



# 2023 Barley Field Crop Trials Results

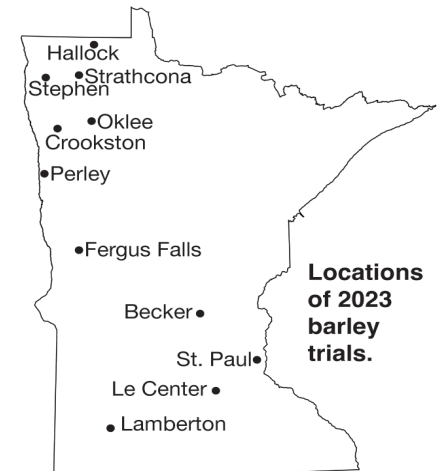
Minnesota Agricultural Experiment Station and the College of Food, Agricultural and Natural Resource Sciences

Spring barley varieties were evaluated in 2023 in replicated trials at Crookston, Hallock, Oklee, Perley, Stephen, and Strathcona in the northern part of the state and Becker, Fergus Falls, Lamberton, Le Center, and St. Paul in the south. Yield is reported for 2023 and multi-year averages as percent of the mean of the trial. Data collected from these trials should be used to make comparisons only among those varieties included in the trials. The average yield across the 11 testing locations was 105.5 bu/acre in 2023. The highest yields this year were recorded in Hallock (162 bu/A) while the lowest grain

yields were recorded in Lamberton (57 bu/A). LSD numbers beneath the yield columns indicate whether the difference between yields is due to genetics or to other factors, such as variations in environment. If the yield difference between two entries equals or exceeds the LSD value, the higher-yielding entry probably was superior in yield. A difference less than the LSD value was probably due to environmental factors.

### Variety Selection Criteria

Most barley producers in the region grow barley for malt and select varieties approved by the American Malting Barley Association (AMBA).



The most important industry specifications for making malting grade are low grain protein (11.5% - 13.5%), kernel plumpness (>80%) and low deoxynivalenol or DON content (<2 ppm). DON is the toxin produced by the Fusarium Head Blight (FHB) pathogen. Additional information about FHB can be found at <https://scabsmart.org>. Please consult the AMBA recommended varieties for the most current information about industry acceptance of malting barley varieties at [www.ambainc.org](http://www.ambainc.org). Variety selection will also be influenced by contracts made available by malting and brewing companies and these vary from year to year.

In addition to yield and acceptable malt quality, disease resistance plays an important role in variety selection. Disease evaluations are carried out in inoculated field and/or greenhouse experiments. Disease ratings are based on the results of two or more experiments and are scored on a

**Table 1. Agronomic characteristics of malting barley varieties, 2021-2023.**

| Entry                      | Origin <sup>1</sup> | Year of Release | PVP Status | Heading (DAP) | Height (inches) | Stem Breakage (%) |
|----------------------------|---------------------|-----------------|------------|---------------|-----------------|-------------------|
| <b>2-row</b>               |                     |                 |            |               |                 |                   |
| AAC Connect                | AAFC                | 2017            | Yes        | 56            | 26              | 7                 |
| AAC Synergy                | AAFC                | 2012            | Yes        | 57            | 27              | 4                 |
| ABI Cardinal               | ABI                 | 2021            | Yes        | 57            | 25              | 11                |
| Excelsior Gold             | NY                  |                 |            | 53            | 29              | 6                 |
| Explorer                   | AS                  | 2020            |            | 57            | 24              | 6                 |
| ND Genesis                 | ND                  | 2015            | Yes        | 56            | 29              | 10                |
| Pinnacle                   | ND                  | 2007            | Yes        | 54            | 26              | 14                |
| <b>6-row</b>               |                     |                 |            |               |                 |                   |
| Lacey                      | MN                  | 2000            | Expired    | 52            | 28              | 13                |
| ND Treasure                | ND                  |                 |            | 51            | 24              | 18                |
| Quest                      | MN                  | 2010            | Yes        | 52            | 29              | 46                |
| Rasmusson                  | MN                  | 2008            | Yes        | 51            | 25              | 12                |
| Robust                     | MN                  | 1984            | Expired    | 52            | 28              | 16                |
| Tradition                  | ABI                 | 2003            | Yes        | 52            | 26              | 5                 |
| <b>No. of Environments</b> |                     |                 |            | <b>9</b>      | <b>8</b>        | <b>6</b>          |

<sup>1</sup>Agriculture and Agri-Food Canada (AAFC), Anheuser-Busch InBev (ABI), North Dakota State University (ND), University of Minnesota (MN), Cornell University (NY), Agrii (Secobra) Excelsior Gold and Explorer evaluated in 2022 and 2023. ND Treasure only evaluated in 2023.

**Table 2. Disease reactions of barley varieties in multiple-year comparisons.**

| Entry                      | DON <sup>1,2</sup> | Bacterial              |                          |                           | Spot Blotch <sup>1,4</sup> |
|----------------------------|--------------------|------------------------|--------------------------|---------------------------|----------------------------|
|                            |                    | Stem Rust <sup>1</sup> | Leaf Streak <sup>1</sup> | Net Blotch <sup>1,3</sup> |                            |
| <b>2-row</b>               |                    |                        |                          |                           |                            |
| AAC Connect                | 3                  | 4                      | 3                        | 1                         | 1                          |
| AAC Synergy                | 4                  | 6                      | 2                        | 1                         | 2                          |
| ABI Cardinal               | 6                  | 5                      | 6                        | 1                         | 5                          |
| Excelsior Gold             | 2                  | 4                      | 2                        | 1                         |                            |
| Explorer                   | 6                  | 7                      | 3                        | 1                         |                            |
| ND Genesis                 | 5                  | 7                      | 5                        | 1                         | 3                          |
| Pinnacle                   | 2                  | 8                      | 6                        | 9                         | 6                          |
| <b>6-row</b>               |                    |                        |                          |                           |                            |
| Lacey                      | 8                  | 4                      | 6                        | 1                         | 1                          |
| ND Treasure                |                    |                        | 5                        | 1                         |                            |
| Quest                      | 4                  | 3                      | 5                        | 1                         | 6                          |
| Rasmusson                  | 7                  | 4                      | 6                        | 1                         | 1                          |
| Robust                     | 7                  | 5                      | 7                        | 1                         | 1                          |
| Tradition                  | 7                  | 5                      | 7                        | 1                         | 2                          |
| <b>No. of Environments</b> | <b>4</b>           | <b>3</b>               | <b>3</b>                 | <b>2</b>                  | <b>1</b>                   |

<sup>1</sup> All traits measured on a scale from 1-9 where 1=resistant and 9=susceptible.

<sup>2</sup> Deoxynivalenol (DON) is the mycotoxin produced by the Fusarium head blight pathogen. The score is based on DON data for 2021 and 2022.

<sup>3</sup> Net blotch data is for 2022 and 2023.

<sup>4</sup> Spot Blotch data is for 2020.

Excelsior Gold and Explorer evaluated in 2022 and 2023.

ND Treasure only evaluated in 2023.

1–9 scale where 1 = most resistant and 9 = most susceptible. For most producers the disease FHB and the presence of DON in harvested grain are the two most important factors limiting production of malting barley in the region. The six rows, with the exception of Quest, are generally more susceptible to Fusarium head blight expressed as lower concentrations of vomitoxin or DON.

The other diseases listed in the disease reactions table are leaf diseases that can be a problem in Minnesota. Pinnacle is very susceptible to net blotch. All the varieties tested are generally susceptible (ratings from 3-8) to the QCCJ race of stem rust which has not been identified as a threat in the Midwest yet. All listed varieties carry stem rust resistance to the predominate Puccinia graminis f. sp. tritici race (MCCF). Most varieties possess pre-heading resistance to stem rust; thus, they will not likely incur much damage unless the disease epidemic is severe. Bacterial Leaf Streak (BLS) cannot be controlled by fungicides and there are some modest differences (ratings from 2-6) in resistance among the tested two row varieties.

**Table 3. Relative grain yield of barley varieties in northern Minnesota locations in single-year (2023) and multiple-year comparisons (2021-2023).**

| Entry                 | Crookston    |              |              | Hallock      |              |              | Oklee        |              |             | Perley       |              |              | Roseau <sup>1</sup> |              | Stephen      |              |              | Strathcona <sup>2</sup> |              |
|-----------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|--------------|--------------|---------------------|--------------|--------------|--------------|--------------|-------------------------|--------------|
|                       | 2023         | 2 Yr         | 3 Yr         | 2023         | 2 Yr         | 3 Yr         | 2023         | 2 Yr         | 3 Yr        | 2023         | 2 Yr         | 3 Yr         | 2 Yr                | 3 Yr         | 2023         | 2 Yr         | 3 Yr         | 2023                    | 3 Yr         |
| <b>2-row</b>          |              |              |              |              |              |              |              |              |             |              |              |              |                     |              |              |              |              |                         |              |
| AAC Connect           | 103          | 102          | 102          | 101          | 103          | 104          | 94           | 94           | 95          | 106          | 103          | 106          | 98                  | 99           | 98           | 104          | 103          | 91                      | 96           |
| AAC Synergy           | 100          | 103          | 101          | 102          | 104          | 103          | 94           | 99           | 98          | 106          | 109          | 106          | 96                  | 100          | 107          | 112          | 112          | 102                     | 99           |
| ABI Cardinal          | 109          | 96           | 100          | 96           | 99           | 103          | 90           | 98           | 98          | 105          | 104          | 101          | 95                  | 101          | 106          | 106          | 104          | 97                      | 95           |
| Excelsior Gold        | 87           | 96           | .            | 98           | 103          | .            | 105          | 101          | .           | 106          | 107          | .            | 109                 | .            | 91           | 100          | .            | 90                      | .            |
| Explorer              | 98           | 100          | .            | 97           | 96           | .            | 93           | 93           | .           | 90           | 87           | .            | 104                 | .            | 104          | 97           | .            | 96                      | .            |
| ND Genesis            | 88           | 101          | 102          | 98           | 103          | 101          | 99           | 99           | 102         | 101          | 102          | 105          | 107                 | 107          | 104          | 109          | 105          | 103                     | 104          |
| Pinnacle              | 104          | 98           | 100          | 106          | 100          | 101          | 113          | 111          | 111         | 104          | 101          | 101          | 111                 | 113          | 104          | 100          | 100          | 105                     | 102          |
| <b>6-row</b>          |              |              |              |              |              |              |              |              |             |              |              |              |                     |              |              |              |              |                         |              |
| Lacey                 | 106          | 103          | 101          | 97           | 94           | 92           | 106          | 100          | 102         | 108          | 97           | 97           | 97                  | 100          | 96           | 88           | 92           | 103                     | 101          |
| ND Treasure           | 113          | .            | .            | 106          | .            | .            | 104          | .            | .           | 93           | .            | .            | .                   | .            | 93           | .            | .            | 101                     | .            |
| Quest                 | 94           | 99           | 97           | 100          | 98           | 96           | 99           | 103          | 100         | 89           | 94           | 92           | 90                  | 87           | 95           | 91           | 92           | 101                     | 98           |
| Rasmusson             | 108          | 110          | 107          | 104          | 101          | 104          | 103          | 103          | 103         | 107          | 104          | 103          | 103                 | 107          | 106          | 101          | 95           | 108                     | 104          |
| Robust                | 92           | 94           | 93           | 91           | 94           | 93           | 97           | 95           | 92          | 89           | 93           | 90           | 95                  | 91           | 102          | 99           | 100          | 101                     | 98           |
| Tradition             | 99           | 98           | 95           | 104          | 104          | 101          | 106          | 104          | 100         | 98           | 100          | 98           | 96                  | 95           | 93           | 93           | 97           | 103                     | 102          |
| <b>Mean (Bu/Acre)</b> | <b>119.7</b> | <b>110.6</b> | <b>103.5</b> | <b>162.1</b> | <b>141.0</b> | <b>127.9</b> | <b>110.5</b> | <b>108.1</b> | <b>92.5</b> | <b>113.4</b> | <b>118.5</b> | <b>116.9</b> | <b>132.9</b>        | <b>102.0</b> | <b>124.6</b> | <b>114.8</b> | <b>114.2</b> | <b>129.7</b>            | <b>109.4</b> |
| <b>LSD (0.10)</b>     | <b>13.2</b>  | <b>19.0</b>  | <b>12.8</b>  | <b>5.7</b>   | <b>10.2</b>  | <b>8.5</b>   | <b>14.9</b>  | <b>9.9</b>   | <b>9.0</b>  | <b>9.8</b>   | <b>10.1</b>  | <b>8.5</b>   | <b>8.7</b>          | <b>8.3</b>   | <b>10.3</b>  | <b>14.3</b>  | <b>10.3</b>  | <b>6.9</b>              | <b>8.5</b>   |

<sup>1</sup>Trial data for Roseau is from 2021 and 2022.

<sup>2</sup>Trial data for Strathcona is from 2021 and 2023.

**PVP Status**

The varieties covered by the Protection Act, PVP (94) are indicated in the table. Growers can save seed of PVP protected varieties for their own planting only; it cannot be sold to anyone else, not even a relative or a neighbor without specific permission of the applicant for protection.

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**Researchers**

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**Barley**  
**Planting Rate and Date**

Bushel Weight, Pounds.....48  
Seeds/Pound.....14,300  
Planting Rate, Pounds/Acre.....85  
Planting Rate, Seeds/Sq. Ft.....28  
Planting Date.....Early Spring

**Table 4. Relative grain yield of barley varieties in southern Minnesota locations in single-year (2023) and multiple-year comparisons (2021-2023).**

| Entry                 | Becker      |             |             | Fergus Falls |              |              | Lamberton   |             |             | Le Center    |              |             | New Ulm <sup>1</sup> |             | Rochester <sup>1</sup> |             | St. Paul    |             |             |
|-----------------------|-------------|-------------|-------------|--------------|--------------|--------------|-------------|-------------|-------------|--------------|--------------|-------------|----------------------|-------------|------------------------|-------------|-------------|-------------|-------------|
|                       | 2023        | 2 Yr        | 3 Yr        | 2023         | 2 Yr         | 3 Yr         | 2023        | 2 Yr        | 3 Yr        | 2023         | 2 Yr         | 3 Yr        | 2 Yr                 | 3 Yr        | 2 Yr                   | 3 Yr        | 2023        | 2 Yr        | 3 Yr        |
| <b>2-row</b>          |             |             |             |              |              |              |             |             |             |              |              |             |                      |             |                        |             |             |             |             |
| AAC Connect           | 100         | 100         | 98          | 103          | 102          | 101          | 91          | 92          | 94          | 90           | 100          | 101         | 102                  | 103         | 97                     | 102         | 114         | 104         | 107         |
| AAC Synergy           | 100         | 101         | 106         | 107          | 102          | 101          | 98          | 97          | 97          | 100          | 95           | 92          | 110                  | 87          | 109                    | 100         | 113         | 106         | 108         |
| ABI Cardinal          | 104         | 105         | 108         | 110          | 97           | 101          | 79          | 90          | 96          | 110          | 105          | 98          | 98                   | 95          | 76                     | 71          | 116         | 107         | 107         |
| Excelsior Gold        | 90          | 95          | .           | 99           | 104          | .            | 93          | 96          | .           | 96           | 93           | .           | 83                   | .           | 91                     | .           | 92          | 86          | .           |
| Explorer              | 91          | 97          | .           | 96           | 96           | .            | 99          | 103         | .           | 91           | 95           | .           | 101                  | .           | 88                     | .           | 156         | 124         | .           |
| ND Genesis            | 101         | 93          | 96          | 106          | 110          | 106          | 102         | 104         | 102         | 113          | 103          | 103         | 83                   | 98          | 107                    | 105         | 102         | 101         | 101         |
| Pinnacle              | 94          | 96          | 100         | 102          | 103          | 102          | 80          | 91          | 92          | 94           | 99           | 100         | 101                  | 104         | 103                    | 103         | 99          | 96          | 103         |
| <b>6-row</b>          |             |             |             |              |              |              |             |             |             |              |              |             |                      |             |                        |             |             |             |             |
| Lacey                 | 125         | 101         | 99          | 95           | 95           | 97           | 108         | 105         | 105         | 103          | 101          | 100         | 103                  | 108         | 109                    | 105         | 95          | 102         | 97          |
| ND Treasure           | 98          | .           | .           | 99           | .            | .            | 118         | .           | .           | 102          | .            | .           | .                    | .           | .                      | .           | 73          | .           | .           |
| Quest                 | 82          | 99          | 101         | 92           | 96           | 97           | 129         | 119         | 119         | 100          | 102          | 101         | 106                  | 104         | 107                    | 106         | 72          | 81          | 82          |
| Rasmusson             | 120         | 119         | 113         | 101          | 106          | 105          | 110         | 106         | 106         | 107          | 106          | 104         | 107                  | 105         | 113                    | 117         | 97          | 106         | 108         |
| Robust                | 98          | 88          | 83          | 90           | 87           | 90           | 97          | 96          | 93          | 97           | 96           | 95          | 101                  | 98          | 99                     | 92          | 67          | 82          | 79          |
| Tradition             | 96          | 103         | 95          | 99           | 102          | 101          | 95          | 101         | 97          | 97           | 106          | 104         | 105                  | 100         | 100                    | 100         | 104         | 105         | 107         |
| <b>Mean (Bu/Acre)</b> | <b>70.5</b> | <b>85.7</b> | <b>67.4</b> | <b>109.0</b> | <b>118.4</b> | <b>106.4</b> | <b>56.8</b> | <b>64.0</b> | <b>62.7</b> | <b>106.3</b> | <b>104.6</b> | <b>94.0</b> | <b>81.3</b>          | <b>92.5</b> | <b>82.4</b>            | <b>87.2</b> | <b>64.1</b> | <b>64.0</b> | <b>59.6</b> |
| <b>LSD (0.10)</b>     | <b>13.0</b> | <b>21.3</b> | <b>21.4</b> | <b>6.5</b>   | <b>12.9</b>  | <b>11.2</b>  | <b>26.8</b> | <b>12.1</b> | <b>10.6</b> | <b>9.2</b>   | <b>15.0</b>  | <b>11.7</b> | <b>16.1</b>          | <b>22.3</b> | <b>12.5</b>            | <b>11.5</b> | <b>14.9</b> | <b>31.6</b> | <b>14.9</b> |

<sup>1</sup>Trial data for New Ulm and Rochester is from 2021 and 2022.

**Table 5. Relative grain yield of barley varieties in a single-year (2023) and multiple-year comparisons (2021-2023).**

| Entry                      | State        |              |             | North        |              |              | South       |             |             |
|----------------------------|--------------|--------------|-------------|--------------|--------------|--------------|-------------|-------------|-------------|
|                            | 2023         | 2 Yr         | 3 Yr        | 2023         | 2 Yr         | 3 Yr         | 2023        | 2 Yr        | 3 Yr        |
| <b>2-row</b>               |              |              |             |              |              |              |             |             |             |
| AAC Connect                | 99           | 100          | 101         | 99           | 100          | 101          | 99          | 100         | 101         |
| AAC Synergy                | 103          | 103          | 101         | 102          | 104          | 103          | 103         | 101         | 98          |
| ABI Cardinal               | 102          | 99           | 99          | 100          | 100          | 101          | 106         | 99          | 97          |
| Excelsior Gold             | 96           | 98           | .           | 96           | 101          | .            | 95          | 95          | .           |
| Explorer                   | 99           | 97           | .           | 96           | 95           | .            | 104         | 100         | .           |
| ND Genesis                 | 101          | 103          | 103         | 99           | 103          | 104          | 106         | 102         | 102         |
| Pinnacle                   | 102          | 101          | 102         | 106          | 103          | 103          | 95          | 99          | 101         |
| <b>6-row</b>               |              |              |             |              |              |              |             |             |             |
| Lacey                      | 103          | 99           | 99          | 102          | 97           | 97           | 104         | 101         | 101         |
| ND Treasure                | 100          | .            | .           | 102          | .            | .            | 98          | .           | .           |
| Quest                      | 96           | 98           | 97          | 96           | 97           | 95           | 94          | 100         | 101         |
| Rasmusson                  | 106          | 106          | 105         | 106          | 104          | 103          | 107         | 109         | 108         |
| Robust                     | 94           | 94           | 92          | 95           | 95           | 94           | 91          | 92          | 90          |
| Tradition                  | 100          | 101          | 100         | 101          | 100          | 99           | 98          | 103         | 101         |
| <b>Mean (Bu/Acre)</b>      | <b>105.5</b> | <b>103.1</b> | <b>95.0</b> | <b>125.9</b> | <b>119.6</b> | <b>109.6</b> | <b>81.1</b> | <b>86.7</b> | <b>80.3</b> |
| <b>LSD (0.10)</b>          | <b>5.4</b>   | <b>3.8</b>   | <b>3.2</b>  | <b>5.3</b>   | <b>4.5</b>   | <b>3.6</b>   | <b>12.1</b> | <b>6.6</b>  | <b>5.5</b>  |
| <b>No. of Environments</b> | <b>11</b>    | <b>24</b>    | <b>38</b>   | <b>6</b>     | <b>12</b>    | <b>19</b>    | <b>5</b>    | <b>12</b>   | <b>19</b>   |