.5 | | 2.5 | 6.8 | 11.1 | 22.9 | -- | -- |
| LSD 5% | 1.3 | NS | 6.3 | | 0.6 | 10.5 | 12.8 | 6.8 | -- | -- |
| LSD 10% | 1.1 | NS | 5.1 | | 0.5 | 8.6 | 0.3 | 5.6 | -- | -- |

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

** Not enough sample for an accurate test weight.

Planting Date: April 28

Harvest Date: August 2

**Barley - 2021** **Regent, ND**

| Variety | Plant Height | Plant Lodge | Plump | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | inches | 0-9* | % | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| **TWO ROW** | | | | | | | | | | |
| AAC Connect | 24 | 0 | 76 | 45.4 | 15.7 | -- | 32.2 | 46.2 | 39.2 | -- |
| AAC Synergy | 26 | 0 | 83 | 45.9 | 15.8 | -- | 34.8 | 41.2 | 38.0 | -- |
| ABI Cardinal | 25 | 0 | 83 | 46.3 | 15.7 | -- | -- | 51.3 | -- | -- |
| Brewski | 25 | 0 | 88 | 46.3 | 15.8 | -- | -- | 45.8 | -- | -- |
| CDC Bow | 25 | 0 | 85 | 45.0 | 15.1 | -- | -- | 41.7 | -- | -- |
| ND Genesis | 27 | 0 | 87 | 47.3 | 15.2 | 76.3 | 39.9 | 41.6 | 40.8 | 52.6 |
| Trial Mean | 25 | 0 | 84 | 46.0 | 15.5 | 72.8 | 34.1 | 44.6 | 26.3 | 50.1 |
| C.V. % | 6.0 | -- | 2.6 | 2.0 | 2.0 | 7.8 | 7.7 | 9.0 | -- | -- |
| LSD 5% | 2.3 | NS | 3.3 | 1.4 | 0.5 | 8.8 | 4.1 | 6.1 | -- | -- |
| LSD 10% | 1.9 | NS | 2.7 | 1.2 | 0.4 | 7.2 | 3.3 | 5.0 | -- | -- |

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

Planting Date: April 28

Harvest Date: August 11

Previous Crop: Canola

**2021 Barley - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Protein | % Plump | Grain Yield 2019 | Grain Yield 2020 | Grain Yield 2021 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | % | >6/64 | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| ***Six Row*** | | | | | | | | | | | |
| Tradition | 68 | 15,798 | 16 | 44.5 | 17.2 | 48 | 67.3 | 40.7 | 22.2 | 31.4 | 43.4 |
| ***Two Row*** | | | | | | | | | | | |
| AAC Connect | 71 | 12,019 | 16 | 48.0 | 18.2 | 72 | 73.7 | 49.5 | 10.9 | 30.2 | 44.7 |
| AAC Synergy | 71 | 12,511 | 18 | 48.5 | 17.5 | 82 | 73.8 | 50.3 | 11.4 | 30.8 | 45.2 |
| ABI Cardinal | 72 | 13,291 | 16 | 48.7 | 18.9 | 74 | 74.7 | 52.7 | 12.3 | 32.5 | 46.5 |
| Brewski | 70 | 12,775 | 18 | 46.7 | 16.2 | 63 | -- | 50.6 | 23.8 | 37.2 | -- |
| CDC Bow | 73 | 12,481 | 17 | 48.5 | 17.1 | 90 | -- | 47.7 | 11.3 | 29.5 | -- |
| CDC Fraser | 72 | 12,193 | 16 | 47.4 | 17.3 | 91 | -- | -- | 9.2 | -- | -- |
| Conlon | 68 | 12,145 | 16 | 46.5 | 17.4 | 86 | 60.7 | 45.7 | 21.5 | 33.6 | 42.6 |
| Explorer | 70 | 13,813 | 16 | 45.8 | 18.5 | 64 | 86.9 | 52.4 | 20.1 | 36.3 | 53.2 |
| MS-21B2 | 71 | 13,148 | 17 | 47.2 | 19.5 | 55 | -- | -- | 14.4 | -- | -- |
| ND Genesis | 69 | 13,403 | 17 | 46.3 | 15.2 | 60 | 69.1 | 50.5 | 19.2 | 34.8 | 46.3 |
| Pinnacle | 69 | 12,930 | 16 | 49.0 | 16.3 | 82 | 76.4 | 49.2 | 22.0 | 35.6 | 49.2 |
| Trial Mean | 70 | 13,013 | 16 | 47.3 | 16.7 | 74 | 73.0 | 48.7 | 18.9 | -- | -- |
| CV % | 1.3 | 4.8 | 4.8 | 1.5 | 2.6 | 12.1 | 11.3 | 7.2 | 13.1 | -- | -- |
| LSD 0.05 | 1 | 876 | 1 | 1.0 | 0.6 | 12 | 11.8 | 5.0 | 3.5 | -- | -- |
| LSD 0.10 | 1 | 731 | 1 | 0.9 | 0.5 | 11 | 9.8 | 4.2 | 2.9 | -- | -- |

Planting Date: April 21, 2021
Harvest Date: August 2, 2021
Previous Crop: Oat Hay
Seeding Rate: 1.2 million live seeds/ac
Grain protein percentages reported on a 0% moisture basis
The trial sustained extreme drought (6.69" total precipitation)

**2021 Glen Ullin Barley - Recrop** **Dickinson, ND**

| Variety | Seeds per Pound | Test Weight | % Plump | Protein | ------Grain Yield------ 2018 | 2020 | 2021 | Average Yield 2 Year | 3 Year |
|---|---|---|---|---|---|---|---|---|---|
| | | lbs/bu | >6/64 | % | --------bu/ac-------- | | | ----bu/ac---- | |
| ***Six Row*** | | | | | | | | | |
| Tradition | 11,975 | 49.5 | 96 | 13.3 | 106.3 | 76.1 | 65.5 | 70.8 | 82.6 |
| ***Two Row*** | | | | | | | | | |
| AAC Synergy | 9,963 | 50.2 | 97 | 13.7 | -- | 106.8 | 74.6 | 90.7 | -- |
| ABI Cardinal | 10,443 | 49.6 | 97 | 13.6 | | | 80.6 | | |
| Brewski | 9,636 | 49.6 | 97 | 12.9 | | | 69.6 | | |
| CDC Bow | 10,152 | 49.8 | 97 | 14.0 | -- | 94.5 | 65.9 | 80.2 | -- |
| ND Genesis | 10,144 | 49.6 | 97 | 11.6 | 115.8 | 102.8 | 72.0 | 87.4 | 96.9 |
| Trial Mean | 10,240 | 49.7 | 96 | 12.7 | 117.9 | 95.4 | 69.1 | -- | -- |
| CV % | 3.4 | 1.0 | 1.3 | 4.3 | 9.2 | 7.6 | 11.3 | -- | -- |
| LSD 0.05 | 508 | 0.8 | 2 | 0.8 | 16.3 | 10.8 | 11.5 | -- | -- |
| LSD 0.10 | 420 | 0.6 | 2 | 0.7 | 13.4 | 9.9 | 9.5 | -- | -- |

Planting Date: April 27, 2021
Harvest Date: August 11, 2021
2019 Crop lost due to hail
Seeding Rate: 1.2 million live seeds/ac
Grain protein percentages reported on a 0% moisture basis

**2021 North Dakota oat variety descriptions.**

| Variety | Origin[1] | Year Released | Grain Color | Height (inch) | 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 | 22 | M.strg. | 61 | 8 | 4 | 6 | V.good | M |
| CDC Minstrel | Sask. | 2006 | White | 21 | M.strg. | 62 | 8 | 8 | 8 | Good | M |
| CS Camden | Meridian | 2016 | White | 21 | Strong | 64 | 8 | 6 | NA | Good | M |
| Deon | MN | 2013 | Yellow | 22 | Strong | 63 | 8 | 2 | 2 | V.good | M |
| Hayden | SD | 2014 | White | 20 | Med. | 62 | 8 | 6 | NA | V.good | M |
| HiFi | ND | 2001 | White | 22 | Strong | 64 | 4 | 8 | 2 | Good | M |
| Hytest | SD | 1986 | White | 23 | M.strg. | 62 | 8 | 6 | 8 | V.good | H |
| Jury | ND | 2012 | White | 23 | M.strg. | 62 | 1 | 8 | 4 | V.good | M |
| Killdeer | ND | 2000 | White | 21 | Strong | 62 | 8 | 6 | 4 | Good | M |
| Leggett | AAFC | 2005 | White | 21 | Strong | 64 | 3 | 1 | 8 | Good | M |
| ND Heart | ND | 2020 | White | 22 | Strong | 62 | 3 | 6 | 4 | Good | H |
| Newburg | ND | 2011 | White | 20 | Med. | 65 | 1 | 8 | 4 | Good | M |
| Otana | MT | 1977 | White | 23 | M.weak | 64 | 8 | 8 | 8 | V.good | M/L |
| Paul[6] | ND | 1994 | Hull-less | 23 | Strong | 65 | 1 | 4 | 2 | V.good | H |
| Rockford | ND | 2008 | White | 22 | Strong | 63 | 8 | 8 | 4 | V.good | M |
| Warrior | SD | 2018 | White | 20 | Strong | 62 | 6 | 1 | NA | V.good | M |

Bolded varieties were tested for the first time this year, so some ratings may change as new data become available.

[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.

[6]Hull-less variety.

**Oat - 2021** **Hettinger, ND**

| Variety | Days to Head | Plant Height | Plant Lodge | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | lbs/bu | % | ---------- Bushels per acre ---------- | | | | |
| AAC Douglas | 61 | 26 | 0 | 33.5 | | -- | -- | 96.0 | -- | -- |
| Beach | 62 | 26 | 0 | 32.9 | | 153.9 | 44.9 | 63.0 | 54.0 | 87.3 |
| CDC Minstrel | 62 | 26 | 0 | 34.2 | | 183.6 | 47.8 | 72.6 | 60.2 | 101.3 |
| CS Camden | 63 | 25 | 0 | 29.2 | | 173.9 | 56.4 | 88.1 | 72.3 | 106.1 |
| Deon | 63 | 28 | 0 | 31.8 | | 160.6 | 40.0 | 81.0 | 60.5 | 93.9 |
| Hayden | 61 | 24 | 0 | 34.5 | | 174.1 | 48.2 | 81.3 | 64.8 | 101.2 |
| ND Heart | 62 | 27 | 0 | 31.4 | | 154.1 | 42.9 | 67.6 | 55.3 | 88.2 |
| HiFi | 63 | 26 | 0 | 31.7 | | 161.7 | 50.6 | 68.7 | 59.6 | 93.7 |
| Hytest | 61 | 29 | 0 | 33.6 | | 146.4 | 48.7 | 74.6 | 61.7 | 89.9 |
| Jury | 62 | 31 | 0 | 31.6 | | 162.2 | 48.2 | 80.5 | 64.4 | 97.0 |
| Killdeer | 61 | 25 | 0 | 32.7 | | 150.5 | 48.6 | 78.4 | 63.5 | 92.5 |
| Leggett | 63 | 24 | 0 | 32.8 | | 160.5 | 49.9 | 67.2 | 58.5 | 92.5 |
| Newburg | 63 | 26 | 0 | 33.2 | | 159.1 | 40.5 | 78.2 | 59.4 | 92.6 |
| Otana | 63 | 30 | 0 | 33.8 | | 159.3 | 42.9 | 81.9 | 62.4 | 94.7 |
| Rockford | 62 | 29 | 0 | 35.1 | | 167.7 | 55.9 | 86.7 | 71.3 | 103.4 |
| Warrior | 60 | 25 | 0 | 34.2 | | 168.1 | 47.4 | 91.1 | 69.3 | 102.2 |
| Paul (hull-less) | 65 | 26 | 0 | 39.7 | | 105.5 | 32.9 | 44.3 | 38.6 | 60.9 |
| Trial Mean | 62 | 27 | 0 | 33.4 | | 157.6 | 46.8 | 77.1 | 60.6 | 94.7 |
| C.V. % | 1.0 | 6.0 | -- | 4.2 | | 7.3 | 7.5 | 7.9 | -- | -- |
| LSD 5% | 0.8 | 2.3 | -- | 2.0 | | 16.2 | 4.9 | 7.2 | -- | -- |
| LSD 10% | 0.7 | 1.9 | -- | 1.6 | | 13.5 | 4.1 | 5.6 | -- | -- |

[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 22

Harvest Date: August 3

Previous Crop: Lentil

**2021 Oat - Recrop** **Dickinson, ND**

| Variety | Days to Head | Seeds per Pound | Plant Height | Test Weight | Grain Yield 2019 | Grain Yield 2020 | Grain Yield 2021 | Average Yield 2 Year | Average Yield 3 Year |
|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | bu/ac | bu/ac | bu/ac | bu/ac | bu/ac |
| Beach | 68 | 14,553 | 24 | 37.1 | 108.5 | 90.3 | 18.4 | 54.4 | 72.4 |
| CDC Minstrel | 69 | 14,576 | 22 | 36.7 | 127.5 | 93.9 | 18.3 | 56.1 | 79.9 |
| Cs Camden | 71 | 13,991 | 19 | 30.9 | 102.4 | 98.5 | 15.3 | 56.9 | 72.1 |
| Deon | 70 | 15,616 | 20 | 35.8 | 149.8 | 94.5 | 18.5 | 56.5 | 87.6 |
| Hayden | 69 | 14,378 | 22 | 36.4 | 129.5 | 93.2 | 22.0 | 57.6 | 81.5 |
| HiFi | 70 | 15,622 | 21 | 32.0 | 118.0 | 93.3 | 13.6 | 53.5 | 75.0 |
| Hytest | 69 | 15,881 | 23 | 36.2 | 90.5 | 86.9 | 19.1 | 53.0 | 65.5 |
| Jury | 68 | 14,909 | 23 | 34.6 | 122.6 | 93.6 | 27.5 | 60.5 | 81.2 |
| Killdeer | 69 | 16,905 | 19 | 34.6 | 125.7 | 102.5 | 21.7 | 62.1 | 83.3 |
| Leggett | 70 | 16,017 | 19 | 36.4 | 97.9 | 88.5 | 15.6 | 52.0 | 67.3 |
| ND Heart | 68 | 13,985 | 24 | 33.9 | 99.2 | 93.0 | 25.1 | 59.1 | 72.4 |
| Newburg | 72 | 15,410 | 18 | 34.3 | 107.5 | 101.3 | 16.0 | 58.6 | 74.9 |
| Otana | 70 | 16,823 | 22 | 33.8 | 108.0 | 94.5 | 17.0 | 55.7 | 73.2 |
| Paul | 71 | 18,039 | 23 | 42.1 | 87.5 | 62.3 | 9.5 | 35.9 | 53.1 |
| Rockford | 70 | 16,322 | 21 | 35.3 | 123.4 | 90.5 | 17.1 | 53.8 | 77.0 |
| Warrior | 68 | 15,295 | 21 | 35.5 | 97.0 | 91.6 | 22.1 | 56.9 | 70.2 |
| Trial Mean | 69 | 15,138 | 21 | 35.5 | 113.7 | 91.3 | 20.2 | -- | -- |
| CV % | 1.7 | 4.7 | 8.6 | 4.2 | 14.6 | 7.9 | 30.5 | -- | -- |
| LSD 0.05 | 2 | 989 | 3 | 2.1 | 23.2 | 10.1 | 8.6 | -- | -- |
| LSD 0.10 | 1 | 827 | 2 | 1.7 | 19.4 | 8.4 | 7.2 | -- | -- |

Planting Date: April 19, 2021
Harvest Date: August 10, 2021
Previous Crop: Oat hay
Seeding Rate: 1 million live seeds/ac
The trial sustained extreme drought (6.69" total precipitation)

## NDSU Hettinger Research Extension Center

**Corn - 2021** **Hettinger, ND**

| Brand | Hybrid | Relavtive Maturity[1] | Days to Silk | Plant Height | Ear Height | Stalk Lodge | Moisture Content | Test Weight | Grain Yield | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 2021 | 2-Yr |
| | | days | DAP[2] | inches | inches | % | % | lbs/bu | ------bu/ac------ | |
| Integra | 3009 | 80 | 69 | 55 | 26 | 0 | 22.6 | 54.7 | 37.9 | -- |
| Integra | 3282 | 82 | 75 | 56 | 26 | 0 | 25.1 | 54.9 | 35.1 | 43.5 |
| Integra | 3431 | 84 | 74 | 54 | 26 | 0 | 25.7 | 56.2 | 35.4 | 44.7 |
| Integra | 3537 | 85 | 77 | 54 | 26 | 0 | 23.9 | 54.6 | 37.5 | 42.7 |
| Proseed | 1882 | 82 | 74 | 54 | 26 | 0 | 25.2 | 58.3 | 39.0 | 45.3 |
| Proseed | 1984 | 84 | 73 | 55 | 26 | 0 | 24.4 | 56.5 | 39.5 | 49.4 |
| Trial Mean | | | 74.0 | 55 | 26 | 0 | 24.5 | 55.8 | 37.4 | 45.1 |
| C.V. % | | | 1.0 | 6.9 | 8.3 | -- | 6.2 | 4.1 | 9.3 | -- |
| LSD 5% | | | 0.8 | 3.8 | 3.2 | -- | 1.5 | 2.3 | 5.3 | -- |
| LSD 10% | | | 0.6 | 3.2 | 2.7 | -- | 1.3 | 1.9 | 4.3 | -- |

[1] Relavtive maturity provided by company.

[2] Days after planting

Planting Date: May 12

Harvest Date: October 18

Previous Crop: Oats

**Sunflower - Oil Type - 2021** **Hettinger, ND**

| Company/Brand | Hybrid | Oil Type & Traits[1] | Days to Bloom | Plant Height | Test Weight | Oil Content | Grain Yield | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 2021 | 2-Year | 3-Year |
| | | | DAP[2] | inches | lbs/bu | % | --------lbs/ac-------- | | |
| Croplan | CP3845 | HO | 61 | 60 | 30.5 | 43.0 | 3481 | 2414 | 2453 |
| Croplan | CP432E | NS, EX | 57 | 61 | 23.1 | 34.3 | 1609 | 1663 | 1661 |
| Croplan | CP450E | HO, EX | 62 | 57 | 28.6 | 38.8 | 3266 | 2670 | 2388 |
| Croplan | CP455E | HO, EX | 62 | 62 | 28.2 | 39.9 | 3557 | 2888 | 2579 |
| Croplan | CP4909E | NS, EX | 61 | 52 | 29.3 | 39.9 | 2965 | 2482 | 2288 |
| Dairyland Seed | D643HO | HO, EX | 60 | 62 | 28.0 | 39.6 | 2933 | 2418 | -- |
| Dairyland Seed | D683MO | MO, EX | 61 | 62 | 26.7 | 39.1 | 3097 | 2548 | -- |
| Dairyland Seed | D690MO | MO, EX | 63 | 68 | 27.7 | 39.6 | 3663 | 2713 | -- |
| Dyna-Gro | H42HO18CL | HO, CL | 61 | 55 | 26.6 | 39.7 | 2696 | 2210 | 2102 |
| Dyna-Gro | H44HO12CL | HO, CL | 58 | 59 | 27.5 | 39.7 | 2581 | 2295 | 2243 |
| Dyna-Gro | H45HO10EX | HO, EX | 60 | 59 | 25.2 | 38.8 | 2910 | 2295 | 2206 |
| Dyna-Gro | H45NS16CL | NS, CL | 61 | 58 | 29.6 | 41.5 | 2753 | 2360 | 2402 |
| Dyna-Gro | H47HO11EX | HO, EX | 63 | 65 | 27.7 | 38.4 | 3014 | -- | -- |
| Dyna-Gro | H49HO19CL | HO, CL | 64 | 62 | 28.5 | 42.6 | 3492 | 2749 | 2688 |
| Dyna-Gro | H49NS14CL | NS, CL | 63 | 59 | 28.1 | 40.1 | 3478 | 2605 | 2507 |
| Dyna-Gro | XH81H52CP | HO, CP | 64 | 65 | 28.5 | 44.8 | 3671 | 2744 | 2566 |
| Dyna-Gro | XH81H59EX | HO, EX | 61 | 58 | 29.1 | 37.6 | 3000 | -- | -- |
| Dyna-Gro | XH81H60EX | HO, EX | 62 | 63 | 28.8 | 41.3 | 3837 | -- | -- |
| Dyna-Gro | XH81H61EX | HO, EX | 64 | 66 | 28.6 | 41.6 | 3504 | -- | -- |
| Dyna-Gro | XH81N58EX | NS, EX | 63 | 55 | 30.0 | 41.2 | 3230 | -- | -- |
| Dyna-Gro | XH81N62EX | NS, EX | 65 | 60 | 29.5 | 38.1 | 3073 | -- | -- |
| Dyna-Gro | XH82H63EX | HO, EX | 60 | 62 | 28.2 | 40.2 | 2885 | -- | -- |
| Nuseed | Falcon | NS, EX | 62 | 56 | 27.5 | 39.3 | 2984 | 2483 | 2340 |
| Nuseed | Hornet | HO, CL | 64 | 64 | 28.3 | 40.5 | 3707 | 2703 | 2593 |
| Nuseed | N4H302 E | HO, EX | 61 | 58 | 25.7 | 40.6 | 3044 | 2431 | 2295 |
| Nuseed | N4H422 CL | HO, CL | 62 | 66 | 28.1 | 39.4 | 3469 | 2618 | -- |
| Nuseed | N4H470 CL Plus | HO, CP | 63 | 67 | 32.6 | 43.5 | 3852 | 2836 | 2628 |
| Nuseed | N4H521 CL | HO, CL | 63 | 57 | 29.6 | 40.3 | 3364 | 2838 | 2717 |
| Nuseed | N4HM354 | NS, CL | 60 | 60 | 30.9 | 41.5 | 2725 | 2204 | 2106 |
| Nuseed | NHKE53359 | HO, EX | 63 | 70 | 25.5 | 37.5 | 2874 | -- | -- |
| Nuseed | NLKE04002 | NS, EX | 64 | 60 | 28.9 | 38.0 | 3045 | -- | -- |
| Nuseed | NLKP74437 | NS, CP | 61 | 62 | 26.3 | 35.7 | 3444 | -- | -- |
| Proseed | 12G25 CL | HO, CL | 61 | 62 | 28.9 | 42.0 | 3220 | 2683 | -- |
| Proseed | E-50016 CL | HO, CL | 62 | 59 | 28.6 | 41.4 | 3254 | 2566 | -- |
| Proseed | E-31 CL | HO, CL | 62 | 63 | 27.5 | 35.4 | 2592 | -- | -- |
| Proseed | E-91 E | HO, EX | 62 | 72 | 27.9 | 37.7 | 2858 | 2290 | -- |
| Proseed | E-93 E | HO, EX | 62 | 69 | 25.7 | 37.7 | 3026 | 2432 | -- |
| Sunflower Partners | SF440 HO/CL | HO, CL | 65 | 64 | 28.6 | 42.0 | 3644 | -- | -- |
| Sunflower Partners | SW1H63CL | HO, CL | 64 | 55 | 27.1 | 41.9 | 3031 | -- | -- |
| Sunflower Partners | SW1H81CLP | HO, CP | 62 | 63 | 28.3 | 42.0 | 3485 | -- | -- |
| Sunflower Partners | NSW21460 | HO, CL | 62 | 68 | 28.4 | 39.7 | 3550 | -- | -- |

***Table continued on next page***

**Sunflower - Oil Type - 2021** **Hettinger, ND**

| Company/Brand | Hybrid | Oil Type & Traits[1] | Days to Bloom | Plant Height | Test Weight | Oil Content | Grain Yield 2021 | Grain Yield 2-Year | Grain Yield 3-Year |
|---|---|---|---|---|---|---|---|---|---|
| ***Table continues from previous page*** | | | | | | | | | |
| Brevant | B8H131CL | HO, CL | 59 | 64 | 27.5 | 40.2 | 2349 | -- | -- |
| Brevant | B8H460CP | HO, CP | 64 | 64 | 27.2 | 43.7 | 2920 | -- | -- |
| Brevant | B8H395E | HO, EX | 61 | 63 | 25.4 | 38.3 | 2958 | -- | -- |
| Brevant | B8M390E | MO, EX | 64 | 66 | 27.2 | 39.1 | 3516 | -- | -- |
| SunOpta | 4415 | HO, CP | 61 | 65 | 27.9 | 35.6 | 2950 | 2358 | 2390 |
| SunOpta | 4425 CL | MO, CL | 61 | 70 | 27.4 | 36.6 | 3836 | 2817 | 2538 |
| SunOpta | EXP725 CL | MO, CL | 61 | 69 | 25.0 | 37.1 | 3534 | 2701 | 2559 |
| RAGT | AC2101 | HO, CP | 61 | 66 | 26.7 | 39.4 | 3293 | -- | -- |
| USDA (Check) | 894 | TR | 61 | 67 | 27.6 | 38.7 | 2838 | 2076 | 1925 |
| CROPLAN (Check) | 559CL | NS, CL | 62 | 69 | 29.3 | 41.7 | 3466 | 2127 | -- |
| AAFC/USDA (Check | Honeycomb NS | NS | 55 | 56 | 23.0 | 37.1 | 770 | 1154 | 1602 |
| Mycogen Seeds (Chec | 8N270CLDM | NS, CL | 57 | 54 | 26.6 | 38.2 | 1853 | 1722 | 1798 |
| Trial Mean | | | 62 | 62 | 27.7 | 39.6 | 3094 | 2428 | 2316 |
| C.V. % | | | 1.3 | 6.3 | 5.3 | 4.4 | 8.1 | -- | -- |
| LSD 5% | | | 0.9 | 4.6 | 1.6 | 2.0 | 415 | -- | -- |
| LSD 10% | | | 0.7 | 3.5 | 1.3 | 1.6 | 227 | -- | -- |

[1] Type: TR-Traditonal, NS-NuSun, HO-High Oleic, CL=Clearfield, CP=Clearfield Plus, EX=ExpressSun.

[2] Days after planting.

Planting Date: June 3

Harvest Date: October 29

Previous Crop: Wheat

**Sunflower - Confectionary - 2021** **Hettinger, ND**

| Company/Brand | Hybrid | Days to Bloom | Plant Height | Test Weight | Seed Over Screen 22/64 | Seed Over Screen 20/64 | Seed Over Screen 18/64 | Grain Yield 2021 | Grain Yield 2-Year |
|---|---|---|---|---|---|---|---|---|---|
| | | DAP[1] | inches | lbs/bu | ---------(%)--------- | | | -----lbs/ac----- | |
| SunOpta | SS90 | 58 | 68 | 21.8 | 13.0 | 53.0 | 95.0 | 2581 | 1962 |
| SunOpta | SS91 | 61 | 62 | 20.7 | 18.0 | 63.0 | 96.0 | 2759 | -- |
| Trial Mean | | 60 | 65 | 21.3 | 15.0 | 58.0 | 95.0 | 2670 | 1962 |
| C.V. % | | 1.0 | 5.2 | 2.6 | 13.8 | 7.4 | 0.3 | 11.7 | -- |
| LSD 5% | | 1.3 | 7.6 | 1.2 | 4.8 | 9.6 | 0.6 | 706 | -- |
| LSD 10% | | 1.0 | 5.6 | 0.9 | 3.5 | 7.2 | 0.4 | 523 | -- |

[1] Days after planting.

Planting Date: June 3

Harvest Date: October 30

Previous Crop: Wheat

## NDSU Hettinger Research Extension Center

**Flax - 2021** **Hettinger, ND**

| Variety | Days to Bloom | Plant Height | Test Weight | Oil Content | -------Grain Yield-------- | | | Average Yield | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2018 | 2020 | 2021 | 2-Yr | 3-Yr[1] |
| | DAP [2] | inches | lbs/bu | % | ---------- bu per acre ---------- | | | | |
| AAC Bright | 51 | 18 | 49.3 | 42.5 | -- | 12.5 | 18.3 | 15.4 | -- |
| AAC Marvelous | 51 | 19 | 49.1 | 42.3 | -- | -- | 17.9 | -- | -- |
| Carter [3] | 51 | 19 | 49.5 | 42.9 | 24.5 | 14.1 | 18.5 | 16.3 | 19.0 |
| CDC Buryu | 51 | 18 | 49.7 | 43.0 | -- | 13.1 | 19.2 | 16.2 | -- |
| CDC Dorado [3] | 51 | 19 | 49.0 | 42.3 | -- | 13.9 | 18.2 | 16.0 | -- |
| CDC Glas | 52 | 19 | 49.2 | 41.9 | 24.1 | 15.0 | 17.1 | 16.1 | 18.7 |
| CDC Neela | 50 | 18 | 48.4 | 42.1 | 25.1 | 16.1 | 17.5 | 16.8 | 19.6 |
| CDC Plava | 52 | 18 | 48.5 | 42.9 | -- | 16.2 | 18.0 | 17.1 | -- |
| CDC Rowland | 52 | 19 | 48.9 | 41.8 | -- | -- | 17.5 | -- | -- |
| Gold ND [3] | 51 | 19 | 49.8 | 42.9 | 22.0 | 13.9 | 17.3 | 15.6 | 17.7 |
| ND Hammond | 51 | 17 | 49.9 | 43.4 | 22.0 | 13.2 | 18.3 | 15.7 | 17.8 |
| Omega [3] | 51 | 19 | 49.6 | 42.6 | 18.9 | 16.3 | 18.1 | 17.2 | 17.8 |
| Webster | 51 | 17 | 48.8 | 42.1 | 23.9 | 14.8 | 18.4 | 16.6 | 19.0 |
| York | 52 | 18 | 49.2 | 42.0 | 24.0 | 17.2 | 17.5 | 17.4 | 19.6 |
| Trial Mean | 51 | 18 | 48.4 | 42.7 | 23.0 | 16.3 | 18.0 | 16.3 | 18.8 |
| C.V. % | 2.1 | 7.1 | 1.5 | 2.7 | 11.6 | 13.0 | 5.6 | -- | -- |
| LSD 5% | 1.5 | 1.8 | 0.9 | 1.6 | 3.7 | 3.0 | 1.2 | -- | -- |
| LSD 10% | 1.3 | 1.5 | 0.7 | 1.4 | 3.1 | 2.5 | 0.9 | -- | -- |

[1] Average of 2018, 2020 and 2021

[2] Days after planting.

[3] Yellow seed type.

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

Planting Date: May 5

Harvest Date: August 12

Previous Crop: Peas

**2021 Flax - Recrop** **Dickinson, ND**

| Variety | Days to Flower | Days to Mature | Plant Height | Test Weight | Oil Content | -- Grain Yield-- 2019 | 2020 | 2021 | Average Yield 2 Year | 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | in | lbs/bu | % | ------bu/ac------ | | | ----bu/ac---- | |
| AAC Bright | 57 | 91 | 16 | 52.5 | 43.9 | 13.6 | 20.1 | 13.4 | 16.7 | 15.7 |
| AAC Marvelous | 57 | 91 | 17 | 53.9 | 43.1 | -- | -- | 10.9 | -- | -- |
| CDC Buryu | 57 | 91 | 16 | 54.0 | 40.8 | 15.4 | 22.9 | 8.8 | 15.9 | 15.7 |
| CDC Dorado | 56 | 91 | 15 | 52.2 | 42.5 | -- | 17.9 | 9.2 | 13.5 | -- |
| CDC Glass | 57 | 91 | 15 | 52.3 | 41.9 | 13.3 | 19.7 | 8.6 | 14.1 | 13.8 |
| CDC Neela | 57 | 91 | 16 | 53.9 | 42.1 | 13.9 | 22.7 | 12.2 | 17.5 | 16.3 |
| CDC Plava | 57 | 90 | 15 | 52.9 | 42.3 | 9.9 | 18.4 | 10.1 | 14.3 | 12.8 |
| CDC Rowland | 57 | 92 | 15 | 53.8 | 41.3 | -- | -- | 10.8 | -- | -- |
| Carter | 57 | 92 | 17 | 51.8 | 40.5 | 14.7 | 20.0 | 10.4 | 15.2 | 15.0 |
| Gold ND | 57 | 92 | 18 | 54.1 | 42.4 | 14.1 | 19.1 | 13.4 | 16.3 | 15.5 |
| ND Hammond | 58 | 91 | 16 | 53.6 | 40.4 | 11.0 | 19.2 | 11.3 | 15.3 | 13.8 |
| Omega | 59 | 92 | 15 | 54.6 | 40.6 | 13.3 | 19.0 | 12.2 | 15.6 | 14.8 |
| Webster | 57 | 91 | 16 | 53.7 | 41.6 | 13.9 | 22.2 | 11.4 | 16.8 | 15.9 |
| York | 57 | 92 | 17 | 54.1 | 41.6 | 18.4 | 20.6 | 11.0 | 15.8 | 16.7 |
| Trial Mean | 58 | 92 | 17 | 53.6 | 41.8 | 14.6 | 21.1 | 11.3 | -- | -- |
| CV % | 1.3 | 0.8 | 6.6 | 1.4 | 1.4 | 15.0 | 10.9 | 24.4 | -- | -- |
| LSD 0.05 | 1 | 1 | 2 | 1.2 | 0.9 | 3.6 | 3.7 | NS | -- | -- |
| LSD 0.10 | 1 | 1 | 1 | 1.0 | 0.8 | 3.0 | 3.1 | NS | -- | -- |

Planting Date: April 23, 2021
Harvest Date: August 13, 2021
Previous Crop: Cover Crop
No Lodging observed
Oil content reported on 9% moisture basis
The trial sustained extreme drought (6.69" total precipitation)

**Dry Bean - 2021** **Hettinger, ND**

| Variety | Type | Plant Height | Plant Lodge | Test Weight | Grain Yield 2019 | Grain Yield 2020 | Grain Yield 2021 | 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 | 20 | 7 | * | 1441 | 1139 | 819 | 979 | 1133 |
| Lariat | Pinto | 21 | 8 | | 1245 | 1159 | 690 | 925 | 1031 |
| Monterrey | Pinto | 23 | 6 | | 1345 | 1036 | 809 | 923 | 1063 |
| ND Falcon | Pinto | 22 | 7 | | 1509 | 1105 | 746 | 926 | 1120 |
| ND Palomino | Pinto | 20 | 6 | | 1611 | 1019 | 801 | 910 | 1144 |
| Stampede | Pinto | 21 | 6 | | 1797 | 1207 | 714 | 961 | 1239 |
| Torreon | Pinto | 21 | 7 | | 1437 | 1031 | 895 | 963 | 1121 |
| Vibrant | Pinto | 20 | 7 | | 1286 | 1150 | 569 | 860 | 1002 |
| Windbreaker | Pinto | 18 | 7 | | 1295 | 1070 | 640 | 855 | 1002 |
| Cowboy | Pinto | 21 | 7 | | -- | -- | 586 | -- | -- |
| Blizzard | Navy | 22 | 6 | | 1166 | 787 | 448 | 618 | 800 |
| HMS Medalist | Navy | 20 | 5 | | 1130 | 962 | 474 | 718 | 855 |
| T9905 | Navy | 18 | 5 | | 1350 | 878 | 580 | 729 | 936 |
| Merlot | Sm Red | 21 | 5 | | 1757 | 794 | 654 | 724 | 1068 |
| Viper | Sm Red | 20 | 5 | | 1659 | 1257 | 1042 | 1150 | 1319 |
| Rosetta | Pink | 19 | 5 | | -- | -- | 738 | -- | -- |
| Black Tails | Black | 21 | 6 | | 1870 | 1151 | 730 | 941 | 1250 |
| Eclipse | Black | 20 | 5 | | 1661 | 1250 | 457 | 854 | 1123 |
| ND Twilight | Black | 16 | 6 | | 1525 | 1073 | 663 | 868 | 1087 |
| Zorro | | 20 | 6 | | -- | -- | 753 | -- | -- |
| ND Pegasus | Great Northern | 24 | 5 | | 1811 | 1342 | 740 | 1041 | 1298 |
| Trial Mean | | 20 | 6 | | 1488 | 1063 | 709 | 879 | 1088 |
| C.V. % | | 9.4 | 9.7 | | 15.7 | 12.2 | 18.7 | 13.7 | 13.3 |
| LSD 5% | | 2.7 | 0.8 | | 330 | 184 | 187 | 257 | 239 |
| LSD 10% | | 2.3 | 0.7 | | 275 | 154 | 156 | 212 | 199 |

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

* No data dut to issues with test weight chamber on weigh system.

Planting Date: June 2

Harvest Date: October 8

Previous Crop: Durum Wheat

**Chickpea - 2021** **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 | | | 2019 | 2020 | 2021 | 2 yr | 3 yr |
| | DAP[1] | inches | 0 - 9[2] | ----------%---------- | | | | seed/lb | lb/bu | ----------lbs/ac---------- | | | | |
| **Kabuli Type** | | | | | | | | | | | | | | |
| CDC Frontier | 49 | 14 | 0 | 35 | 59 | 6 | 0 | 1524 | ** | 1483 | 761 | 571 | 666 | 938 |
| CDC Leader | 44 | 13 | 0 | 25 | 58 | 15 | 2 | 1375 | | 2307 | 834 | 864 | 849 | 1335 |
| CDC Orion | 43 | 13 | 0 | 10 | 51 | 28 | 11 | 1197 | | 1918 | 624 | 840 | 732 | 1127 |
| CDC Palmer | 43 | 13 | 0 | 13 | 62 | 21 | 3 | 1278 | | 2762 | 648 | 888 | 768 | 1433 |
| ND Crown | 44 | 14 | 0 | 6 | 54 | 35 | 5 | 1202 | | -- | 487 | 539 | 513 | -- |
| New Hope | 45 | 15 | 0 | 18 | 57 | 21 | 3 | 1362 | | -- | -- | 581 | -- | -- |
| Royal | 49 | 15 | 0 | 24 | 34 | 27 | 15 | 1405 | | -- | 340 | 411 | 376 | -- |
| Sawyer | 47 | 14 | 0 | 29 | 52 | 15 | 4 | 1413 | | 662 | 347 | 722 | 535 | 577 |
| Sierra | 47 | 15 | 0 | 29 | 35 | 22 | 14 | 1443 | | 280 | 271 | 339 | 305 | 297 |
| Mean | 46 | 14 | 0 | 21 | 51 | 21 | 6 | 1355 | | 1823 | 539 | 640 | 593 | 951 |
| C.V. % | 2.6 | 9.1 | -- | 19.9 | 7.2 | 15.3 | 23.5 | 7.3 | | 13.0 | 10.3 | 20.5 | -- | -- |
| LSD 5% | 1.7 | 1.8 | -- | 6 | 5 | 5 | 2 | 144 | | 343 | 82 | 191 | -- | -- |
| LSD 10% | 1.4 | 1.5 | -- | 5 | 4 | 4 | 2 | 119 | | 284 | 68 | 158 | -- | -- |

[1] Days after planting.

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

** Not enough sample for a test weight.

Planting Date: May 12

Harvest Date: August 16

Previous Crop: Pea

## NDSU Hettinger Research Extension Center

**Field Pea - 2021** **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 2021 | Seed Yield 2-Yr. Avg. | Seed Yield 3-Yr. Avg. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | days | DAP[1] | inches | 0 - 9[2] | % | gm | seeds | lb/bu | -------Bushels per acre------- | | |
| **Yellow Cotyledon Type** | | | | | | | | | | | | |
| AAC Asher | 51 | 13 | 82 | 16 | 0 | 26.9 | 230 | 1978 | 63.8 | 28.2 | 32.4 | 36.9 |
| AAC Carver | 51 | 11 | 80 | 18 | 1 | 25.2 | 209 | 2171 | 62.7 | 27.6 | 30.6 | 37.2 |
| AAC Chrome | 51 | 13 | 82 | 17 | 0 | 26.1 | 197 | 2311 | 60.4 | 23.7 | 27.8 | 34.7 |
| AAC Profit | 50 | 13 | 81 | 17 | 2 | 28.3 | 192 | 2372 | 61.0 | 24.6 | 30.2 | 36.9 |
| Agassiz | 51 | 12 | 81 | 18 | 2 | 26.8 | 199 | 2285 | 61.9 | 24.1 | 28.0 | 34.8 |
| CDC Amarillo | 50 | 13 | 81 | 18 | 0 | 27.6 | 191 | 2385 | 60.9 | 23.7 | 29.0 | 34.0 |
| CDC Inca | 52 | 12 | 81 | 19 | 1 | 27.5 | 195 | 2332 | 62.3 | 26.2 | 30.8 | 37.5 |
| CDC Spectrum | 51 | 13 | 82 | 16 | 1 | 27.9 | 201 | 2255 | 62.6 | 27.0 | 30.2 | 35.7 |
| Cronos | 51 | 14 | 82 | 19 | 2 | 28.2 | 240 | 1890 | 60.1 | 20.6 | 19.9 | -- |
| DL Apollo | 50 | 13 | 81 | 17 | 2 | 27.7 | 195 | 2327 | 64.1 | 25.1 | 25.1 | 32.6 |
| DL Growpro | 51 | 11 | 79 | 20 | 2 | 28.9 | 231 | 1971 | 61.6 | 26.0 | -- | -- |
| DS Admiral | 51 | 12 | 83 | 18 | 1 | 27.6 | 212 | 2146 | 61.2 | 23.0 | 24.6 | 31.1 |
| Durwood | 51 | 14 | 83 | 20 | 3 | 26.8 | 199 | 2279 | 63.0 | 25.1 | 27.1 | 33.2 |
| EP_6360 | 51 | 12 | 82 | 15 | 0 | 29.9 | 202 | 2255 | 57.0 | 19.4 | -- | -- |
| EP_6381 | 52 | 10 | 80 | 19 | 1 | 28.5 | 185 | 2454 | 57.0 | 18.0 | -- | -- |
| EP_6816 | 51 | 14 | 83 | 19 | 2 | 28.5 | 201 | 2285 | 57.3 | 20.3 | -- | -- |
| EP_8272 | 51 | 13 | 82 | 17 | 1 | 29.6 | 206 | 2208 | 57.7 | 18.2 | -- | -- |
| EP_8506 | 52 | 13 | 82 | 18 | 3 | 28.1 | 176 | 2587 | 56.1 | 18.0 | -- | -- |
| EP_8971 | 51 | 13 | 82 | 18 | 2 | 30.6 | 228 | 1996 | 59.3 | 20.6 | -- | -- |
| EPX_6186 | 51 | 13 | 82 | 21 | 2 | 28.6 | 200 | 2272 | 59.7 | 20.5 | -- | -- |
| Jetset | 52 | 12 | 81 | 18 | 1 | 27.3 | 201 | 2260 | 59.3 | 23.3 | 23.9 | 31.2 |
| Kite | 52 | 12 | 82 | 15 | 3 | 26.2 | 221 | 2056 | 60.3 | 22.7 | 22.1 | -- |
| Korando | 51 | 12 | 81 | 18 | 3 | 28.7 | 237 | 1918 | 61.7 | 24.2 | 24.1 | 30.0 |
| LG Stunner | 51 | 13 | 82 | 18 | 0 | 29.3 | 176 | 2580 | 59.7 | 22.2 | 24.8 | 31.4 |
| MS-20YP4 | 51 | 11 | 79 | 18 | 0 | 28.8 | 203 | 2242 | 62.5 | 25.9 | -- | -- |
| ND Dawn | 51 | 13 | 82 | 19 | 2 | 26.4 | 206 | 2202 | 61.2 | 25.3 | 26.2 | 31.7 |
| Orchestra | 50 | 12 | 82 | 17 | 2 | 29.4 | 229 | 1985 | 61.6 | 24.3 | 25.2 | -- |
| Peregrine | 51 | 11 | 81 | 17 | 1 | 26.7 | 207 | 2199 | 62.0 | 21.6 | 26.5 | -- |
| Salamanca | 50 | 11 | 79 | 18 | 2 | 27.7 | 224 | 2026 | 63.4 | 25.7 | 26.4 | 34.0 |
| Spider | 52 | 11 | 80 | 19 | 2 | 28.1 | 196 | 2332 | 61.1 | 23.5 | -- | -- |
| PS17100022 | 50 | 12 | 80 | 21 | 4 | 25.6 | 221 | 2056 | 63.9 | 26.3 | -- | -- |
| PS17100239 | 51 | 11 | 79 | 16 | 2 | 26.7 | 207 | 2197 | 61.8 | 24.2 | 26.9 | -- |
| **Green Cotyledon Type** | | | | | | | | | | | | |
| Aragorn | 51 | 11 | 81 | 16 | 1 | 28.1 | 198 | 2300 | 60.4 | 19.9 | 21.2 | -- |
| Arcadia | 51 | 12 | 81 | 17 | 0 | 27.0 | 182 | 2493 | 62.8 | 23.4 | 27.5 | 31.9 |
| CDC Striker | 51 | 11 | 80 | 16 | 1 | 26.8 | 174 | 2604 | 62.0 | 24.2 | 25.0 | 31.1 |
| Empire | 51 | 15 | 84 | 19 | 4 | 27.2 | 186 | 2443 | 59.7 | 22.0 | 24.7 | 29.9 |
| Greenwood | 50 | 11 | 80 | 16 | 1 | 27.0 | 186 | 2441 | 58.8 | 20.9 | 23.8 | -- |
| Shamrock | 51 | 13 | 83 | 20 | 2 | 26.2 | 200 | 2276 | 62.5 | 23.9 | 24.5 | 30.0 |
| PS17100183 | 52 | 13 | 83 | 19 | 2 | 27.7 | 189 | 2407 | 63.1 | 24.4 | -- | -- |
| Mean | 51 | 12 | 81 | 18 | 1 | 27.7 | 204 | 2245 | 61.0 | 23.3 | 26.2 | 33.3 |
| C.V. % | 1.7 | 15.9 | 2.3 | 10.3 | 74.0 | 2.3 | 4.2 | 4.4 | 3.4 | 8.8 | -- | -- |
| LSD 5% | 1.2 | 2.7 | 2.3 | 2.6 | 1.5 | 0.9 | 12 | 138 | 2.9 | 2.4 | -- | -- |
| LSD 10% | 1.0 | 2.3 | 1.9 | 2.2 | 1.2 | 0.8 | 10 | 115 | 2.5 | 1.9 | -- | -- |

[1] Days after planting.

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

Planting Date: May l

Harvest Date: July 28

Previous Crop: Corn

**2021 Field Pea - Recrop** **Dickinson, ND**

| Variety | Days to Flower | Days to Mature | 1000 Seed Weight | Seeds per Pound | Plant Height | Test Weight | Protein | --Grain Yield-- 2019 | 2020 | 2021 | Average Yield 2 Year | 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | gm | | in | lbs/bu | % | --------bu/ac-------- | | | --bu/ac-- | |
| ***Yellow Types*** | | | | | | | | | | | | |
| AAC Carver | 60 | 92 | 242 | 1,890 | 16 | 63.6 | 27.6 | 47.0 | 24.2 | 18.6 | 21.4 | 29.9 |
| AAC Chrome | 63 | 93 | 268 | 1,701 | 14 | 65.0 | 27.4 | 50.1 | 26.1 | 13.8 | 20.0 | 30.0 |
| AAC Julius | 62 | 92 | 243 | 1,871 | 15 | 64.4 | 28.5 | -- | -- | 15.5 | -- | -- |
| Agassiz | 62 | 93 | 250 | 1,818 | 15 | 64.3 | 28.6 | 52.2 | 24.4 | 14.8 | 19.6 | 30.5 |
| CDC Amarillo | 63 | 93 | 218 | 2,088 | 17 | 63.5 | 29.0 | 43.2 | 34.5 | 14.0 | 24.2 | 30.6 |
| CDC Inca | 63 | 93 | 221 | 2,053 | 19 | 63.8 | 29.4 | 54.42 | 29.23 | 16.3 | 22.77 | 33.32 |
| CDC Spectrum | 62 | 93 | 253 | 1,794 | 13 | 63.6 | 29.1 | 45.8 | 29.5 | 15.1 | 22.3 | 30.1 |
| Cronos | 59 | 93 | 266 | 1,706 | 17 | 64.0 | 30.8 | -- | 21.8 | 11.1 | 16.4 | -- |
| DL GrowPro | 60 | 93 | 303 | 1,513 | 17 | 64.1 | 30.3 | -- | -- | 14.6 | -- | -- |
| DS Admiral | 60 | 92 | 247 | 1,849 | 17 | 63.1 | 30.1 | 40.7 | 30.4 | 16.3 | 23.4 | 29.2 |
| Durwood | 61 | 93 | 254 | 1,802 | 16 | 63.3 | 29.5 | -- | 31.7 | 14.3 | 23.0 | -- |
| EP_6360 | 61 | 92 | 244 | 1,878 | 16 | 61.9 | 31.3 | -- | -- | 12.0 | -- | -- |
| EP_6381 | 61 | 93 | 246 | 1,846 | 15 | 64.2 | 29.7 | -- | -- | 11.9 | -- | -- |
| EP_6816 | 61 | 92 | 222 | 2,046 | 17 | 62.7 | 30.9 | -- | -- | 13.2 | -- | -- |
| EP_8272 | 61 | 93 | 249 | 1,829 | 14 | 63.4 | 30.2 | -- | -- | 10.5 | -- | -- |
| EP_8506 | 61 | 93 | 225 | 2,025 | 17 | 63.8 | 30.9 | -- | -- | 12.5 | -- | -- |
| EP_8971 | 61 | 93 | 264 | 1,716 | 17 | 64.6 | 32.9 | -- | -- | 12.2 | -- | -- |
| Empire | 63 | 93 | 233 | 1,954 | 19 | 64.9 | 29.1 | -- | -- | 9.9 | -- | -- |
| Goldenwood | 68 | 93 | 204 | 2,230 | 12 | 65.0 | 29.1 | -- | -- | 11.4 | -- | -- |
| Hyline | 62 | 92 | 267 | 1,709 | 18 | 63.4 | 28.6 | 48.7 | 34.1 | 18.0 | 26.1 | 33.6 |
| Jetset | 61 | 92 | 247 | 1,842 | 19 | 63.2 | 29.8 | 43.62 | 31.09 | 17.2 | 24.14 | 30.63 |
| MS-20YP4 | 63 | 93 | 242 | 1,895 | 16 | 64.4 | 29.4 | -- | -- | 16.1 | -- | -- |
| ND Dawn | 62 | 93 | 266 | 1,723 | 16 | 62.8 | 27.7 | 41.8 | 25.8 | 16.1 | 21.0 | 27.9 |
| Pizzaz | 58 | 90 | 274 | 1,658 | 14 | 63.5 | 28.5 | -- | -- | 12.9 | -- | -- |
| Pro 143-6220 | 62 | 92 | 240 | 1,905 | 15 | 62.3 | 29.0 | -- | -- | 15.8 | -- | -- |
| Pro 143-6230 | 60 | 91 | 226 | 2,019 | 15 | 62.7 | 28.9 | -- | -- | 14.2 | -- | -- |
| Pro 153-7409 | 60 | 90 | 246 | 1,844 | 15 | 61.7 | 28.9 | -- | -- | 15.1 | -- | -- |
| Pro 174-7148 | 63 | 91 | 215 | 2,109 | 13 | 63.2 | 28.3 | -- | -- | 20.3 | -- | -- |
| Salamanca | 61 | 92 | 259 | 1,757 | 14 | 62.9 | 29.2 | 45.5 | 25.7 | 15.1 | 20.4 | 28.8 |
| Spider | 62 | 93 | 249 | 1,830 | 15 | 63.7 | 29.4 | -- | -- | 11.1 | -- | -- |
| ***Green Types*** | | | | | | | | | | | | |
| Aragorn | 59 | 88 | 215 | 2,116 | 14 | 60.8 | 29.1 | -- | 23.4 | 11.4 | 17.4 | -- |
| Arcadia | 61 | 90 | 207 | 2,207 | 13 | 63.1 | 27.9 | 44.3 | 33.6 | 14.8 | 24.2 | 30.9 |
| CDC Greenwater | 63 | 94 | 269 | 1,692 | 17 | 63.4 | 29.5 | 41.07 | 34.88 | 13.6 | 24.22 | 29.84 |
| CDC Striker | 61 | 91 | 230 | 1,981 | 14 | 63.0 | 27.4 | 46.2 | 23.2 | 14.8 | 19.0 | 28.1 |
| EPX_6186 | 62 | 93 | 252 | 1,807 | 16 | 63.8 | 28.9 | -- | -- | 13.8 | -- | -- |
| Ginny 2 | 60 | 90 | 233 | 1,947 | 13 | 62.5 | 28.7 | -- | -- | 13.8 | -- | -- |
| Greenwood | 59 | 89 | 208 | 2,183 | 13 | 63.0 | 26.9 | -- | 25.1 | 13.5 | 19.3 | -- |
| MS-20GP5 | 62 | 93 | 274 | 1,661 | 17 | 64.2 | 28.4 | -- | 28.4 | 17.0 | 22.7 | -- |
| Pro 141-6258 | 59 | 88 | 222 | 2,050 | 14 | 61.7 | 29.2 | -- | -- | 15.4 | -- | -- |
| Shamrock | 62 | 93 | 235 | 1,945 | 16 | 64.4 | 29.0 | -- | 32.8 | 13.0 | 22.9 | -- |
| Trial Mean | 61 | 92 | 243 | 1,887 | 15 | 63.4 | 29.2 | 45.2 | 28.4 | 14.3 | -- | -- |
| CV % | 1.3 | 1.2 | 7.5 | 7.1 | 12.8 | 0.8 | 3.1 | 11.2 | 17.1 | 17.6 | -- | -- |
| LSD 0.05 | 1 | 2 | 25 | 189 | 3 | 0.7 | 1.2 | 7.1 | 6.8 | 3.5 | -- | -- |
| LSD 0.10 | 1 | 1 | 21 | 158 | 2 | 0.6 | 1.0 | 6.0 | 5.7 | 2.9 | -- | -- |

Planting Date: April 19, 2021 Seeding Rate: 325,000 live seeds/ac

Harvest Date: July 26, 2021 Grain protein percentages reported on 0% moisture basis

Previous Crop: cover crop forage

## NDSU Hettinger Reserach Extension Center

**Lentil - 2021** **Hettinger, ND**

| Variety | Days to Flower | Height | Lodging | 1,000 Seed Wt. | Seeds Lb | Test Weight | Grain Protein | ----- Grain Yield ----- 2019 | 2020 | 2021 | Average Yield 2 yr | 3 yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0 - 9[2] | gm | seeds | lb/bu | % | ----------lbs/acre---------- | | | | |
| **Large Green Type** | | | | | | | | | | | | |
| CDC Grandora | 55 | 16 | 0 | 58 | 7870 | 63.0 | 24.5 | -- | -- | 1192 | -- | -- |
| CDC Greenstar | 56 | 14 | 0 | 56 | 8156 | 60.3 | 23.6 | -- | 1893 | 1591 | 1742 | -- |
| **Medium Green Type** | | | | | | | | | | | | |
| Avondale | 55 | 12 | 0 | 45 | 10177 | 62.6 | 22.3 | -- | 1852 | 1725 | 1789 | -- |
| CDC Richlea | 55 | 13 | 0 | 40 | 11437 | 62.7 | 23.8 | 1830 | 1700 | 1618 | 1659 | 1716 |
| **Small Green Type** | | | | | | | | | | | | |
| CDC Kermit | 57 | 10 | 0 | 25 | 18415 | 64.3 | 24.9 | -- | 1688 | 1564 | 1626 | -- |
| ND Eagle | 54 | 10 | 0 | 34 | 13349 | 63.1 | 23.8 | 2134 | 1671 | 1536 | 1604 | 1780 |
| Trial Mean | 55 | 12 | 0 | 43 | 11567 | 62.7 | 23.8 | 1912 | 1687 | 1537 | 1684 | 1748 |
| C.V. % | 0.8 | 6.2 | -- | 4.0 | 4.0 | 1.0 | 1.2 | 11.5 | 12.4 | 6.3 | -- | -- |
| LSD 5% | 0.9 | 1.4 | -- | 3.1 | 849 | 1.1 | 0.5 | 317 | 310 | 176 | -- | -- |
| LSD 10% | 0.7 | 1.1 | -- | 2.5 | 690 | 0.9 | 0.4 | 264 | 256 | 143 | -- | -- |

[1] Days after planting.

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

Planting Date: May 5

Harvest Date: August 2

Previous Crop: Field Peas

# NDSU Hettinger Research Extension Center

**Lupin - 2021** **Hettinger, ND**

| Variety | Days to Flower | Flower Duration | Canopy Height | Lodging | 1,000 Seed Wt. | Seeds Lb | Test Weight | Seed Yield |
|---|---|---|---|---|---|---|---|---|
| | DAP[1] | days | inches | 0 - 9[2] | gm | seeds | lb/bu | lb/ac |
| LND0704 | 50 | 19 | 15 | 0 | 258 | 1763 | * | 596 |
| LND0605 | 50 | 19 | 13 | 0 | 261 | 1741 | | 551 |
| LND0530 | 50 | 19 | 13 | 0 | 261 | 1741 | | 607 |
| LND0619 | 50 | 19 | 14 | 0 | 260 | 1749 | | 606 |
| LND0621 | 50 | 19 | 14 | 0 | 264 | 1723 | | 548 |
| LND0309 | 50 | 19 | 13 | 0 | 258 | 1761 | | 526 |
| LND0127 | 50 | 19 | 14 | 0 | 282 | 1609 | | 591 |
| LND0603 | 50 | 19 | 12 | 0 | 265 | 1716 | | 606 |
| LND0617 | 50 | 19 | 14 | 0 | 269 | 1690 | | 490 |
| LUPRO 2085 | 50 | 19 | 13 | 0 | 270 | 1684 | | 507 |
| | | | | | | | | |
| Trial Mean | 50 | 19 | 13 | 0 | 265 | 1718 | | 563 |
| C.V. % | 1.0 | 2.0 | 6.7 | -- | 2.5 | 2.4 | | 14.0 |
| LSD 5% | NS | NS | 1.3 | -- | 9 | 60 | | 114 |
| LSD 10% | NS | NS | 1.1 | -- | 8 | 50 | | 95 |

[1] Days after planting.

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

* Not enough grain sample for a test weight measurement.

Planting Date: May 4

## NDSU Hettinger Research Extension Center

**Soybean - Roundup Ready - 2021** **Hettinger, ND**

| Company/ Brand | Variety | Maturity | Mature Date | Plant Height | Test Weight | Seed Oil | Seed Protein | Seed Yield | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 2021 | 2-Yr | 3-Yr |
| | | | | inches | lbs/bu | % | % | ----------bu/ac---------- | | |
| NDSU | ND17009GT | 00.9 | 9/9 | 24 | 58.1 | 17.9 | 32.9 | 21.1 | 22.3 | 28.4 |
| Proseed | XT80-20N | 0.2 | 9/13 | 22 | 56.8 | 17.0 | 30.7 | 23.8 | 23.0 | -- |
| Integra | 70212XF | 0.2 | 9/10 | 24 | 56.8 | 18.4 | 30.0 | 21.8 | -- | -- |
| Proseed | EL90-33N | 0.3 | 9/14 | 20 | 55.8 | 17.5 | 30.7 | 22.2 | -- | -- |
| Integra | 50309N | 0.3 | 9/13 | 22 | 56.4 | 17.1 | 30.7 | 21.9 | 23.6 | 30.1 |
| Integra | 40300N | 0.3 | 9/13 | 21 | 55.6 | 17.5 | 30.9 | 21.3 | 24.2 | -- |
| Proseed | XT60-40N | 0.4 | 9/13 | 21 | 56.4 | 18.1 | 31.1 | 22.3 | 22.1 | 28.1 |
| Proseed | XT90-50 | 0.5 | 9/15 | 19 | 56.7 | 17.9 | 31.4 | 24.0 | -- | -- |
| Integra | 70622XF | 0.6 | 9/15 | 19 | 56.6 | 16.6 | 32.0 | 22.9 | -- | -- |
| Proseed | XT20-70 | 0.7 | 9/16 | 23 | 56.8 | 16.7 | 31.8 | 23.8 | -- | -- |
| Proseed | EL20-73N | 0.7 | 9/17 | 20 | 56.5 | 17.0 | 31.2 | 23.3 | -- | -- |
| NDSU | ND2108GT73 | 0.8 | 9/17 | 19 | 57.1 | 17.9 | 30.6 | 23.6 | 22.8 | 28.5 |
| Trial Mean | | | 9/14 | 21 | 56.6 | 17.5 | 31.2 | 22.7 | 23.1 | 28.9 |
| C.V. % | | | 1.1 | 7.5 | 0.7 | 1.7 | 1.7 | 9.1 | -- | -- |
| LSD 5% | | | 1.6 | 2.3 | 0.5 | 0.4 | 0.6 | 2.5 | -- | -- |
| LSD 10% | | | 1.3 | 1.9 | 0.4 | 0.3 | 0.5 | 1.9 | -- | -- |

Planting Date: June 1

Harvest Date: September 24

Previous Crop: Spring Wheat

## NDSU Hettinger Research Extension Center

**Soybean - Roundup Ready - 2021** **Mandan, ND**

| Company/ Brand | Variety | Maturity | Plant Height | Test Weight | Seed Oil | Seed Protein | Seed Yield | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 2021 | 2-Yr | 3-Yr |
| | | | inches | lbs/bu | % | % | ----------bu/ac---------- | | |
| NDSU | ND17009GT | 00.9 | 23 | 56.2 | 17.6 | 34.2 | 27.8 | 33.2 | -- |
| Proseed | XT80-20N | 0.2 | 21 | 55.8 | 16.3 | 31.8 | 29.3 | 32.2 | -- |
| Integra | 70212XF | 0.2 | 23 | 55.5 | 17.1 | 32.3 | 28.1 | -- | -- |
| Proseed | EL90-33N | 0.3 | 19 | 54.4 | 17.1 | 31.9 | 27.8 | -- | -- |
| Integra | 50309N | 0.3 | 21 | 56.3 | 16.0 | 32.0 | 30.7 | 34.1 | 36.0 |
| Integra | 40300N | 0.3 | 21 | 53.7 | 17.3 | 31.2 | 30.4 | 35.4 | -- |
| Proseed | XT60-40N | 0.4 | 18 | 54.3 | 16.8 | 33.1 | 25.5 | 28.8 | 32.4 |
| Proseed | XT90-50 | 0.5 | 16 | 54.2 | 16.7 | 32.6 | 27.9 | -- | -- |
| Integra | 70622XF | 0.6 | 16 | 55.9 | 15.9 | 33.0 | 25.9 | -- | -- |
| Proseed | XT20-70 | 0.7 | 16 | 53.6 | 16.1 | 33.3 | 24.8 | -- | -- |
| Proseed | EL20-73N | 0.7 | 17 | 56.0 | 16.2 | 32.4 | 29.3 | -- | -- |
| NDSU | ND2108GT73 | 0.8 | 19 | 56.2 | 17.2 | 31.6 | 31.8 | 34.9 | 37.8 |
| Trial Mean | | | 19 | 55.2 | 16.7 | 32.4 | 28.3 | 33.1 | 35.4 |
| C.V. % | | | 7.0 | 2.0 | 1.6 | 1.7 | 7.1 | -- | -- |
| LSD 5% | | | 1.6 | 1.3 | 0.3 | 0.7 | 2.4 | -- | -- |
| LSD 10% | | | 1.3 | 1.0 | 0.2 | 0.5 | 1.9 | -- | -- |

Planting Date: June 2
Harvest Date: September 30
Previous Crop: Spring Wheat

**2021 Industrial Hemp - Recrop** **Dickinson, ND**

| Variety | Plant Stand | PLSE[1] | Seedling Mortality | Seeds per Pound | Test Weight | Oil Content[2] | -- Grain Yield-- 2019 | 2020 | 2021 | Average Yield 2 Year | 3 Year |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ft$^2$ | % | % | | lbs/bu | % | ------ lbs/ac ------ | | | --- lbs/ac --- | |
| Anka | 1 | 4 | 96 | 34,346 | 35.8 | 31.0 | -- | -- | 137 | -- | -- |
| CFX-2 | 5 | 32 | 68 | 33,709 | 38.7 | 32.4 | 722 | 451 | 626 | 538.4 | 599.4 |
| CRS-1 | 6 | 35 | 65 | 32,839 | 38.3 | 31.5 | 744 | 569 | 544 | 556.8 | 619.0 |
| Canda | 7 | 41 | 59 | 28,457 | 38.1 | 30.7 | 897.5 | 414.7 | 450 | 432.4 | 587 |
| Joey | 5 | 31 | 69 | 31,622 | 38.6 | 30.2 | -- | 426 | 433 | 429.7 | -- |
| Katani | 7 | 43 | 57 | 35,913 | 39.2 | 31.7 | 671 | 435 | 518 | 476.3 | 541.2 |
| Vega | 4 | 23 | 77 | 32,464 | 38.5 | 31.1 | -- | 482.8 | 508 | 495.3 | -- |
| Trial Mean | 4.8 | 30 | 70 | 32,764 | 38.2 | 31.2 | 697 | 427 | 459 | -- | -- |
| CV % | 34.3 | 34.3 | 14.7 | 2.5 | 2.1 | 3.1 | 13.8 | 17.3 | 14.7 | -- | -- |
| LSD 0.05 | 2.4 | 15 | 15 | 1,239 | 1.2 | 1.5 | 136 | 108 | 101 | -- | -- |
| LSD 0.10 | 2.0 | 13 | 13 | 1,023 | 1.0 | 1.2 | 114 | 89 | 83 | -- | -- |

[1] Pure live seed emergence

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

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

Planting Date: June 2, 2021

Harvest Dates August 25, 2021 CFX-2, CRS-1, Katani

August 30, 2021 All others

Previous Crop: cover crop forage

**HRSW Fungicide - 2021** **Hettinger, ND**

| Treatment | Days to Head | Plant Height | Plant Lodge | Test Weight | Grain Protein | Grain Yield |
|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | lbs/bu | % | bu/ac |
| ***Variety*** | | | | | | |
| ND VitPro | 61 | 22 | 0 | 59.5 | 15.4 | 34.9 |
| SY Valda | 62 | 22 | 0 | 59.1 | 15.1 | 35.6 |
| Shelly | 63 | 25 | 0 | 59.5 | 14.5 | 36.1 |
| LSD 5% | NS | NS | -- | 0.3 | 0.1 | 0.9 |
| ***Fungicide*** | | | | | | |
| CONTROL | 62 | 23 | 0 | 59.1 | 15.0 | 34.4 |
| TILT @ Feeks 2-3 | 62 | 23 | 0 | 59.3 | 14.9 | 35.3 |
| PROSARO @ Feeks 10.51 | 62 | 23 | 0 | 59.5 | 15.1 | 36.4 |
| TILT @ Feeks 2-3 + PROSARO @ Feeks | 62 | 23 | 0 | 59.4 | 15.1 | 36.2 |
| LSD 5% | NS | NS | -- | NS | NS | 1.1 |
| ***Variety x Fungicide*** | | | | | | |
| ND Vitpro | | | | | | |
| CONTROL | 61 | 22 | 0 | 59.3 | 15.6 | 34.0 |
| TILT @ Feeks 2-3 | 61 | 22 | 0 | 59.7 | 15.5 | 35.4 |
| PROSARO @ Feeks 10.51 | 61 | 22 | 0 | 59.6 | 15.2 | 35.6 |
| 10.51 | 61 | 23 | 0 | 59.5 | 15.4 | 34.6 |
| SY Valda | | | | | | |
| CONTROL | 62 | 21 | 0 | 58.8 | 15.0 | 34.6 |
| TILT @ Feeks 2-3 | 62 | 22 | 0 | 59.3 | 14.9 | 35.7 |
| PROSARO @ Feeks 10.51 | 62 | 23 | 0 | 59.3 | 15.2 | 37.2 |
| 10.51 | 62 | 22 | 0 | 59.0 | 15.3 | 37.0 |
| Shelly | | | | | | |
| CONTROL | 63 | 25 | 0 | 59.4 | 14.5 | 34.6 |
| TILT @ Feeks 2-3 | 63 | 25 | 0 | 59.1 | 14.8 | 34.7 |
| PROSARO @ Feeks 10.51 | 63 | 25 | 0 | 59.7 | 14.4 | 36.2 |
| 10.51 | 63 | 25 | 0 | 59.8 | 14.5 | 36.9 |
| LSD 5% | NS | NS | -- | NS | 0.3 | NS |
| Average | 62.0 | 23.0 | 0.0 | 59.3 | 15.0 | 35.6 |
| CV | 0.3 | 2.7 | -- | 0.8 | 1.5 | 4.4 |

[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 23

Harvest Date: July 31

Feeks 2-3 Application: June 1

Feeks 10.51 Application: June 26

**Durum Fungicide - 2021** **Hettinger, ND**

| Treatment | Days to Head | Plant Height | Plant Lodge | Test Weight | Grain Protein | Grain Yield |
|---|---|---|---|---|---|---|
| | DAP[1] | inches | 0-9[2] | lbs/bu | % | |
| CONTROL | 66 | 30 | 0 | 55.3 | 15.2 | 28.9 |
| TILT @ Feeks 2-3 | 66 | 29 | 0 | 55.4 | 15.3 | 27.4 |
| PROSARO @ Feeks 10.51 | 66 | 29 | 0 | 55.4 | 15.0 | 30.8 |
| TILT @ Feeks 2-3 + PROSARO @ Feeks 10.51 | 66 | 30 | 0 | 55.7 | 15.2 | 31.3 |
| | | | | | | |
| Trial Mean | 66 | 29 | 0 | 55.4 | 15.2 | 29.6 |
| C.V. % | -- | 3.5 | -- | 1.5 | 1.4 | 8.6 |
| LSD 5% | -- | 1.7 | -- | 1.3 | 0.3 | 5.1 |
| LSD 10% | -- | 1.4 | -- | 1.1 | 0.3 | 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.

Variety: ND Riveland

Planting Date: April 23

Harvest Date: August 2

Feeks 2-3 Application: 6/1/21

Feeks 10.51 Application: 6/30/21

## 2021 Acid Soil Management with Hard Red Spring Wheat

**Ryan Buetow**

Hard Red Spring Wheat (HRSW) yields are decreasing due to acidic soils. No-till practices paired with heavy N use have lowered the soil pH on many acres of the Northern Great Plains. Acid soil where the pH drops below 5.5 has an impact on nutrient availability, soil microbial activity, stunted roots from aluminum (Al) toxicity and other plant/soil interactions. These areas can be improved from surface liming; however, liming can be costly. For many producers facing this issue, especially those working rented land, there is a search for alternative options to reduce yield loss on acidic ground. Research has been conducted in western North Dakota on adaptive management strategies for mitigating the symptoms of aluminum toxicity and soil acidity including variety selection, in-furrow fertilizer application, and seed treatments. Variety selection showed a significant difference in yield (Table 1). In a trial focusing on in-furrow treatments, interactions were found among variety, biochar application, and in-furrow phosphorus. It was observed that a susceptible variety of Hard Red Spring Wheat (SY Soren) had a yield response to in-furrow phosphorus (P), where a tolerant variety (Lanning) did not respond to in-furrow P (Table 2). Calcium in-furrow did not have an impact on yield. Across HRSW varieties a yield bump of 1.5 bushel was shown from seed placed P (0-45-0) applied at high rates (60 lb $P_2O_5$/ac) (Table 3). This mechanism doesn't appear to be as strong for HRSW as shown in similar durum trials. A yield reduction from biochar was identified with the control yielding 24 bushels/ac and a rate of 8 lbs/ac seed placed yielded 17.6 bushels/ac. This trial is planned to be repeated in 2022 to hopefully separate out the influence of drought. The 2021 data suggests use of tolerant HRSW varieties along with in-furrow P fertilizer to alleviate symptoms of an acid soil. Ideally producers should be applying tons of lime to bring the pH above 5.5 because the variety and fertilizer may fix the yield loss but does not fix issues with pesticide breakdown and carryover, soil microbiological activity, and nutrient tie-up; all issues caused by acid soil. This issue is in more than a small pocket of North Dakota and is facing fields across the state as shown in the 2021 sunflower survey data (Figure 1).

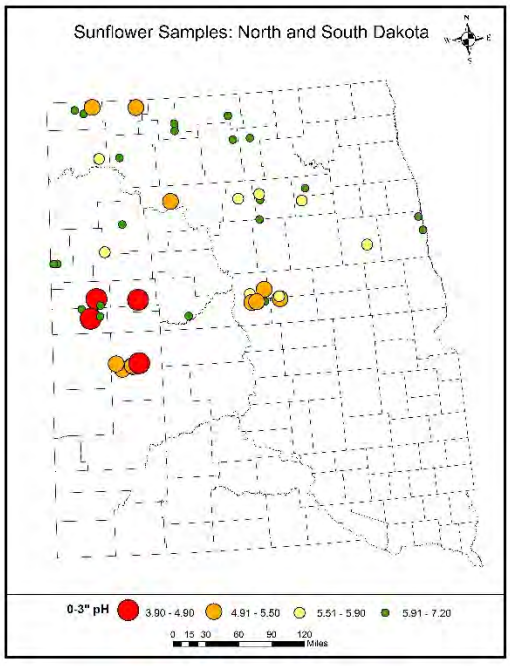



*Figure 1. 0-3" soil samples taken in 2021.*

**Table 1. Variety yield data across locations 2021.**

| Variety | Dickinson | Minot | Lefor |
|---|---|---|---|
| | | bu/ac | |
| Bolles | 18.0b | 36.0 | 57.3 |
| CP3099A | **23.0** | **47.2** | - |
| CP3119A | **22.6** | **47.3** | **69.3** |
| CP3188 | **21.8** | **42.3** | 65.4 |
| CP3530 | **19.9** | 34.0 | - |
| CP3915 | 17.4 | **39.7** | 64.4 |
| Dagmar | **22.6** | 37.2 | 64.2 |
| Duclair | **20.2** | **41.6** | 61.5 |
| Glenn | 18.6 | 34.4b | 60.4 |
| Lanning (tolerant check) | **20.5** | **47.9** | 64.8 |
| SY Soren (susceptible check) | **19.2** | **39.6** | 61.9 |
| TCG Heartland | 15.8 | **39.6** | 62.3 |
| TCG Spitfire | **20.8** | **42.4** | **72.6** |
| WB9479 | 12.7 | **41.8** | 61.8 |
| WB9516 | 13.1 | **46.4** | **68.4** |
| WB9590 | 13.2 | **39.6** | 66.8 |
| WB9606 | **21.4** | **39.0** | 67.4 |
| WB9719 | 11.2 | **44.5** | **70.8** |
| LSD (0.05) | 3.9 | 10.7 | 4.2 |

**Table 2. In-furrow fertilizer treatments in Dickinson 2021.**

| In-furrow treatment | Variety | |
|---|---|---|
| | Soren (susceptible) | Lanning (tolerant |
| Control | 21.4bc | 25.7a |
| Control+biochar* | 15.3e | 18.1d |
| Phosphorus | 25.1a | 24.0ab |
| Phosphorus+biochar* | 16.2de | 21.0c |
| LSD (0.05) | 2.6 | |

*biochar was placed in furrow at a rate of 8lbs/ac

**Table 3. P fertilizer across varieties, Dickinson 2021.**

| Treatment | Yield |
|---|---|
| Control | 20.1b |
| 60 lbs additional P | 21.6a |

## Hettinger Soybean Seeding Rate Study

John Rickertsen & Michael Wells, Hettinger Research Extension Center, 2018 - 2021

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, North Dakota. In 2021 the variety ND17009GT was no-till planted on June 1 with a 9 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 trial was harvested with a Kincaid 8XP small plot combine on September 24. Data was recorded on flowering, height, maturity date, yield, test weight, seed size, seed protein and seed oil content.

The droughty conditions June and July limited yields to 23.9 bu/ac and caused significant plot variation in the 7” drill plots while the 30” rows where much more uniform. Because of this, only the 7” vs 30” row spacing used the full data set with population treatments analyzed separately by row spacing. For 30” rows, there was no significant difference in height, seed size, oil and protein. For maturity, test weight, and yield only the 20,000 seeding rate was different, with the rest of the seeding rates being similar in performance for those traits. The 7” rows had no significant difference in height and protein, but the 20,000 rate had lower test weight, bigger seed lower oil and lower yield than the rest of the seeding rates. The CV of 23.7 for yield indicated that there was a high amount of variation in the 7” row spacing protion of the trial.

In 2018, 2020 and 2021, 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 four years the seeding rates of 100,000 seeds/acre and higher have not been significantly different in yield.

**30" Rows vs 7" Drilled**

| Row Spacing | Mature Date | Plant Height | Moisture | Test Weight | Seed Size | Seed Oil | Seed Protein | Grain Yield |
|---|---|---|---|---|---|---|---|---|
| | | inches | % | lbs/bu | Seeds/lb | % | % | bu/ac |
| 7" Rows | 9/11 | 26 | 8.2 | 56.9 | 3280 | 17.3 | 36.4 | 24.5 |
| 30" Rows | 9/11 | 29 | 8.1 | 56.9 | 3296 | 17.5 | 36.4 | 23.3 |
| Trial Mean | 9/11 | 28 | 8.1 | 56.9 | 3288 | 17.4 | 36.4 | 23.9 |
| CV | 0.1 | 11.5 | 10.3 | 1.1 | 6.7 | 2 | 3 | 13.8 |
| LSD 5% | NS | 2 | NS | NS | NS | NS | NS | NS |

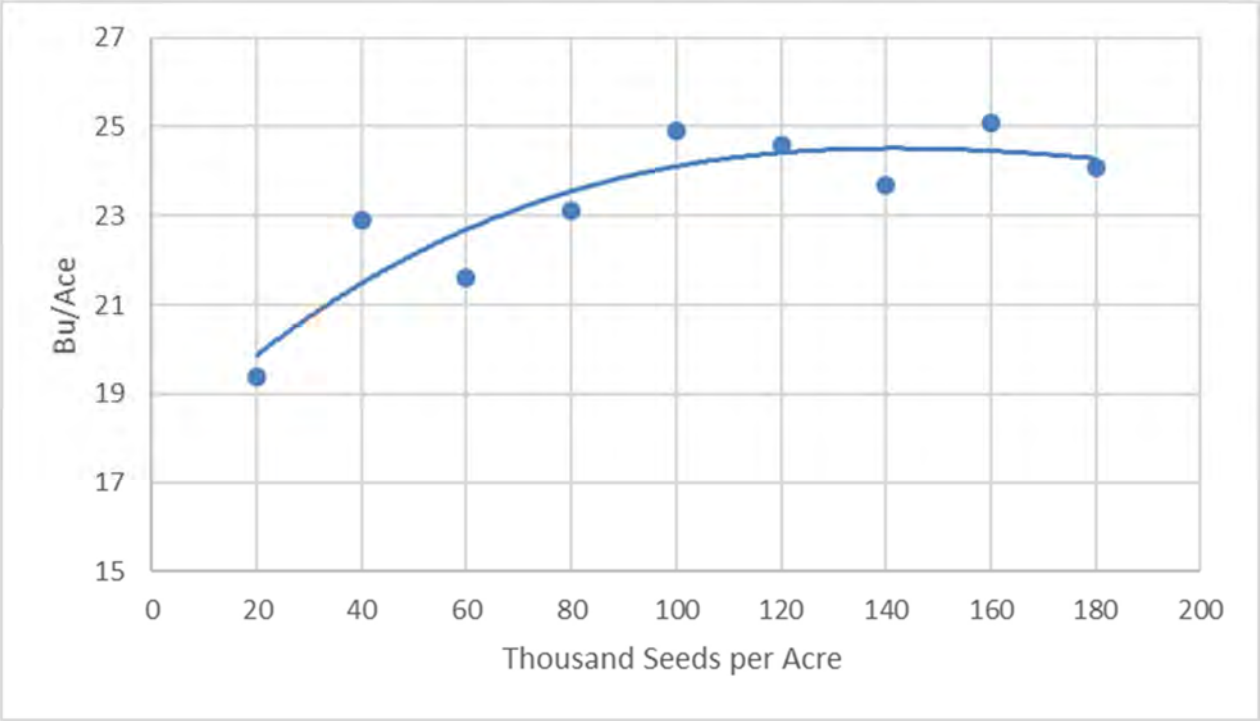
**30" Rows x Population**

| Population | Mature Date | Plant Height | Moisture | Test Weight | Seed Size | Seed Oil | Seed Protein | Grain Yield |
|---|---|---|---|---|---|---|---|---|
| | | inches | % | lbs/bu | Seeds/lb | % | % | bu/ac |
| 20,000 | 9/14 | 31 | 9.8 | 56.0 | 3279 | 17.4 | 38.1 | 19.4 |
| 40,000 | 9/11 | 29 | 8.5 | 56.7 | 3234 | 17.6 | 36.3 | 22.9 |
| 60,000 | 9/11 | 28 | 8.2 | 57.0 | 3244 | 17.6 | 35.8 | 21.6 |
| 80,000 | 9/11 | 29 | 7.4 | 57.2 | 3316 | 17.5 | 35.8 | 23.1 |
| 100,000 | 9/11 | 29 | 7.0 | 57.4 | 3349 | 17.9 | 36.5 | 24.9 |
| 120,000 | 9/11 | 29 | 9.1 | 56.6 | 3274 | 17.3 | 37.3 | 24.6 |
| 140,000 | 9/10 | 30 | 8.0 | 57.1 | 3301 | 17.6 | 35.5 | 23.7 |
| 160,000 | 9/11 | 29 | 7.1 | 57.0 | 3339 | 17.8 | 35.7 | 25.1 |
| 180,000 | 9/11 | 28 | 7.5 | 57.0 | 3327 | 17.6 | 37.2 | 24.1 |
| Trial Mean | 9/11 | 29 | 8.1 | 56.9 | 3296 | 17.6 | 36.5 | 23.3 |
| CV | 0.1 | 6.6 | 11.3 | 0.7 | 4.9 | 1.9 | 2.0 | 8.9 |
| LSD 5% | 1 | NS | 1.3 | 0.6 | NS | NS | NS | 2.8 |

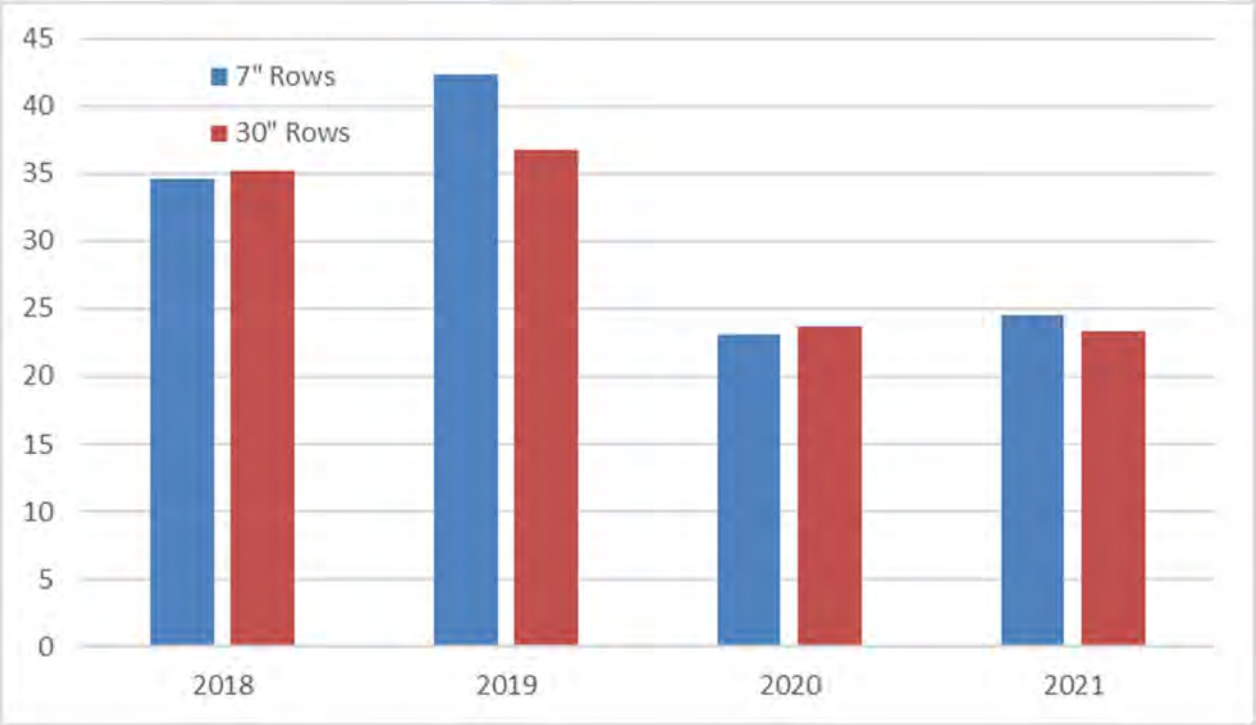
**7" Rows x Population**

| Population | Mature Date | Plant Height | Moisture | Test Weight | Seed Size | Seed Oil | Seed Protein | Grain Yield |
|---|---|---|---|---|---|---|---|---|
| | | inches | % | lbs/bu | Seeds/lb | % | % | bu/ac |
| 20,000 | 9/13 | 32 | 12.3 | 55.5 | 2669 | 16.4 | 38.5 | 17.5 |
| 40,000 | 9/10 | 25 | 8.0 | 56.2 | 3278 | 17.1 | 37.0 | 26.1 |
| 60,000 | 9/11 | 29 | 7.6 | 57.2 | 3368 | 17.3 | 36.2 | 23.4 |
| 80,000 | 9/12 | 25 | 7.8 | 56.3 | 3402 | 17.4 | 35.9 | 23.1 |
| 100,000 | 9/12 | 26 | 7.6 | 57.9 | 3266 | 17.2 | 36.8 | 26.6 |
| 120,000 | 9/11 | 26 | 8.3 | 57.2 | 3251 | 17.5 | 36.2 | 27.8 |
| 140,000 | 9/12 | 25 | 7.5 | 57.3 | 3307 | 17.4 | 36.3 | 29.8 |
| 160,000 | 9/11 | 24 | 7.6 | 56.9 | 3517 | 17.5 | 35.7 | 22.9 |
| 180,000 | 9/10 | 25 | 7.2 | 57.6 | 3462 | 17.6 | 35.7 | 23.3 |
| Trial Mean | 9/11 | 26 | 8.2 | 56.9 | 3280 | 17.3 | 36.5 | 24.5 |
| CV | 0.1 | 15.1 | 9.6 | 1.4 | 8.1 | 2.3 | 3.2 | **23.7** |
| LSD 5% | 1 | NS | 1.2 | 1.2 | 386 | 0.6 | NS | 8.5 |

Yields by Seeding Rate in 30” Rows, 2021.




Yield by Row Spacing, 2018 - 2021.



## Surface Applied Super-U Impacts on Two-row Barley Yield and Quality

Chris Augustin, Director – Dickinson Research Extension Center

### Introduction

A barley nitrogen trial sponsored by the North Dakota Barley Council was conducted in 2021 near Belfield. This

### Materials and Methods

Field plots were 10 feet wide and 40 feet long with 10 foot buffers between each plot. There were six replications and the experiment was arranged as a randomized complete block design. AAC Synergy barley (two-row) was planted on April 27, 2021 at a rate of 900,000 live plants per acre with an Amity single disc no-till drill. The initial soil test revealed 17 lbs nitrogen/ac and 70 lbs/ac of 11-52-0 fertilizer was mid-row banded at planting. Super-U was hand applied three days after planting. Super-U is a urea fertilizer treated with the nitrogen stabilizing products DCD and NBPT. Plots were combined on August 20, 2021.

### Results

Nitrogen treatments did not impact barley yield, protein, or test weight (table 1). The grain yield ranged from 8.9 to 13.6 bu/ac. Barley protein content was extremely high and ranged from 17.8 to 19.4 percent. Barley test weight ranged from 45.1 to 46.5 lbs/bu.

Table 1. Impacts of nitrogen treatments on barley yield, protein, and test weight.

| Treatment (lbs nitrogen/ac) | Yield (bu/ac) | Protein (%) | Test Weight (lbs/bu) |
|---|---|---|---|
| Check (25) | 13.6 | 17.8 | 45.7 |
| 50 | 12.3 | 18.5 | 45.6 |
| 75 | 8.9 | 18.5 | 45.3 |
| 100 | 10.3 | 18.7 | 45.1 |
| 125 | 11.8 | 18.2 | 45.2 |
| 150 | 13.6 | 18.6 | 45.7 |
| 175 | 10.4 | 19.4 | 46.5 |
| P-Value | 0.3625 | 0.4106 | 0.2472 |
| Variance | 16.73 | 0.91 | 0.98 |
| Coefficient of Variation | 35.4 | 2.1 | 5.3 |

### Summary

Barley did not respond to nitrogen treatments. The drought of 2020 and 2021 likely impacted the yields.

## 2021 Weed Control Trials

The 2021 cropping season brought many opportunities and challenges for weed control research. The spring started out dry, with almost no stored soil moisture due to the dry winter of 2020-21. Under these dry conditions, spring wheat, oat, flax, dry pea, lentil, and chickpea trials were all planted into dry soil with hopes of rainfall. Few if any weeds had emerged at planting due to these dry conditions. Spring wheat was planted on April 26-28. Dry pea were planted on April 28. Lentil were planted on April 29. Oats were planted on April 30. Chickpea were planted on May 3. Flax was planted on May 5. Safflower were planted on May 6 (varietal response to sulfentrazone) and May 15 (preemergence herbicide trial). Canola was planted on May 12. Crop seed was drilled using a John Deere 1590 no-till drill. All field have been farmed under continuous no-till for 20+ years.

Following planting, rainfall during the month of May was above normal with a recorded 4.77 inches of rain (normal or average rainfall for May is 2.46 inches in Hettinger). Many of the trials included evaluation of preemergence applied herbicides. This above normal rainfall provided good conditions for evaluating crop tolerance to these herbicides as well as efficacy for weed control. However, results will differ in years when less rainfall occurs, but it is especially important to know how crops will respond to these herbicides in years when above average rainfall occurs. This wetter than normal month of May was followed by a hotter than normal and dryer than normal June and July. In the months of June and July, only 1.7 inches of rain was recorded (normal or average rainfall for June and July is 5.5 inches at Hettinger) and temperatures were frequently above 90 F and occasionally greater than 100 F; reaching 104 F on July 3, 100 F on July 22, and 105 F on July 27. The average maximum temperature for June and July ranges from 72 to 87 F at Hettinger. These hot and dry conditions resulted in drought conditions which stunted the growth of both crops and weeds. These conditions made weed control with postemergence herbicide more difficult herbicides work best when weeds are actively growing and not stress by drought. The drought conditions resulted in high variability in crop yields making efforts to draw conclusions on crop responses to herbicides more difficult. In most cases, no significant differences in yield could be detected even when there were large differences because of the high amounts of variability. Many of these experiments conducted in 2021 will be repeated in 2022 to evaluated results under different environmental conditions.

**Effect of Fall Application of Pyroxasulfone on Spring Weed Control in Wheat.**
Pyroxasulfone (Zidua 85% DF) was applied at three application timings to evaluate effects on weed control in spring wheat compared with a fall application of glyphosate alone. There did not appear to be any difference in weed control due to timing of application. Control of green foxtail, lambsquarters, and kochia was fair to good with all rates applied, however, control was more consistent with rates of 2.25 and 2.5 oz/A of Zidua. There were no effects on wheat height and while there were differences in wheat yield, it was inconsistent, where in some Zidua treatments yield was less than in the glyphosate alone while in others there were no differences in yield.

| | | | | Green foxtail | | Lambsquarters | | Kochia | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Treatment[a] | Rate | Time[b] | 29DAE | 49DAE | 29DAE | 49DAE | 29DAE | 49DAE | Height | Yield |
| | | | ——————————— %control ——————————— | | | | | | — cm — | —Bu/A — |
| 1 Glyphosate | 22 | A | 0 d | 0 e | 0 d | 0 c | 0 c | 0 d | 48 - | 15.5 a |
| AMS | 8.5 | A | | | | | | | | |
| 2 Zidua | 2 | A | 74 a | 82 c | 55 ab | 83 ab | 91 ab | 91 ab | 48 - | 12.1 c |
| Glyphosate | 22 | A | | | | | | | | |
| AMS | 8.5 | A | | | | | | | | |
| 3 Zidua | 2.25 | A | 75 a | 89 a | 63 a | 87 a | 91 ab | 89 bc | 48 - | 15.4 a |
| Glyphosate | 22 | A | | | | | | | | |
| AMS | 8.5 | A | | | | | | | | |
| 4 Zidua | 2.5 | A | 79 a | 88 ab | 55 ab | 81 ab | 90 ab | 93 ab | 48 - | 12.5 c |
| Glyphosate | 22 | A | | | | | | | | |
| AMS | 8.5 | A | | | | | | | | |
| 5 Zidua | 2 | B | 54 c | 72 d | 26 c | 73 b | 78 ab | 84 c | 49 - | 14.8 ab |
| Glyphosate | 22 | B | | | | | | | | |
| AMS | 8.5 | B | | | | | | | | |
| 6 Zidua | 2.25 | B | 58 bc | 83 bc | 51 ab | 82 ab | 74 b | 91 ab | 47 - | 13.4 abc |
| Glyphosate | 22 | B | | | | | | | | |
| AMS | 8.5 | B | | | | | | | | |
| 7 Zidua | 2.5 | B | 71 ab | 83 bc | 58 ab | 82 ab | 91 ab | 95 ab | 49 - | 11.6 c |
| Glyphosate | 22 | B | | | | | | | | |
| AMS | 8.5 | B | | | | | | | | |
| 8 Zidua | 2 | C | 75 a | 84 abc | 41 bc | 75 ab | 95 a | 91 ab | 50 - | 12.2 c |
| Glyphosate | 22 | C | | | | | | | | |
| AMS | 8.5 | C | | | | | | | | |
| 9 Zidua | 2.25 | C | 73 ab | 85 abc | 48 ab | 74 b | 91 ab | 96 a | 48 - | 13.1 bc |
| Glyphosate | 22 | C | | | | | | | | |
| AMS | 8.5 | C | | | | | | | | |
| 10 Zidua | 2.5 | C | 71 ab | 85 abc | 41 bc | 76 ab | 94 a | 95 ab | 49 - | 14.8 ab |
| Glyphosate | 22 | C | | | | | | | | |
| AMS | 8.5 | C | | | | | | | | |
| LSD P=.10 | | | 14.8 | 6.2 | 17.0 | 13.1 | 17.5 | 6.9 | NS | 2.09 |
| Treatment Prob(F) | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.2536 | 0.0173 |

[a] Glyphosate, Roundup PowerMax (4.5 lb/gal); Zidua, pyroxasulfone (85% DF), AMS, ammonium sulfate.
[b] Time of application: A, October 7, 2020; B, October 20, 2020; C, November 2, 2020.

**Fall Application of Preemergence Herbicide Combinations for Spring Weed Control in Spring Wheat.**

Anthem Flex (pyroxasulfone + carfentrazone) was applied in the fall (October 7, 2020) to evaluate crop tolerance and weed control in spring wheat. Anthem Flex treatments were compared with other herbicide treatments. In October, following application, there was approximately 0.5 inches of precipitation (rain and snow). The remainder of the winter received little additional precipitation up until after the wheat crop was planted. Downy brome control increased with all Anthem Flex and Olympus treatments (95 to 99%) compared with glyphosate alone (80%). Kochia control with treatments containing pyroxasulfone was 81 to 97% 35 days after crop emergence compared with 0% control in Olympus and glyphosate alone treatments. Green foxtail control increased at the higher rates of Anthem Flex and were higher compared to Olympus and Authority Supreme treatments. Common lambsquarters control also increased at higher rates of Anthem Flex and Anthem Flex treatments generally resulted in better control compared with Olympus or Authority Supreme treatments. Wheat yield was very low due to drought conditions. However, glyphosate alone and the spring/fall application of Olympus resulted in the lowest wheat yield, excluding the untreated control where yield was near zero.

| | | | | Downy brome | Kochia | | Green foxtail | | Lambs-quarters | Wheat | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Treatment | | Rate | Time[a] | 14 DAE | 14 DAE | 35 DAE | 14 DAE | 35 DAE | 35 DAE | Height | Yield |
| | | oz/A | | % control | | | | | | cm | BU/A |
| 1 | Untreated control | | | 0 c | 0 c | 0 c | 0 c | 0 e | 0 d | 45 d | 0.4 e |
| 2 | Glyphosate | 22 | F | 80 b | 0 c | 0 c | 0 c | 0 e | 0 d | 48 ab | 6.0 d |
| 3 | Anthem Flex | 3.5 | F | 99 a | 97 a | 98 a | 82 a | 69 b | 66 bc | 46 bcd | 7.8 bcd |
| | Glyphosate | 22 | F | | | | | | | | |
| 4 | Anthem Flex | 4 | F | 99 a | 95 a | 96 a | 83 a | 78 a | 78 ab | 49 a | 9.0 a-d |
| | Glyphosate | 22 | F | | | | | | | | |
| 5 | Anthem Flex | 4.5 | F | 98 a | 99 a | 96 a | 87 a | 80 a | 88 a | 48 a | 9.6 abc |
| | Glyphosate | 22 | F | | | | | | | | |
| 6 | Olympus | 0.2 | F | 95 a | 25 b | 0 c | 72 b | 43 d | 0 d | 46 cd | 7.0 cd |
| | Glyphosate | 22 | F | | | | | | | | |
| | Olympus | 0.2 | S | | | | | | | | |
| 7 | Authority Supreme | 7.5 | F | 97 a | 94 a | 81 b | 84 a | 54 c | 60 c | 48 abc | 10.5 ab |
| | Glyphosate | 22 | F | | | | | | | | |
| 8 | Anthem Flex | 4 | F | 98 a | 97 a | 93 a | 87 a | 83 a | 80 a | 48 ab | 10.9 a |
| | Glyphosate | 22 | F | | | | | | | | |
| | Olympus | 0.2 | S | | | | | | | | |
| LSD P=.10 | | | | 5.7 | 22.1 | 8.2 | 5.3 | 7.1 | 12.5 | 1.7 | 3.1 |
| Treatment Prob(F) | | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0164 | 0.003 |

[a]Glyphosate, Roundup PowerMAX (4.5 lb/gal); Anthem Flex, carfentrazone (0.267 lb/gal) plus pyroxasulfone (3.733 lb/gal); Olympus, propoxycarbazone-sodium (70% DF); Authority Supreme, pyroxasulfone + sulfentrazone (2.08 + 2.08 lb/gal).

[b]AMS (ammonium sulfate) at a rate of 8.5 lb/100 gal was added to all treatments including Roundup PowerMax; a nonionic surfactant (NIS) at 0.5% v/v was add to treatments containing Olympus.

[c]Time of application: Fall (F); applied on October 7, 2020, or Spring (S); May 26, 2021.

**Spring wheat response to timing of application of pyroxasulfone (Zidua SC).**

Pyroxasulfone (Zidua SC) was applied at rates of 1.75 to 4.0 oz/A at three application timings in wheat. Application timings were at-planting preemergence, delayed preemergence (about a week after planting after wheat had germinated and coleoptiles were approximately 0.75 inches in length and had not emerged), and early postemergence (one-leaf wheat stage). Trials were conducted in 2019, 2020, and 2021 in order to evaluate over different environmental conditions. Trials were maintained weed free through postemergence application of grass and broadleaf herbicides applied to the entire trial. In all three years this trial was conducted there were no differences in wheat yield due to timing or rate of Zidua application. However, the Zidua label for spring wheat only allows for application of Zidua at the delayed preemergence or postemergence due to potential for injury to wheat.

| | | Application | Wheat Yield | | | |
|---|---|---|---|---|---|---|
| Treatment | Rate | Timing | 2019 | 2020 | 2021 | 3-Yr Avg |
| | oz/A | | bu/acre | | | |
| 1 Zidua SC[a] | 1.75 | PRE[b] | 60.3 - | 40.1 - | 30.7 - | 43.7 - |
| 2 Zidua SC | 2.5 | PRE | 63.3 - | 42.0 - | 29.4 - | 44.9 - |
| 3 Zidua SC | 3.25 | PRE | 61.0 - | 42.7 - | 30.8 - | 44.8 - |
| 4 Zidua SC | 4.0 | PRE | 61.1 - | 37.7 - | 31.3 - | 43.4 - |
| 5 Zidua SC | 1.75 | DPRE | 58.8 - | 36.1 - | 32.0 - | 42.3 - |
| 6 Zidua SC | 2.5 | DPRE | 61.4 - | 40.8 - | 31.0 - | 44.4 - |
| 7 Zidua SC | 3.25 | DPRE | 63.7 - | 39.5 - | 29.6 - | 44.3 - |
| 8 Zidua SC | 4.0 | DPRE | 59.8 - | 43.0 - | 34.3 - | 45.7 - |
| 9 Zidua SC | 1.75 | POST | 63.9 - | 39.0 - | 29.7 - | 44.2 - |
| 10 Zidua SC | 2.5 | POST | 59.2 - | 44.2 - | 30.0 - | 44.4 - |
| 11 Zidua SC | 3.25 | POST | 58.1 - | 40.2 - | 30.8 - | 43.0 - |
| 12 Zidua SC | 4.0 | POST | 61.8 - | 45.3 - | 34.2 - | 47.1 - |
| 13 Untreated Check | | | 63.4 - | 39.5 - | 31.7 - | 44.8 - |
| LSD P=.10 | | | NS | NS | NS | NS |
| Treatment ProDPRE(F) | | | 0.9978 | 0.3813 | 0.4784 | 0.8734 |

[a]Zidua SC, pyroxasulfone (4.17 lb/gal)

[b]Timing: PRE, preemergence (applied at planting); DPRE, delayed preemergence (applied after wheat seed has geminated and coleoptile is at least 0.75 inches but has not emerged); POST, postemergence (after wheat emergence, at 1-leaf stage).

**Postemergence control of kochia in spring wheat.**

A trial was conducted to evaluate different herbicide combinations for control of kochia in spring wheat. Wheat was planted on April 28, 2021. Herbicides were applied on June 2, 2021 at the early-tiller stage of wheat maturity. At time of application, kochia height averaged 3.4 inches, common mallow height averaged 2.4 inches, and field bindweed runners averaged 6.4 inches in length. Due to the hot and dry conditions following herbicide application, weeds became stressed due to lack of soil moisture. Under these conditions, many of the systemic type herbicides did not perform as well as would be expected under more favorable growing conditions. Under these conditions herbicide combinations that included bromoxynil, which is a primarily a contact herbicide, often performed better than those with systemic herbicides alone (such as fluroxypyr, or MCPA). This was especially true for kochia control. Even while there were differences in weed control, there were no differences in wheat height or yield due to herbicide treatments. Lack of differences in yield may be due to the high amount of yield variability due to the drought conditions which severely limited crop production.

| | | Kochia | | | Common mallow | | Bindweed | | Wheat | |
|---|---|---|---|---|---|---|---|---|---|---|
| Treatment[ab] | Rate | 13 DAT | 23 DAT | 49 DAT | 13 DAT | 23 DAT | 13 DAT | 23 DAT | Height | Yield |
| | oz/A | % control | | | | | | | cm | Bu/A |
| 1 Untreated | | 0 j | 0 j | 0 i | 0 h | 0 g | 0 g | 0 h | 48 - | 22.4 - |
| 2 Starane Ultra | 5.3 | 73 fgh | 67 hi | 71 g | 77 efg | 93 cde | 73 abc | 91 ab | 48 - | 24.8 - |
| 3 OpenSky | 16 | 76 efg | 78 efg | 79 f | 79 def | 97 a-d | 69 a-e | 83 b-e | 46 - | 21.3 - |
| 4 Quelex<br>Starane Ultra | 0.75<br>5.3 | 77 d-g | 76 fg | 86 cde | 84 b-e | 95 a-d | 76 abc | 88 a-e | 47 - | 24.8 - |
| 5 Quelex<br>OpenSky | 0.75<br>16 | 57 i | 66 i | 63 h | 72 g | 83 f | 57 f | 70 f | 47 - | 25.8 - |
| 6 WideMatch | 21.3 | 72 fgh | 79 d-g | 81 ef | 78 efg | 95 a-d | 67 b-f | 90 abc | 48 - | 23.7 - |
| 7 WideMatch<br>MCPE | 21.3<br>8 | 64 hi | 65 i | 66 gh | 76 fg | 91 de | 72 a-d | 92 a | 48 - | 20.1 - |
| 8 WideMatch<br>Quelex | 21.3<br>0.75 | 73 fg | 76 fg | 83 def | 80 def | 94 a-e | 71 a-d | 82 b-e | 48 - | 23.2 - |
| 9 PerfectMatch | 16 | 76 efg | 80 d-g | 83 ef | 82 cde | 99 abc | 68 b-e | 89 a-e | 46 - | 22.5 - |
| 10 Supremacy | 4 | 71 gh | 63 i | 66 gh | 76 fg | 88 ef | 63 def | 58 g | 45 - | 23.1 - |
| 11 Talinor | 13.7 | 85 bcd | 89 bc | 90 bcd | 83 b-e | 92 de | 61 ef | 89 a-d | 47 - | 22.8 - |
| 12 Huskie Complete | 13.7 | 89 ab | 92 ab | 93 abc | 89 abc | 99 ab | 73 a-d | 80 def | 47 - | 26.9 - |
| 13 Huskie FX | 18 | 94 a | 97 a | 97 a | 91 a | 100 a | 78 a | 85 a-e | 49 - | 29.3 - |
| 14 Huskie FX<br>LuxxurB | 18<br>6.85 | 83 b-e | 86 bcd | 92 abc | 89 ab | 99 abc | 78 a | 79 ef | 46 - | 22.0 - |
| 15 Huskie FX<br>LuxxurA<br>LuxxurB | 18<br>0.21<br>6.85 | 89 abc | 92 ab | 95 ab | 89 abc | 99 ab | 77 a | 88 a-e | 46 - | 24.1 - |
| 16 Carnivore | 1 | 81 b-f | 84 cde | 84 def | 85 a-d | 94 b-e | 76 ab | 88 a-e | 49 - | 29.2 - |
| LSD P=.10 | | 8.75 | 7.23 | 6.86 | 6.63 | 6.47 | 9.45 | 9.59 | 2.55 | 5.86 |
| Treatment Prob(F) | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.5974 | 0.4362 |

[a]Starane Ultra, fluroxypyr (2.8 lb/gal); OpenSky, pyroxsulam + fluroxypyr (0.107+0.095 lb/gal); Quelex, halauxifen + florasulam (0.1 + 0.1 lb/gal); WideMatch, fluroxypyr + clopyralid (0.75 + 0.75 lb/gal); MCPE, MCPA-ester (4 lb/gal); PerfectMatch, pyroxsum + clopyralid + fluroxypyr (0.11 + 0.75 + 0.75 lb/gal); Supremacy, fluroxypyr + tribenuron + thifensulfuron (WDG 25 + 1.5 + 4.5%); Talinor, bromoxynil + bicyclopyrone (1.46 + 0.31 lb/gal); Huskie Complete, thiencarbazone + pyrasulfotole + bromoxynil (0.042 + 0.26 + 1.46 lb/gal); Huskie FX, pyrasulftole + bromoxynil + fluroxypyr (0.26 + 1.44 + 0.6 lb/gal); LuxxurA, tribenuron (50% SG); LuxxurB, thinfensulfuron (0.083 lb/gal).

[b]NIS (0.5% v/v) was included with treatments 3, 4, 5, 8, 9, 10, and 13; COC and CoAct+ (1% v/v and 2.5 oz/A) was included with treatment 11; AMS (15 lb/100 gal) was included with treatments 3, 9, 10 and 13 and 5 lb/100 in treatment 12.

**Oat response to preemergence and postemergence herbicides.**

A trial was conducted to evaluate oat response to preemergence herbicides applied at planting and at the 1-leaf stage of oats; trial also included evaluation of two postemergence herbicides, topramezone (Armezon) and tembotrione (Laudis) applied at the 1-leaf and 4-leaf growth stage. Oat was planted on April 30 and emerged on May 14. Herbicide treatments were applied on May 4, May 26, and June 5, for preemergence, 1-leaf, and 4-leaf timings. More than an inch of rainfall occurred after planting and prior to oat emergence. Following the preemergence application, Zidua caused severe injury to oats; Outlook also resulted in moderate injury to oats. This was observed at all evaluation dates. Dual II Magnum also resulted in minor to moderate injury to oats. Injury was much reduced when preemergence herbicides were applied after oats had emerged. Both Armezon and Laudis caused minor to moderate injury of oats. Oat height was reduced following PRE application of Zidua (3 oz/A) and Outlook. Other treatments did not reduce height compared to the untreated control. Zidua (3 oz/A) applied PRE reduced wheat yield by more than 50%. Dual II Magnum, Prowl H2O, and Outlook also reduced yield when applied PRE. At the 1-leaf application timing, Zidua, Dual II Magnum, Prowl H2O, Armezon, and Laudis all resulted in yield that was less than the untreated control. At the 4-leaf stage, Armezon reduced oat yield, but Laudis did not. The above normal rainfall that occurred in May, followed by drought conditions that occurred during June and July likely contributed to the observed yield losses.

| Treatment[ab] | Rate | Time[c] | Injury[d] | | | | Height | Yield |
|---|---|---|---|---|---|---|---|---|
| | | | 21 DAA | 9 DAB | 10 DAC | 20 DAC | | |
| | oz/A | | ——————————%—————————— | | | | cm | Bu/A |
| 1 Untreated | | ABC | 0 c | 0 e | 0 e | 0 e | 51 abc | 1163 a |
| 2 Zidua | 1.5 | A | 21 b | 49 b | 41 b | 23 c | 46 cde | 1034 a-d |
| 3 Zidua | 3 | A | 64 a | 75 a | 68 a | 56 a | 43 e | 455 f |
| 4 Warrant | 48 | A | 0 c | 0 e | 3 de | 0 e | 54 a | 1037 abc |
| 5 Dual II Magnum | 27 | A | 0 c | 11 c | 15 c | 4 de | 51 a-d | 904 de |
| 6 Prowl H2O | 48 | A | 0 c | 0 e | 0 e | 0 e | 53 ab | 918 de |
| 7 Outlook | 18 | A | 25 b | 49 b | 43 b | 31 b | 45 de | 945 cde |
| 8 Zidua | 1.5 | B | | 5 de | 2 de | 0 e | 49 a-d | 969 b-e |
| 9 Zidua | 3 | B | | 0 e | 4 de | 6 d | 48 b-e | 943 cde |
| 10 Warrant | 48 | B | | 0 e | 3 de | 0 e | 53 ab | 1052 abc |
| 11 Dual II Magnum | 27 | B | | 0 e | 0 e | 0 e | 52 abc | 879 e |
| 12 Prowl H2O | 48 | B | | 0 e | 1 de | 0 e | 55 a | 1000 bcd |
| 13 Outlook | 18 | B | | 0 e | 0 e | 0 e | 54 ab | 1034 a-d |
| 14 Armezon | 1 | B | | 12 c | 7 d | 2 de | 49 a-d | 947 cde |
| 15 Armezon | 1 | C | | 0 e | 14 c | 3 de | 51 a-d | 986 b-e |
| 16 Laudis | 3 | B | | 10 cd | 4 de | 0 e | 53 ab | 964 cde |
| 17 Laudis | 3 | C | | 0 e | 7 d | 1 e | 54 ab | 1075 ab |
| LSD P=.10 | | | 6.4 | 5.5 | 6.7 | 4.8 | 6.2 | 107.0 |
| Treatment Prob(F) | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0637 | 0.0002 |

[a]Zidua, pyroxasulfone (85% DF); Warrant, acetochlor (3 lb/gal); Dual II Magnum, metolachlor, 7.64 lb/gal); Prowl H2O, pendimethalin (3.8 lb/gal); Outlook, dimethenamid (6 lb/gal); Armezon, topramezone (2.8 lb/gal); Laudis, tembotrione (3.5 lb/gal).

[b]COC (1% v/v) was included with Armezon treatments; MSO (1% v/v) was included with Laudis treatments.

[c]Time of application: A, at planting; B, at 1-2 leaf oats; C, at 4-5 leaf oats.

[d]Injury evaluations: 21 DAA, 21 days after 'A' PRE treatments, May 25, 11 days after oat emergence; 9 DAB, 9 days after 'B' application, June 4; 10 DAC, 10 days after 'C' application, June 15; 20 DAC, 20 days after 'C' treatment.

**Evaluation of Potential for Carryover of Fall-applied 2,4-D and Dicamba in Dry Pea, Lentil, Chickpea, and Sunflower.**

A trial was conducted to evaluate response of spring broadleaf crops (dry pea, chickpea, lentil, and sunflower) to fall application of dicamba. Dicamba and 2,4-D treatments were applied on November 2, 2020. While this late application date is generally later than when these herbicides would be applied, it would represent a latest possible date with the highest potential for carryover. Conditions following application were such that carryover potential was high due to lack of winter and spring precipitation. This allowed for more of the herbicide to remain on the soil surface, avoiding degradation. Dry pea were planted on April 28, chickpea on April 29, and Lentil on April 30; sunflower were planted on May 14, 2021. Under these conditions, injury was dry pea, chickpea, and lentil 18 days after crop emergence. However, no injury was observed to sunflower. At 37 days after crop emergence, injury was still visible in dry pea and lentil, but not in chickpea or sunflower. When crop height was measured at 32 days after emergence, there were no significant reductions in height for any of the crops evaluated. However, there was a reduction in lentil population for both dicamba treatments. No other crop had a significant reduction in stand population due to herbicide treatment. Yield of lentil was reduced only at the higher dicamba rate (8 oz/A). There were no significant reductions in crop yield in dry pea, chickpea due to dicamba or 2,4-D treatments. Sunflower was not harvested due to damage from birds and deer that left little available for harvesting. This trial supports the safety of fall application of 2,4-D for weed control prior to planting spring broadleaf crops. However, there is potential risk for injury, especially in lentil, for fall applications of dicamba.

| | | | Crop injury | | Crop height | | | |
|---|---|---|---|---|---|---|---|---|
| Treatment | | Rate | 18 DAE | 37 DAE | 32 DAE | 63 DAE | Crop stand | Yield |
| | | – oz/A – | ——— % ——— | | ——— cm ——— | | – No./ $m^2$ – | – LB/A – |
| | Dry Pea | | | | | | | |
| 1 | Untreated | | 0 e | 0 c | 32 ab | | 55 def | 1163 bc |
| 2 | 2,4-D ester | 16 | 0 e | 0 c | 33 a | | 66 d | 1193 abc |
| 3 | 2,4-D ester | 32 | 0 e | 0 c | 30 bcd | | 57 de | 1143 bc |
| 4 | Dicamba | 4 | 8 de | 5 c | 31 abc | | 56 def | 1119 bcd |
| 5 | Dicamba | 8 | 48 b | 24 b | 31 abc | | 53 def | 1082 bcd |
| | Chickpea | | | | | | | |
| 6 | Untreated | | 0 e | 0 c | 28 e | | 40 ef | 1300 ab |
| 7 | 2,4-D ester | 16 | 0 e | 0 c | 29 cde | | 39 ef | 1184 abc |
| 8 | 2,4-D ester | 32 | 0 e | 0 c | 27 e | | 36 f | 1288 ab |
| 9 | Dicamba | 4 | 1 e | 0 c | 28 e | | 49 def | 1176 abc |
| 10 | Dicamba | 8 | 29 c | 5 c | 28 de | | 43 ef | 1397 a |
| | Lentil | | | | | | | |
| 11 | Untreated | | 0 e | 0 c | 21 hi | | 219 a | 945 cde |
| 12 | 2,4-D ester | 16 | 0 e | 0 c | 21 ghi | | 205 a | 807 ef |
| 13 | 2,4-D ester | 32 | 5 e | 3 c | 20 i | | 215 a | 872 def |
| 14 | Dicamba | 4 | 14 d | 6 c | 21 hi | | 180 b | 819 ef |
| 15 | Dicamba | 8 | 58 a | 46 a | 19 i | | 132 c | 694 f |
| | Sunflower | | | | | | | |
| 16 | Untreated | | 0 e | 0 c | 23 fgh | 85 - | 45 def | |
| 17 | 2,4-D ester | 16 | 0 e | 0 c | 24 f | 86 - | 41 ef | |
| 18 | 2,4-D ester | 32 | 0 e | 0 c | 21 ghi | 81 - | 46 def | |
| 19 | Dicamba | 4 | 0 e | 0 c | 23 fg | 78 - | 48 def | |
| 20 | Dicamba | 8 | 0 e | 0 c | 21 ghi | 79 - | 45 def | |
| LSD P=.10 | | | 8.05 | 8.47 | 2.41 | 21.15 | 15.29 | 230.4 |
| Treatment Prob(F) | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.6979 | 0.0002 |

**Weed Control in Dry Pea with Preemergence Burndown Herbicide Combinations.**
A trial was conducted to evaluate preemergence herbicide options for weed control in dry pea. Dry pea were planted on April 28, 2021. Herbicide treatments were applied on May 6. Dry pea emerged on May 17. All treatments included glyphosate and were compared with glyphosate alone and an untreated control (no herbicide). There were few weeds present at time of application. Wild buckwheat control was best with sulfentrazone + metolachlor (Spartan Elite) and with sulfentrazone plus saflufenacil (Spartan + Sharpen). Kochia control was reduced only with the pyroxasulfone + sulfentrazone (Authority Edge) and carfentrazone (Aim) alone. Dry pea yield was highest with the Spartan Elite, Spartan Charge, Sharpen, and Anthem Flex treatments.

| Treatment[ab] | | Rate | Wild buckwheat | | Kochia | | Height | | Stand | | Yield | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz/A | ———— % control ———— | | | | cm | | No./m$^2$ | | LB/A | |
| 1 | Authority Supreme | 5.8 | 50 | bc | 100 | a | 30 | - | 52 | bcd | 507 | bcd |
| | Aim | 1 | | | | | | | | | | |
| | Roundup PowerMax | 0.77 | | | | | | | | | | |
| 2 | Spartan Elite | 19 | 99 | a | 98 | ab | 31 | - | 51 | bcd | 709 | a |
| | Aim | 1 | | | | | | | | | | |
| | Roundup PowerMax | 0.77 | | | | | | | | | | |
| 3 | Spartan Charge | 3.75 | 75 | ab | 100 | a | 31 | - | 58 | a | 709 | a |
| | Roundup PowerMax | 0.77 | | | | | | | | | | |
| 4 | Sharpen | 2 | 76 | ab | 95 | ab | 31 | - | 44 | e | 604 | ab |
| | Roundup PowerMax | 0.77 | | | | | | | | | | |
| 5 | Spartan | 2.28 | 100 | a | 100 | a | 30 | - | 52 | bcd | 534 | bc |
| | Sharpen | 2 | | | | | | | | | | |
| | Roundup PowerMax | 0.77 | | | | | | | | | | |
| 6 | Authority Edge | 4.4 | 55 | bc | 80 | bc | 30 | - | 57 | ab | 509 | bc |
| | Aim | 1 | | | | | | | | | | |
| | Roundup PowerMax | 0.77 | | | | | | | | | | |
| 7 | Anthem Flex | 4 | 21 | cd | 100 | a | 31 | - | 50 | cde | 713 | a |
| | Aim | 0.47 | | | | | | | | | | |
| | Roundup PowerMax | 0.77 | | | | | | | | | | |
| 8 | Roundup PowerMax | 0.77 | 29 | cd | 64 | c | 29 | - | 55 | abc | 518 | bc |
| | Aim | 1 | | | | | | | | | | |
| 9 | Roundup PowerMax | 0.77 | 0 | d | 0 | d | 29 | - | 51 | bcd | 446 | cd |
| 10 | Untreated | | 0 | d | 0 | d | 29 | - | 48 | de | 361 | d |
| LSD P=.10 | | | 35.6 | | 17.1 | | 1.9 | | 6.0 | | 147.0 | |
| Treatment Prob(F) | | | 0.0001 | | 0.0001 | | 0.1174 | | 0.0196 | | 0.0029 | |

[a] Authority Supreme, pyroxasulfone (2.08 lb/gal) plus sulfentrazone 2.08 lb/gal); Aim, carfentrazone (2 lb/gal); Roundup PowerMax, glyphosate (4.5 lb/gal); Spartan Elite, sulfentrazone (0.7 lb/gal) plus metolachlor (6.3 lb/gal) Spartan Charge, sulfentrazone (3.15 lb/ga) plus carfentrazone (0.35 lb/gal); Spartan, sulfentrazone (4 lb/gal); Sharpen, saflufenacil (2.85 lb/gal); Authority Edge, pyroxasulfone (1.52 lb/gal) plus sulfentrazone (2.73 lb/gal); Anthem Flex, carfentrazone (0.267 lb/gal) plus pyroxasulfone (3.733 lb/gal).
[b]All treatments included ammonium sulfate (AMS), 8.5 lb/100 gal and Methylated Seed Oil (MSO), 1% v/v.

**Preemergence Weed Control in Chickpea.**

A trial was conducted to evaluate preemergence herbicides for weed control in chickpea. Chickpea was planted on May 3, 2021 and herbicide treatments were applied on May 6. Few weeds had emerged at time of herbicide application. Weed control was evaluated 15 and 29 days after chickpea emergence. Treatments containing sulfentrazone resulted in best control of wild buckwheat, common lambsquarters, and kochia. Pyroxasulfone plus carfentrazone (Anthem Flex) treatments also resulted in best control of kochia, but was less consistent in control of wild buckwheat and common lambsquarters. No treatment reduced chickpea stand and while there were significant differences in chickpea height, there was no consistent response. Chickpea yield was highly variable due to the drought conditions and no differences in yield were observed.

| | | | Wild buckwheat | | Lambsquarters | | Kochia | | | Chickpea | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Treatment[ab] | | Rate | 15 DAE | 29 DAE | 15 DAE | 29 DAE | 15 DAE | 29 DAE | Stand | Height | Yield |
| | | oz/A | % control | | | | | | No/m$^2$ | cm | Bu/A |
| 1 | Authority Supreme Aim | 5.8 1 | 100 a | 100 a | 100 a | 100 a | 100 a | 100 a | 37 - | 30 a-d | 868 - |
| 2 | Spartan Elite Aim | 19 1 | 94 abc | 100 a | 98 ab | 98 a | 100 a | 100 a | 34 - | 30 ab | 852 - |
| 3 | Spartan Charge | 3.75 | 95 ab | 96 ab | 100 a | 100 a | 98 a | 97 a | 35 - | 29 cde | 590 - |
| 4 | Sharpen | 1 | 61 f | 45 c | 48 d | 31 c | 34 c | 30 c | 36 - | 29 e | 662 - |
| 5 | Sharpen | 2 | 94 ab | 84 ab | 70 c | 51 c | 44 c | 41 c | 37 - | 29 e | 774 - |
| 6 | Sharpen | 3 | 87 bc | 75 abc | 89 b | 85 ab | 77 b | 68 b | 36 - | 31 a | 783 - |
| 7 | Authority Edge Aim | 4.4 1 | 100 a | 100 a | 100 a | 100 a | 100 a | 98 a | 40 - | 30 b-e | 603 - |
| 8 | Anthem Flex | 3 | 66 ef | 48 c | 94 ab | 75 b | 97 a | 93 a | 34 - | 31 ab | 788 - |
| 9 | Anthem Flex | 4 | 83 cd | 90 ab | 88 b | 81 ab | 98 a | 94 a | 36 - | 30 abc | 745 - |
| 10 | Anthem Flex | 5 | 75 de | 71 bc | 92 ab | 91 ab | 99 a | 95 a | 35 - | 30 b-e | 703 - |
| 11 | Untreated | | 0 | 0 | 0 | 0 | 0 | 0 | 40 - | 29 de | 629 - |
| LSD P=.10 | | | 11.28 | 27.79 | 10.05 | 20.39 | 10.86 | 15.77 | NS | 1.09 | NS |
| Treatment Prob(F) | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.8220 | 0.0165 | 0.6037 |

[a]All treatments (including the untreated control) were tank-mixed with glyphosate (Roundup PowerMax at 22 oz/A), AMS (8.5 lb/100 gal), and MSO (1% v/v).

[b]Authority Supreme, sulfentrazone + pyroxasulfone (2.08 + 2.08 lb/gal); Aim, carfentrazone (2 lb/gal), Spartan Elite, sulfentrazone + metolachlor (0.7 + 6.3 lb/gal); Spartan Charge, sulfentrazone + carfentrazone (3.15 + 0.35 lb/gal); Sharpen, saflufenacil (2.85 lb/gal); Authority Edge sulfentrazone + pyroxasulfone (2.73 + 1.52 lb/gal); Anthem Flex, carfentrazone + pyroxasulfone (0.267 + 3.733 lb/gal).

**Preemergence Burndown Combinations for Weed Control in Lentil.**
A trial was conducted to evaluate Anthem Flex and metribuzin combinations for weed control and lentil tolerance. Lentil were planted on April 29, 2021. Herbicide treatments were applied on May 5. Lentil emerged on May 15. Rainfall measuring 1.1 inches fell between herbicide application and lentil emergence. Kochia control was 96 to 100% 39 days after emergence with all treatments except pendimethalin (Prowl H2O) where no kochia control was observed. Wild buckwheat control was inconsistent. No herbicide treatment resulted in reduction of lentil height, stand, and yield.

| | | | Kochia | | Wild buckwheat | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Treatment[a] | | Rate | 24 DAE | 39 DAE | 24 DAE | 39 DAE | Height | Stand | Yield |
| | | oz/A | % control | | | | cm | No./m$^2$ | LB/BU |
| 1 | Anthem Flex<br>Roundup PowerMax | 3.5<br>22 | 100 a | 100 a | 45 c | 38 e | 19 - | 235 - | 1475 - |
| 2 | Anthem Flex<br>Roundup PowerMax | 4<br>22 | 100 a | 100 a | 69 ab | 73 ab | 20 - | 209 - | 1355 - |
| 3 | Anthem Flex<br>Metribuzin<br>Roundup PowerMax | 3.5<br>2<br>22 | 95 b | 97 a | 53 bc | 66 bc | 20 - | 216 - | 1395 - |
| 4 | Anthem Flex<br>Metribuzin<br>Roundup PowerMax | 4<br>2<br>22 | 100 a | 96 a | 56 bc | 73 ab | 19 - | 243 - | 1159 - |
| 5 | Anthem Flex<br>Metribuzin<br>Roundup PowerMax | 3.5<br>4<br>22 | 100 a | 100 a | 68 abc | 80 a | 19 - | 230 - | 1128 - |
| 6 | Anthem Flex<br>Metribuzin<br>Roundup PowerMax | 4<br>4<br>22 | 100 a | 100 a | 57 bc | 46 de | 20 - | 235 - | 1625 - |
| 7 | Anthem Flex<br>Metribuzin<br>Roundup PowerMax | 3.5<br>5.3<br>22 | 100 a | 100 a | 80 a | 83 a | 19 - | 234 - | 1311 - |
| 8 | Anthem Flex<br>Metribuzin<br>Roundup PowerMax | 4<br>5.3<br>22 | 100 a | 100 a | 71 ab | 78 a | 19 - | 245 - | 1239 - |
| 9 | Anthem Flex<br>Roundup PowerMax | 6<br>22 | 100 a | 97 a | 61 abc | 58 cd | 20 - | 242 - | 1424 - |
| 10 | Prowl H2O<br>Roundup PowerMax | 40<br>22 | 0 c | 0 b | 0 d | 0 f | 20 - | 217 - | 1522 - |
| LSD P=.10 | | | 3.8 | 4.5 | 22.8 | 11.6 | NS | NS | NS |
| Treatment Prob(F) | | | 0.0001 | 0.0001 | 0.0003 | 0.0001 | 0.1216 | 0.6910 | 0.6446 |

[a]Anthem Flex, carfentrazone + pyroxasulfone (0.267 + 3.733 lb/gal); Roundup PowerMAX, glyphosate (4.5 lb/gal); Metribuzin (75% DF); Prowl H2O, pendimethalin (3.8 lb/gal).

**Flax Response to Preemergence Herbicides.**

A trial was conducted to evaluate flax response to preemergence herbicides. Flax was planted on May 5, 2021 and herbicides treatments were applied on May 6. Flax emerged on May 18. Rainfall of 1.1 inches was recorded after planting and prior to flax emergence. Under these conditions, injury was observed with most treatments 21 days after flax emergence, with the high rate of Spartan plus Zidua and Outlook resulting in the greatest injury. For most treatments, injury was not visible at 31 and 38 days after emergence. However, the high rate of Zidua, the higher combination of Spartan plus Zidua, and Outlook treatments still resulted in moderate injury of flax. No treatment reduced flax stand, but there were differences in flax height due to herbicide treatment. However, differences in height were small and inconsistent with a range of 33 to 37 cm; however, flax height was lowest following application of Outlook. While there were differences in yield they were associated with both weed control and herbicide injury as common mallow emerged with the flax and competed with flax for the limited soil moisture resources available in 2021 due to drought conditions.

| | | | Injury | | | | | |
|---|---|---|---|---|---|---|---|---|
| Treatment[a] | | Rate | 21DAE | 31 DAE | 38 DAE | Height | Stand | Yield |
| | | oz/A | % | | | cm | No/m$^2$ | LB/A |
| 1 | Untreated | — | 5 c | 0 d | 0 b | 35 cde | 241 - | 203 d |
| 2 | Zidua | 1.5 | 8 bc | 0 d | 1 b | 36 b-e | 223 - | 287 cd |
| 3 | Zidua | 3 | 19 b | 20 b | 13 a | 35 de | 175 - | 301 bcd |
| 4 | Spartan | 4 | 8 bc | 0 d | 0 b | 37 abc | 187 - | 341 abc |
| | Zidua | 1.5 | | | | | | |
| 5 | Spartan | 8 | 30 a | 20 b | 14 a | 35 de | 164 - | 344 abc |
| | Zidua | 3 | | | | | | |
| 6 | Warrant | 48 | 9 bc | 0 d | 6 b | 36 a-d | 248 - | 207 d |
| 7 | Dual II Magnum | 24 | 16 b | 0 d | 0 b | 37 a | 192 - | 422 ab |
| 8 | BroadAxe | 22.8 | 15 bc | 0 d | 3 b | 37 ab | 199 - | 439 a |
| | Dual II Magnum | 5.2 | | | | | | |
| 9 | Prowl H2O | 48 | 14 bc | 8 c | 0 b | 34 ef | 204 - | 335 abc |
| 10 | Outlook | 18 | 33 a | 29 a | 16 a | 33 f | 178 - | 223 cd |
| LSD P=.10 | | | 10.9 | 4.8 | 6.7 | 1.6 | NS | 127 |
| Treatment Prob(F) | | | 0.0017 | 0.0001 | 0.0003 | 0.0006 | 0.3112 | 0.0332 |

[a]Zidua, pyroxasulfone (85% DF); Spartan, sulfentrazone (4 lb/gal); Warrant, acetochlor (3 lb/gal); Duall II Magnum, metolachlor (7.64 lb/gal); BroadAxe, sulfentrazone + metolachlor (0.7 + 6.3 lb/gal); Prowl H2O, pendimethalin (3.8 lb/gal); Outlook, dimethenamid (6 lb/gal).

**Flax Response to Postemergence Herbicides.**

A trial was conducted to evaluate falx response to postemergence herbicides. Flax was planted on May 5 and emerged on May 18. Herbicide treatments were applied on June 1 when flax was 2 to 3 inches in height. Imazamox (Raptor) treatments resulted in the greatest flax injury. When Raptor was tank-mixed with bentazon (Basagran), injury was less than with Raptor alone. Laudis and Laudis plus Bison also caused severe injury to flax. When flax height was measured 23 days after treatment application, flax height was lowest following the Laudis + Bison treatment. Raptor alone also reduced flax height significantly. Due to drought conditions, flax yield was low and highly variable and no differences in yield were seen in this trial.

| | Treatment[ab] | Rate | Injury 10 DAT | Injury 17 DAT | Injury 24 DAT | Height | Yield |
|---|---|---|---|---|---|---|---|
| | | oz/A | % | % | % | cm | Bu/A |
| 1 | Armezon | 0.5 | 0 e | 0 e | 3 ef | 34 b | 228 - |
| 2 | Armezon | 0.75 | 0 e | 0 e | 5 e | 34 b | 144 - |
| 3 | Bison | 16 | 1 e | 4 e | 11 d | 35 b | 198 - |
| 4 | Basagran | 16 | 0 e | 0 e | 0 f | 41 a | 277 - |
| 5 | Raptor | 4 | 30 b | 31 b | 30 b | 29 c | 230 - |
| 6 | Basagran<br>Raptor | 16<br>4 | 9 d | 15 d | 14 cd | 35 b | 243 - |
| 7 | Basagran<br>Raptor | 16<br>6 | 18 c | 17 d | 17 c | 34 b | 122 - |
| 8 | Laudis | 3 | 20 c | 21 c | 16 c | 34 b | 219 - |
| 9 | Laudis<br>Bison | 3<br>16 | 48 a | 43 a | 46 a | 24 d | 239 - |
| 10 | Untreated | — | 0 e | 0 e | 0 f | 38 a | 250 - |
| LSD P=.10 | | | 5.6 | 4.1 | 4.3 | 2.9 | 102.1 |
| Treatment Prob(F) | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.3433 |

[a]Armezon, topramezone (2.8 lb/gal); Bison, bromoxynil + MCPA (2 + 2 lb/gal); Basagran, bentazon (4 lb/gal); Raptor, imazamox (1 lb/gal); Laudis, tembotrione (3.5 lb/gal).

[b]Adjuvants: Crops Oil Concentrate was included at 1% v/v with treatments 1, 2, and 4; Methylate Seed Oil was included at 1% v/v with treatments 6, 7, 8, and 9; Nonionic surfactant was included at 0.25% v/v and 28% N was included at 2.5% v/v with treatment 5.

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