



UNIVERSITY OF
SASKATCHEWAN

College of Agriculture
and Bioresources

Department of Plant Sciences and the Crop Development Centre

51 Campus Drive Saskatoon SK S7N 5A8 Canada

Telephone: (306) 966-5855 Facsimile: (306) 966-5015

Web: agbio.usask.ca/crop-development-centre

NOTE - THIS PACKAGE INCLUDES TWO LINES (HB20351 AND HB21355) WHICH WILL BE TENDERED TOGETHER

Request for Support for Registration of HB20351

Crop: Barley (*Hordeum vulgare* L.)
Type: Two-row, spring, hulless (Malting)

Proposers: A.D. Beattie
Crop Development Centre
University of Saskatchewan
51 Campus Drive
Saskatoon, SK. S7N 5A8

Test #'s: HB20351 or SH170319
Pedigree: CDC Clear x AAC Synergy

Area of Adaptation: Western Canada

Description:

HB20351 is a two-row, hulless malting barley with good adaptability across Western Canada that is intended to replace CDC Clear. It combines shorter height and similar lodging resistance to CDC Clear along with good threshability (similar to CDC Clear), excellent grain plumpness and low thins (similar to CDC Clear). Yield performance was higher than CDC Clear across all soil zones. **HB20351** also demonstrates excellent malting characteristics with lower grain protein, wort beta-glucan and viscosity than CDC Clear with higher wort extract and FAN than CDC Clear. **HB20351** shows resistance or moderate resistance to spot-form net blotch, spot blotch, stem rust and all smuts.

Strengths:

- Grain yield (> CDC Clear).
- Shorter height (< CDC Clear).
- High grain plumpness and low grain thins (= CDC Clear).
- Good threshability (= CDC Clear).
- Heading date and maturity (< CDC Clear).
- Lower protein, wort beta-glucan and viscosity, and higher extract and FAN than CDC Clear.
- Resistant to loose smut, moderately resistant to spot-form net blotch, spot blotch, stem rust, and covered smuts.

Neutral characteristics:

- Lodging resistance (= CDC Clear).
- Kernel weight (> all hulless checks except CDC Clear).
- Intermediate resistance to net-form net blotch and FHB.
- Other malting characteristics (= CDC Clear).

Weaknesses:

- Moderately susceptible scald.

Table 1. Grain yield for HB20351 and checks from the 2020 Western Cooperative Hulless Barley Test.

| Entry | Black Soil Zone | | Black & Grey Zone | | Brown Soil Zone | | Combined | |
|----------------|-----------------|------------------|-------------------|------------------|-----------------|------------------|---------------|------------------|
| | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire |
| AAC Synergy | 5777 | 117 | 7764 | 117 | 6741 | 106 | 6560 | 112 |
| CDC McGwire | 4925 | 100 | 6624 | 100 | 6348 | 100 | 5834 | 100 |
| CDC Rattan | 4574 | 93 | 5488 | 83 | 5453 | 86 | 5109 | 88 |
| CDC Fibar | 3914 | 79 | 3826 | 58 | 4393 | 69 | 4088 | 70 |
| CDC Clear | 5379 | 109 | 6822 | 103 | 6142 | 97 | 5973 | 102 |
| HB20351 | 4830 | 98 | 6020 | 91 | 5493 | 87 | 5333 | 91 |
| Station Years | 4 | | 2 | | 4 | | 10 | |

Table 2. Grain yield for HB20351 and checks from the 2021 Western Cooperative Hulless Barley Test.

| Entry | Black Soil Zone | | Black & Grey Zone | | Brown Soil Zone | | Combined | |
|----------------|-----------------|------------------|-------------------|------------------|-----------------|------------------|---------------|------------------|
| | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire |
| AAC Synergy | 5170 | 118 | 3101 | 119 | 4145 | 105 | 4527 | 113 |
| CDC McGwire | 4382 | 100 | 2599 | 100 | 3952 | 100 | 3998 | 100 |
| CDC Rattan | 4264 | 97 | 2760 | 106 | 3869 | 98 | 3928 | 98 |
| CDC Fibar | 3475 | 79 | 1857 | 71 | 2786 | 70 | 3014 | 75 |
| CDC Clear | 3588 | 82 | 2050 | 79 | 3090 | 78 | 3209 | 80 |
| HB20351 | 4848 | 111 | 2958 | 119 | 3832 | 97 | 4231 | 106 |
| Station Years | 4 | | 1 | | 3 | | 8 | |

Table 3. Grain yield for HB20351 and checks from the 2022 Western Cooperative Hulless Barley Test.

| Entry | Black Soil Zone | | Black & Grey Zone | | Brown Soil Zone | | Combined | |
|----------------|-----------------|------------------|-------------------|------------------|-----------------|------------------|---------------|------------------|
| | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire |
| AAC Synergy | 6319 | 120 | 7282 | 135 | 5694 | 124 | 6267 | 124 |
| CDC McGwire | 5248 | 100 | 5413 | 100 | 4583 | 100 | 5036 | 100 |
| CDC Rattan | 4835 | 92 | 5358 | 99 | 4373 | 95 | 4762 | 95 |
| CDC Fibar | 3575 | 68 | 4187 | 77 | 3720 | 81 | 3739 | 74 |
| CDC Clear | 4954 | 94 | 5103 | 94 | 4297 | 94 | 4742 | 94 |
| HB20351 | 5616 | 107 | 6617 | 122 | 5190 | 113 | 5643 | 112 |
| Station Years | 5 | | 2 | | 4 | | 11 | |

Table 4. Grain yield for HB20351 and checks from the 2020-22 Western Cooperative Hulless Barley Tests.

| Entry | Black Soil Zone | | Black & Grey Zone | | Brown Soil Zone | | Combined | |
|----------------|-----------------|------------------|-------------------|------------------|-----------------|------------------|---------------|------------------|
| | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire |
| AAC Synergy | 5798 | 119 | 6639 | 125 | 5652 | 112 | 5888 | 117 |
| CDC McGwire | 4882 | 100 | 5334 | 100 | 5053 | 100 | 5025 | 100 |
| CDC Rattan | 4579 | 94 | 4890 | 92 | 4628 | 92 | 4652 | 93 |
| CDC Fibar | 3649 | 75 | 3577 | 67 | 3710 | 73 | 3659 | 73 |
| CDC Clear | 4664 | 96 | 5180 | 97 | 4639 | 92 | 4743 | 94 |
| HB20351 | 5138 | 105 | 5647 | 106 | 4930 | 98 | 5146 | 102 |
| Station Years | 13 | | 5 | | 11 | | 29 | |

Table 5. Agronomic characteristics for HB20351 and checks from the 2020 Western Cooperative Hulless Barley Test.

| Entry | Days to Head | Days to Mature | Plant | Lodging | D. Test | C. Test | Kernel | Plump | Thin |
|----------------|--------------|----------------|-------------|-------------|----------------|----------------|------------------|-------------|-------------|
| | | | Height (cm) | Score (1-9) | Weight (kg/hl) | Weight (kg/hl) | Weight (g/1000k) | >5.5/64 (%) | <5.0/64 (%) |
| AAC Synergy | 55.3 | 84.7 | 78.3 | 3.6 | 64.6 | 67.3 | 46.3 | 96.9 | 4.8 |
| CDC McGwire | 56.1 | 86.8 | 83.7 | 4.9 | 76.0 | 80.5 | 38.3 | 85.4 | 13.4 |
| CDC Rattan | 56.7 | 85.0 | 75.4 | 2.1 | 73.2 | 79.2 | 36.5 | 90.3 | 10.2 |
| CDC Fibar | 54.1 | 85.1 | 84.3 | 5.7 | 65.7 | 75.5 | 38.4 | 95.3 | 3.2 |
| CDC Clear | 55.1 | 84.7 | 82.8 | 3.4 | 77.5 | 81.0 | 44.8 | 92.6 | 6.0 |
| HB20351 | 55.2 | 85.7 | 85.6 | 2.7 | 76.7 | 80.6 | 44.6 | 94.2 | 4.9 |
| Station Years | 9 | 11 | 11 | 3 | 7 | 11 | 11 | 7 | 2 |

Table 6. Agronomic characteristics for HB20351 and checks from the 2021 Western Cooperative Hulless Barley Test.

| Entry | Days to Head | Days to Mature | Plant | Lodging | D. Test | C. Test | Kernel | Plump | Thin |
|----------------|--------------|----------------|-------------|-------------|----------------|----------------|------------------|-------------|-------------|
| | | | Height (cm) | Score (1-9) | Weight (kg/hl) | Weight (kg/hl) | Weight (g/1000k) | >5.5/64 (%) | <5.0/64 (%) |
| AAC Synergy | 58.3 | 84.6 | 63.5 | 1.3 | NA | 64.6 | 47.6 | 99.3 | 0.4 |
| CDC McGwire | 58.3 | 86.0 | 66.7 | 1.3 | 75.2 | 78.6 | 39.2 | 92.5 | 4.3 |
| CDC Rattan | 59.8 | 83.7 | 60.5 | 1.7 | 73.9 | 78.7 | 37.9 | 93.0 | 4.0 |
| CDC Fibar | 57.6 | 85.5 | 62.9 | 1.7 | 67.1 | 76.3 | 39.2 | 96.3 | 2.0 |
| CDC Clear | 60.0 | 89.0 | 66.9 | 1.3 | 70.7 | 77.9 | 47.8 | 95.6 | 2.0 |
| HB20351 | 58.6 | 84.6 | 63.2 | 1.3 | 71.8 | 76.3 | 43.8 | 95.6 | 2.7 |
| Station Years | 10 | 10 | 10 | 1 | 7 | 10 | 10 | 7 | 5 |

Table 7. Agronomic characteristics for HB20351 and checks from the 2022 Western Cooperative Hulless Barley Test.

| Entry | Days to Head | Days to Mature | Plant Height (cm) | Lodging Score (1-9) | D. Test Weight (kg/ha) | C. Test Weight (kg/ha) | Kernel Weight (g/1000k) | Plump >5.5/64 (%) | Thin <5.0/64 (%) |
|----------------|---------------------|-----------------------|--------------------------|----------------------------|-------------------------------|-------------------------------|--------------------------------|-----------------------------|----------------------------|
| AAC Synergy | 55.0 | 86.0 | 75.9 | 3.1 | 64.4 | 67.2 | 47.1 | 97.8 | 1.6 |
| CDC McGwire | 57.2 | 88.7 | 80.5 | 3.9 | 74.6 | 80.2 | 40.1 | 91.4 | 3.7 |
| CDC Rattan | 56.8 | 85.6 | 73.7 | 3.6 | 71.9 | 79.3 | 35.5 | 92.3 | 3.6 |
| CDC Fibar | 56.6 | 87.6 | 81.7 | 4.7 | 64.7 | 76.4 | 39.9 | 96.4 | 1.9 |
| CDC Clear | 58.8 | 91.5 | 82.6 | 2.1 | 71.8 | 80.7 | 48.6 | 96.2 | 2.2 |
| HB20351 | 55.8 | 86.4 | 76.6 | 3.3 | 72.8 | 78.9 | 44.6 | 95.7 | 1.8 |
| Station Years | 11 | 11 | 11 | 5 | 10 | 12 | 12 | 10 | 7 |

Table 8. Agronomic characteristics for HB20351 and checks from the 2020-22 Western Cooperative Hulless Barley Tests.

| Entry | Days to Head | Days to Mature | Plant Height (cm) | Lodging Score (1-9) | D. Test Weight (kg/ha) | C. Test Weight (kg/ha) | Kernel Weight (g/1000k) | Plump >5.5/64 (%) | Thin <5.0/64 (%) |
|----------------|---------------------|-----------------------|--------------------------|----------------------------|-------------------------------|-------------------------------|--------------------------------|-----------------------------|----------------------------|
| AAC Synergy | 56.2 | 85.1 | 72.9 | 3.0 | 57.5 | 66.4 | 47.0 | 97.9 | 1.6 |
| CDC McGwire | 57.2 | 87.2 | 77.3 | 4.0 | 75.2 | 79.8 | 39.2 | 89.7 | 5.3 |
| CDC Rattan | 57.8 | 84.8 | 70.2 | 2.9 | 72.9 | 79.1 | 36.6 | 91.9 | 4.7 |
| CDC Fibar | 56.2 | 86.1 | 76.8 | 4.7 | 65.7 | 76.1 | 39.2 | 96.0 | 2.1 |
| CDC Clear | 58.1 | 88.4 | 77.8 | 2.5 | 73.4 | 80.0 | 47.1 | 94.8 | 2.7 |
| HB20351 | 56.6 | 85.6 | 75.5 | 2.8 | 73.8 | 78.7 | 44.3 | 95.2 | 2.6 |
| Station Years | 30 | 32 | 32 | 9 | 24 | 33 | 33 | 24 | 14 |

Table 9. Disease reaction summary for HB20351 and checks from 2020-22 Western Cooperative Hulless Barley Test.

| Entry | | Net Blotch | | | | | Scald | | | Spot Blotch | | | | | |
|----------------|-------------|------------------------|----------|-------------|----------------------|------------|------------------------|----------------|------------|------------------------|-------------|------------|------------|---------------|------------|
| | | Morden Seedling (1-10) | | | Lacombe Field (1-10) | | Morden Seedling (1-10) | Field (1-9) | | Morden Seedling (1-10) | Field (0-9) | | | General (1-9) | |
| | | 102 | 858 | MBV25 | Net | Spot | 2275 | Lac. | Edm. | 1903 | Bran. | CDC | Mel. | Lac. | Bran. |
| AAC Synergy | 2020 | 1 | 1 | 2 | 0.0 | 4.0 | S | 8.5 | 5.0 | 3 | 4.0 | - | 1.0 | 5.0 | 1.7 |
| | 2021 | 1 | 7 | 3 | 0.0 | 3.5 | S | 4.5 | 3.5 | 5 | 3.5 | - | 2.0 | 3.0 | 2.3 |
| | 2022 | 2 | 2 | 2 | 0.0 | 2.5 | S | 5.0/7.5 | 9.0 | 3 | 4.0 | 1.5 | 1.5 | 4.5 | 2.0 |
| Overall | | | | MR/MR | | | | MS | | | | MR | | | |
| CDC McGwire | 2020 | 1 | 5 | 3 | 4.0 | 5.0 | S | 8.5 | 6.5 | 7 | 4.0 | - | 1.0 | 6.0 | 3.0 |
| | 2021 | 6 | 8 | 7 | 1.5 | 4.0 | MS | 5.0 | 2.5 | 7 | 4.5 | - | 2.0 | 1.5 | 2.5 |
| | 2022 | 2 | 2 | 4 | 0.0 | 3.0 | S | 3.5/6.5 | 9.0 | 5 | 4.0 | 2.0 | 2.5 | 5.0 | 2.7 |
| Overall | | | | I/I | | | | MS | | | | I | | | |
| CDC Rattan | 2020 | 5 | 6 | 1 | 5.5 | 4.5 | MS | 8.0 | 7.0 | 5 | 3.5 | - | 6.0 | 6.0 | 1.7 |
| | 2021 | 7 | 8 | 6 | 3.5 | 5.0 | S | 4.5 | 2.5 | 7 | 5.0 | - | 2.0 | 2.0 | 2.5 |
| | 2022 | 6 | 2 | 4 | 3.5 | 3.0 | S | 4.0/6.5 | 8.0 | 5 | 3.0 | 2.0 | 2.5 | 4.5 | 3.2 |
| Overall | | | | MS/I | | | | MS | | | | I | | | |
| CDC Fibar | 2020 | 6 | 2 | 5 | 6.5 | 6.5 | MR | 4.5 | 1.0 | 3 | 7.0 | - | 2.0 | 7.0 | 3.7 |
| | 2021 | 8 | 8 | 8 | 3.5 | 5.5 | MS | 0.0 | 1.0 | 7 | 7.5 | - | 4.0 | 4.0 | 4.0 |
| | 2022 | 6 | 7 | 7 | 0.0 | 4.0 | MS | 3.0/6.0 | 5.0 | 8 | 5.0 | 3.5 | 3.0 | 4.0 | 5.7 |
| Overall | | | | MS/MS | | | | MR | | | | I | | | |
| CDC Clear | 2020 | 2 | 1 | 3 | 1.5 | 5.0 | MR | 6.5 | 6.0 | 3 | 4.5 | - | 3.0 | 5.0 | 2.0 |
| | 2021 | 5 | 7 | 7 | 0.0 | - | MS | 3.5 | 1.0 | 3 | 3.5 | - | 2.0 | 0.0 | 2.5 |
| | 2022 | 2 | 3 | 7 | 0.0 | 2.5 | S | 3.0/6.0 | 7.5 | 5 | 6.0 | 1.0 | 2.0 | 4.5 | 2.4 |
| Overall | | | | I/I | | | | MS | | | | MR | | | |
| HB20351 | 2020 | 2 | 1 | 2 | 0.0 | 4.0 | S | 9.0 | 6.5 | 3 | 4.5 | - | 1.0 | 4.0 | 1.3 |
| | 2021 | 7 | 8 | 2 | 0.0 | 3.5 | S | 5.0 | 4.0 | 3 | 4.5 | - | 2.0 | 2.0 | 2.5 |
| | 2022 | 1 | 7 | 3 | 0.0 | 3.0 | S | 5.0/7.5 | 8.0 | 5 | 4.0 | 1.5 | 1.0 | 4.0 | 3.2 |
| Overall | | | | I/MR | | | | MS | | | | MR | | | |

Table 9. (cont.)

| Entry | | Surface Smuts | | | Loose Smut | Stem Rust | | | | Fusarium Head Blight | | | | | | | |
|----------------|-------------|---------------|-------------|-------------|------------|--------------|-----------------|------------|--------------|----------------------|------------|------------|------------|-------------|-------------|-------------|------------|
| | | CDC (%) | Morden (%) | | CDC (%) | Morden Field | Morden Seedling | CDC | Rating (0-5) | | PEI | | | DON (ppm) | | | |
| | | U. hordei | U. hordei | U. nigra | U. nuda | Sev. (%) | IR | MCC IT | Rpg1 | Bran. | Morden | Inc. | Sev. | Index | Bran. | Morden | PEI |
| AAC Synergy | 2020 | 9.1 | 13.0 | 3.0 | 85.7 | 1 | R | 0; | + | 1.2 | 2.0 | -- | -- | -- | 5.6 | 15.4 | -- |
| | 2021 | 7.0 | 15.0 | 29.0 | 5.9 | -- | -- | 1- | + | 1.3 | 1.5 | 8.5 | 6.5 | 55.3 | 12.0 | 7.5 | 13.1 |
| | 2022 | -- | 16.0 | 30.0 | 0.0 | 3 | MR | ;1- | NT | 1.7 | 1.3 | -- | -- | -- | 40.0 | 33.5 | -- |
| Overall | | | MR | | I | | | R | | | I | | | | | | |
| CDC McGwire | 2020 | 3.2 | 0.0 | 7.0 | 77.8 | 20 | I | ;1- | + | 1.2 | 1.5 | -- | -- | -- | 2.4 | 11.3 | -- |
| | 2021 | 9.4 | 5.0 | 20.0 | 18.2 | -- | -- | ;1- | + | 1.5 | 1.7 | 8.0 | 6.8 | 54.0 | 4.0 | 2.8 | 18.6 |
| | 2022 | -- | -- | 20.0 | 69.2 | 10 | I | -- | + | 2.2 | 2.3 | -- | -- | -- | 13.2 | 37.5 | -- |
| Overall | | | MR | | I | | | I | | | | | | I | | | |
| CDC Rattan | 2020 | 3.0 | 20.0 | 0.0 | 82.4 | 1 | R | 1-1 | + | 0.8 | 2.0 | -- | -- | -- | 2.2 | 3.7 | -- |
| | 2021 | 36.2 | 28.0 | 18.0 | 0.0 | -- | -- | 1- | + | 2.5 | 1.5 | 8.8 | 7.0 | 61.3 | 6.0 | 5.1 | 6.0 |
| | 2022 | -- | 24.0 | 16.0 | 42.9 | 3 | MR | 1- | + | 2.2 | 1.3 | -- | -- | -- | 8.3 | 16.6 | -- |
| Overall | | | I | | I | | | R | | | | | | MR | | | |
| CDC Fibar | 2020 | 4.8 | 12.5 | 12.0 | 60.0 | 30 | MS | 22+ | - | 1.5 | 2.3 | -- | -- | -- | 6.5 | 11.2 | -- |
| | 2021 | 0 | 24.0 | 20.0 | 69.2 | - | - | 23- | - | 4.0 | 2.3 | 8.3 | 6.5 | 53.5 | 12.3 | 7.8 | 9.3 |
| | 2022 | -- | 8.0 | -- | 62.5 | 40 | S | 12- | - | 2.7 | 1.8 | -- | -- | -- | 27.0 | 21.1 | -- |
| Overall | | | MR | | MS | | | MS | | | | | | I | | | |
| CDC Clear | 2020 | 4.9 | 1.0 | 8.0 | dng | 5 | R | 1- | + | 1.2 | 2.2 | -- | -- | -- | 4.0 | 3.8 | -- |
| | 2021 | 7.1 | dng | 15.0 | 0.0 | -- | -- | ;1- | + | 1.5 | 1.0 | 8.0 | 6.8 | 54.0 | 5.0 | 1.5 | 15.7 |
| | 2022 | -- | -- | -- | 0.0 | 1 | R | -- | + | 1.3 | 1.2 | -- | -- | -- | 12.8 | 10.2 | -- |
| Overall | | | R | | R | | | R | | | | | | MR | | | |
| HB20351 | 2020 | 29.9 | 8.0 | 10.0 | 0.0 | 10 | MR | ;1- | + | 1.5 | 1.3 | -- | -- | -- | 1.5 | 6.4 | -- |
| | 2021 | 5.1 | 35.0 | 26.0 | 0.0 | -- | -- | 1-1 | + | 2.2 | 1.3 | 8.3 | 7.0 | 57.8 | 9.4 | 3.2 | 7.0 |
| | 2022 | -- | -- | -- | 0.0 | 3 | MR | 1- | + | 2.2 | 1.2 | -- | -- | -- | 22.7 | 37.9 | -- |
| Overall | | | MR | | R | | | MR | | | | | | I | | | |

Table 10. Average malting characteristics for HB20351 and checks from 2020 Western Cooperative Hulless Barley Test.

| Entry | Barley | | | | | | | | | Malt | | | | | | |
|----------------|--------------|--------------|--------------|--------------|---------------|---------------|-------------|-------------|--------------|---------------|---------------|---------------|--------------|---------------|-------------------------|---------------------------|
| | Plump | | K.Wt. (g) | Prot. (%) | Starch (%) | β-Gluc (%) | G.E. | | RVA (RVU) | Steep. | | Friab. (%) | Adh. | | Diast. Power (°L) | Alpha- Amylase (DU) |
| | >7/64 (%) | >5/64 (%) | | | | | 4 ml (%) | 8 ml (%) | | Moist. (%) | Moist. (%) | | Hulls (%) | Prot. (%,) | | |
| AAC Synergy | 64.7 | 98.6 | 46.9 | 11.5 | -- | -- | 100 | 94 | 133 | 47.6 | 3.3 | 79.8 | 96.8 | 11.9 | 123 | 73 |
| CDC Clear | 4.4 | 98.4 | 45.6 | 11.6 | -- | -- | 97 | 96 | 104 | 48.4 | 3.9 | 40.8 | 0.6 | 11.8 | 141 | 94 |
| HB20351 | 6.1 | 98.6 | 44.7 | 11.6 | -- | -- | 97 | 97 | 135 | 50.1 | 3.8 | 41.1 | 0.3 | 11.7 | 134 | 84 |
| Station Years | 3 | 3 | 3 | 3 | -- | -- | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

Table 10. (cont.)

| Entry | Wort | | | | | | | | |
|----------------|------------------------|--------------------------|--------------------------|----------------------|-------------------------|---------------|------------------|---------------|------|
| | Fine Extract (%) | Coarse Extract (%) | F-C Difference (%) | Sol. Prot. (%) | Kolbach Index (%) | FAN (mg/L) | β-Gluc (mg/L) | Visc. (cP) | |
| | AAC Synergy | 80.4 | 80.1 | 0.2 | 4.6 | 39.2 | 148 | 79 | 1.45 |
| CDC Clear | 87.5 | 86.3 | 1.3 | 5.0 | 42.6 | 165 | 183 | 1.56 | |
| HB20351 | 88.5 | 87.8 | 0.7 | 5.5 | 46.9 | 184 | 84 | 1.49 | |
| Station years | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |

Table 11. Average malting characteristics for HB20351 and checks from 2021 Western Cooperative Hulless Barley Test.

| Entry | Barley | | | | | | | | | Malt | | | | | | |
|----------------|--------------|--------------|--------------|--------------|---------------|----------------------|-------------|-------------|--------------|---------------|---------------|---------------|----------------------|-------------------------|---------------|---------------------------|
| | Plump | | K.Wt. (g) | Prot. (%) | Starch (%) | β -Gluc (%) | G.E. | | RVA (RVU) | Steep. | | | Adh. Hulls (%) | Diast. Prot. (%,) | Power (°L) | Alpha- Amylase (DU) |
| | >7/64 (%) | >5/64 (%) | | | | | 4 ml (%) | 8 ml (%) | | Moist. (%) | Moist. (%) | Friab. (%) | | | | |
| AAC Synergy | 81.8 | 99.3 | 50.8 | 13.9 | -- | -- | 99 | 97 | -- | 45.6 | 3.8 | 78.3 | 97.3 | 13.8 | 184 | 90.5 |
| CDC Clear | 23.5 | 98.2 | 50.3 | 14.3 | -- | -- | 96 | 95 | -- | 46.9 | 4.1 | 44.9 | 0.7 | 14.6 | 188 | 94.2 |
| HB20351 | 10.9 | 98.5 | 46.1 | 13.8 | -- | -- | 94 | 94 | -- | 48.2 | 4.1 | 45.6 | 0.9 | 13.9 | 163 | 71.8 |
| Station Years | 3 | 3 | 3 | 3 | -- | -- | 3 | 3 | -- | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

Table 11. (cont.)

| Entry | Wort | | | | | | | | |
|----------------|------------------------|--------------------------|--------------------------|----------------------|-------------------------|---------------|-------------------------|---------------|------|
| | Fine Extract (%) | Coarse Extract (%) | F-C Difference (%) | Sol. Prot. (%) | Kolbach Index (%) | FAN (mg/L) | β -Gluc (mg/L) | Visc. (cP) | |
| | AAC Synergy | 80.3 | 80.3 | 0.1 | 5.7 | 41.5 | 212 | 85 | 1.42 |
| CDC Clear | 85.2 | 84.2 | 1.0 | 6.0 | 41.1 | 212 | 205 | 1.60 | |
| HB20351 | 87.0 | 86.3 | 0.7 | 6.7 | 48.5 | 257 | 74 | 1.54 | |
| Station years | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |

Table 12. Average malting characteristics for HB20351 and checks from 2022 Western Cooperative Hulless Barley Test.

| Entry | Barley | | | | | | | | | Malt | | | | | | |
|----------------|--------------|--------------|--------------|--------------|---------------|----------------------|-------------|-------------|--------------|---------------|---------------|---------------|----------------------|-------------------------|---------------|---------------------------|
| | Plump | | K.Wt. (g) | Prot. (%) | Starch (%) | β -Gluc (%) | G.E. | | RVA (RVU) | Steep. | | Friab. (%) | Adh. Hulls (%) | Diast. Prot. (%,) | Power (°L) | Alpha- Amylase (DU) |
| | >7/64 (%) | >5/64 (%) | | | | | 4 ml (%) | 8 ml (%) | | Moist. (%) | Moist. (%) | | | | | |
| AAC Synergy | 77.3 | 98.2 | 48.1 | 11.1 | 59.7 | 4.5 | 100 | 89 | 143 | 45.3 | 3.5 | 84.9 | 97.3 | 11.0 | 141 | 81.9 |
| CDC Clear | 12.9 | 98.8 | 50.0 | 11.3 | 63.9 | 4.8 | 96 | 95 | 163 | 45.0 | 4.1 | 53.6 | 0.5 | 11.3 | 149 | 89.4 |
| HB20351 | 4.2 | 98.5 | 44.9 | 11.1 | 65.2 | 4.3 | 96 | 98 | 128 | 47.3 | 3.9 | 71.2 | 1.3 | 10.7 | 146 | 85.2 |
| Station Years | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

Table 12. (cont.)

| Entry | Wort | | | | | | | | |
|----------------|------------------------|--------------------------|--------------------------|----------------------|-------------------------|---------------|-------------------------|---------------|--|
| | Fine Extract (%) | Coarse Extract (%) | F-C Difference (%) | Sol. Prot. (%) | Kolbach Index (%) | FAN (mg/L) | β -Gluc (mg/L) | Visc. (cP) | |
| AAC Synergy | 82.9 | 82.5 | 0.4 | 5.0 | 45.0 | 195 | 204 | 1.47 | |
| CDC Clear | 88.8 | 87.1 | 1.7 | 4.9 | 43.8 | 175 | 376 | 1.66 | |
| HB20351 | 90.2 | 90.0 | 0.3 | 5.3 | 49.7 | 212 | 78 | 1.52 | |
| Station years | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |



UNIVERSITY OF
SASKATCHEWAN

College of Agriculture
and Bioresources

Department of Plant Sciences and the Crop Development Centre

51 Campus Drive Saskatoon SK S7N 5A8 Canada

Telephone: (306) 966-5855 Facsimile: (306) 966-5015

Web: agbio.usask.ca/crop-development-centre

Request for Support for Registration of HB21355

Crop: Barley (*Hordeum vulgare* L.)
Type: Two-row, spring, hulless (Malting)

Proposers: A.D. Beattie
Crop Development Centre
University of Saskatchewan
51 Campus Drive
Saskatoon, SK. S7N 5A8

Test #'s: HB21355 or SH180307
Pedigree: HB14326 x SH120433

Area of Adaptation: Western Canada

Description:

HB21355 is a two-row, hulless malting barley with good adaptability across Western Canada that is intended to replace CDC Clear. It combines shorter height and earlier maturity than CDC Clear along with good threshability (similar to CDC Clear), good grain plumpness and lower thins (similar to CDC McGwire). Yield performance was higher than CDC Clear across all soil zones. **HB21355** also demonstrates excellent malting characteristics with lower wort beta-glucan and viscosity than CDC Clear with higher friability, diastatic power, wort extract and FAN than CDC Clear. **HB21355** shows resistance or moderate resistance to spot blotch, all smuts and FHB.

Strengths:

- Grain yield (> CDC Clear).
- Shorter height (< CDC Clear).
- Good threshability (= CDC Clear).
- Heading date and maturity (< CDC Clear).
- Lower wort beta-glucan and viscosity, and higher friability, diastatic power, wort extract and FAN than CDC Clear.
- Resistant to loose smut, moderately resistant to spot blotch, covered smuts and FHB.

Neutral characteristics:

- Lodging resistance (= CDC McGwire).
- Kernel weight, plumpness and thins (= CDC McGwire).
- Intermediate resistance to net blotch (both forms) and stem rust.
- Other malting characteristics (= CDC Clear).

Weaknesses:

- Moderately susceptible scald.

Table 1. Grain yield for HB21355 and checks from the 2021 Western Cooperative Hulless Barley Test.

| Entry | Black Soil Zone | | Black & Grey Zone | | Brown Soil Zone | | Combined | |
|----------------|-----------------|------------------|-------------------|------------------|-----------------|------------------|---------------|------------------|
| | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire |
| AAC Synergy | 5170 | 118 | 3101 | 119 | 4145 | 105 | 4527 | 113 |
| CDC McGwire | 4382 | 100 | 2599 | 100 | 3952 | 100 | 3998 | 100 |
| CDC Rattan | 4264 | 97 | 2760 | 106 | 3869 | 98 | 3928 | 98 |
| CDC Fibar | 3475 | 79 | 1857 | 71 | 2786 | 70 | 3014 | 75 |
| CDC Clear | 3588 | 82 | 2050 | 79 | 3090 | 78 | 3209 | 80 |
| HB21355 | 3913 | 89 | 2471 | 95 | 3401 | 86 | 3541 | 89 |
| Station Years | 4 | | 1 | | 3 | | 8 | |

Table 2. Grain yield for HB21355 and checks from the 2022 Western Cooperative Hulless Barley Test.

| Entry | Black Soil Zone | | Black & Grey Zone | | Brown Soil Zone | | Combined | |
|----------------|-----------------|------------------|-------------------|------------------|-----------------|------------------|---------------|------------------|
| | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire |
| AAC Synergy | 6319 | 120 | 7282 | 135 | 5694 | 124 | 6267 | 124 |
| CDC McGwire | 5248 | 100 | 5413 | 100 | 4583 | 100 | 5036 | 100 |
| CDC Rattan | 4835 | 92 | 5358 | 99 | 4373 | 95 | 4762 | 95 |
| CDC Fibar | 3575 | 68 | 4187 | 77 | 3720 | 81 | 3739 | 74 |
| CDC Clear | 4954 | 94 | 5103 | 94 | 4297 | 94 | 4742 | 94 |
| HB21355 | 5522 | 105 | 5695 | 105 | 4783 | 104 | 5284 | 105 |
| Station Years | 5 | | 2 | | 4 | | 11 | |

Table 3. Grain yield for HB21355 and checks from the 2021 and 2022 Western Cooperative Hulless Barley Tests.

| Entry | Black Soil Zone | | Black & Grey Zone | | Brown Soil Zone | | Combined | |
|----------------|-----------------|------------------|-------------------|------------------|-----------------|------------------|---------------|------------------|
| | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire | Yield (kg/ha) | Yld as % McGwire |
| AAC Synergy | 5808 | 119 | 5888 | 132 | 5030 | 117 | 5534 | 120 |
| CDC McGwire | 4863 | 100 | 4475 | 100 | 4313 | 100 | 4599 | 100 |
| CDC Rattan | 4582 | 94 | 4492 | 100 | 4157 | 96 | 4411 | 96 |
| CDC Fibar | 3530 | 73 | 3410 | 76 | 3319 | 77 | 3434 | 75 |
| CDC Clear | 4347 | 89 | 4085 | 91 | 3780 | 88 | 4096 | 89 |
| HB21355 | 4807 | 99 | 4620 | 103 | 4191 | 97 | 4550 | 99 |
| Station Years | 9 | | 3 | | 7 | | 19 | |

Table 4. Agronomic characteristics for HB21355 and checks from the 2021 Western Cooperative Hulless Barley Test.

| Entry | Days to Head | Days to Mature | Plant Height (cm) | Lodging Score (1-9) | D. Test Weight (kg/hl) | C. Test Weight (kg/hl) | Kernel Weight (g/1000k) | Plump >5.5/64 (%) | Thin <5.0/64 (%) |
|----------------|---------------------|-----------------------|--------------------------|----------------------------|-------------------------------|-------------------------------|--------------------------------|-----------------------------|----------------------------|
| AAC Synergy | 58.3 | 84.6 | 63.5 | 1.3 | NA | 64.6 | 47.6 | 99.3 | 0.4 |
| CDC McGwire | 58.3 | 86.0 | 66.7 | 1.3 | 75.2 | 78.6 | 39.2 | 92.5 | 4.3 |
| CDC Rattan | 59.8 | 83.7 | 60.5 | 1.7 | 73.9 | 78.7 | 37.9 | 93.0 | 4.0 |
| CDC Fibar | 57.6 | 85.5 | 62.9 | 1.7 | 67.1 | 76.3 | 39.2 | 96.3 | 2.0 |
| CDC Clear | 60.0 | 89.0 | 66.9 | 1.3 | 70.7 | 77.9 | 47.8 | 95.6 | 2.0 |
| HB21355 | 59.4 | 86.2 | 63.9 | 1.0 | 73.2 | 77.1 | 41.2 | 94.2 | 3.5 |
| Station Years | 10 | 10 | 10 | 1 | 7 | 10 | 10 | 7 | 5 |

Table 5. Agronomic characteristics for HB21355 and checks from the 2022 Western Cooperative Hulless Barley Test.

| Entry | Days to Head | Days to Mature | Plant Height (cm) | Lodging Score (1-9) | D. Test Weight (kg/hl) | C. Test Weight (kg/hl) | Kernel Weight (g/1000k) | Plump >5.5/64 (%) | Thin <5.0/64 (%) |
|----------------|---------------------|-----------------------|--------------------------|----------------------------|-------------------------------|-------------------------------|--------------------------------|-----------------------------|----------------------------|
| AAC Synergy | 55.0 | 86.0 | 75.9 | 3.1 | 64.4 | 67.2 | 47.1 | 97.8 | 1.6 |
| CDC McGwire | 57.2 | 88.7 | 80.5 | 3.9 | 74.6 | 80.2 | 40.1 | 91.4 | 3.7 |
| CDC Rattan | 56.8 | 85.6 | 73.7 | 3.6 | 71.9 | 79.3 | 35.5 | 92.3 | 3.6 |
| CDC Fibar | 56.6 | 87.6 | 81.7 | 4.7 | 64.7 | 76.4 | 39.9 | 96.4 | 1.9 |
| CDC Clear | 58.8 | 91.5 | 82.6 | 2.1 | 71.8 | 80.7 | 48.6 | 96.2 | 2.2 |
| HB21355 | 57.3 | 88.7 | 76.9 | 3.6 | 71.1 | 78.7 | 40.9 | 91.0 | 3.5 |
| Station Years | 11 | 11 | 11 | 5 | 9 | 12 | 12 | 9 | 7 |

Table 6. Agronomic characteristics for HB21355 and checks from the 2021 and 2022 Western Cooperative Hulless Barley Tests.

| Entry | Days to Head | Days to Mature | Plant Height (cm) | Lodging Score (1-9) | D. Test Weight (kg/hl) | C. Test Weight (kg/hl) | Kernel Weight (g/1000k) | Plump >5.5/64 (%) | Thin <5.0/64 (%) |
|----------------|---------------------|-----------------------|--------------------------|----------------------------|-------------------------------|-------------------------------|--------------------------------|-----------------------------|----------------------------|
| AAC Synergy | 56.6 | 85.3 | 70.0 | 2.8 | NA | 66.0 | 47.3 | 98.5 | 1.1 |
| CDC McGwire | 57.7 | 87.5 | 74.0 | 3.5 | 74.8 | 79.5 | 39.7 | 91.9 | 3.9 |
| CDC Rattan | 58.2 | 84.7 | 67.4 | 3.3 | 72.8 | 79.0 | 36.6 | 92.6 | 3.7 |
| CDC Fibar | 57.1 | 86.6 | 72.8 | 4.2 | 65.7 | 76.4 | 39.6 | 96.3 | 2.0 |
| CDC Clear | 59.4 | 90.4 | 75.1 | 2.0 | 71.3 | 79.4 | 48.2 | 95.9 | 2.1 |
| HB21355 | 58.3 | 87.5 | 70.7 | 3.2 | 72.0 | 78.0 | 41.0 | 92.4 | 3.5 |
| Station Years | 21 | 21 | 21 | 6 | 16 | 22 | 22 | 16 | 12 |

Table 7. Disease reaction summary for HB21355 and checks from 2021 and 2022 Western Cooperative Hulless Barley Test.

| Entry | | Net Blotch | | | | | Scald | | | Spot Blotch | | | | | |
|----------------|-------------|------------------------|----------|------------|----------------------|------------|------------------------|----------------|------------|------------------------|-------------|------------|------------|---------------|------------|
| | | Morden Seedling (1-10) | | | Lacombe Field (1-10) | | Morden Seedling (1-10) | Field (1-9) | | Morden Seedling (1-10) | Field (0-9) | | | General (1-9) | |
| | | 102 | 858 | MBV25 | Net | Spot | 2275 | Lac. | Edm. | 1903 | Bran. | CDC | Mel. | Lac. | Bran. |
| AAC Synergy | 2021 | 1 | 7 | 3 | 0.0 | 3.5 | S | 4.5 | 3.5 | 5 | 3.5 | -- | 2.0 | 3.0 | 2.3 |
| | 2022 | 2 | 2 | 2 | 0.0 | 2.5 | S | 5.0/7.5 | 9.0 | 3 | 4.0 | 1.5 | 1.5 | 4.5 | 2.0 |
| Overall | | | | MR/MR | | | | MS | | | | MR | | | |
| CDC McGwire | 2021 | 6 | 8 | 7 | 1.5 | 4.0 | MS | 5.0 | 2.5 | 7 | 4.5 | -- | 2.0 | 1.5 | 2.5 |
| | 2022 | 2 | 2 | 4 | 0.0 | 3.0 | S | 3.5/6.5 | 9.0 | 5 | 4.0 | 2.0 | 2.5 | 5.0 | 2.7 |
| Overall | | | | I/I | | | | MS | | | | I | | | |
| CDC Rattan | 2021 | 7 | 8 | 6 | 3.5 | 5.0 | S | 4.5 | 2.5 | 7 | 5.0 | -- | 2.0 | 2.0 | 2.5 |
| | 2022 | 6 | 2 | 4 | 3.5 | 3.0 | S | 4.0/6.5 | 8.0 | 5 | 3.0 | 2.0 | 2.5 | 4.5 | 3.2 |
| Overall | | | | MS/I | | | | MS | | | | I | | | |
| CDC Fibar | 2021 | 8 | 8 | 8 | 3.5 | 5.5 | MS | 0.0 | 1.0 | 7 | 7.5 | -- | 4.0 | 4.0 | 4.0 |
| | 2022 | 6 | 7 | 7 | 0.0 | 4.0 | MS | 3.0/6.0 | 5.0 | 8 | 5.0 | 3.5 | 3.0 | 4.0 | 5.7 |
| Overall | | | | MS/MS | | | | MR | | | | I | | | |
| CDC Clear | 2021 | 5 | 7 | 7 | 0.0 | -- | MS | 3.5 | 1.0 | 3 | 3.5 | -- | 2.0 | 0.0 | 2.5 |
| | 2022 | 2 | 3 | 7 | 0.0 | 2.5 | S | 3.0/6.0 | 7.5 | 5 | 6.0 | 1.0 | 2.0 | 4.5 | 2.4 |
| Overall | | | | I/I | | | | MS | | | | MR | | | |
| HB21355 | 2021 | 4 | 8 | 7 | 0.0 | 4.5 | MS | 3.5 | 1.0 | 5 | 4.5 | -- | 1.0 | 1.5 | 3.0 |
| | 2022 | 2 | 3 | 3 | 0.0 | 3.5 | S | 4.0/6.5 | 8.0 | 5 | 4.0 | 1.0 | 1.0 | 4.0 | 3.2 |
| Overall | | | | I/I | | | | MS | | | | MR | | | |

Table 7. (cont.)

| Entry | | Surface Smuts | | | Loose Smut | Stem Rust | | | | Fusarium Head Blight | | | | | | | |
|----------------|-------------|---------------|-------------|-------------|------------|--------------|-----------------|------------|--------------|----------------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| | | CDC (%) | Morden (%) | | CDC (%) | Morden Field | Morden Seedling | CDC | Rating (0-5) | | PEI | | | DON (ppm) | | | |
| | | U. hordei | U. hordei | U. nigra | U. nuda | Sev. (%) | IR | IT | <i>Rpg1</i> | Bran. | Morden | Inc. | Sev. | Index | Bran. | Morden | PEI |
| AAC Synergy | 2021 | 7.0 | 15.0 | 29.0 | 5.9 | -- | -- | 1- | + | 1.3 | 1.5 | 8.5 | 6.5 | 55.3 | 12.0 | 7.5 | 13.1 |
| | 2022 | -- | 16.0 | 30.0 | 0.0 | 3 | MR | ;1- | NT | 1.7 | 1.3 | -- | -- | -- | 40.0 | 33.5 | -- |
| Overall | | | MR | | I | | | R | | I | | | | | | | |
| CDC McGwire | 2021 | 9.4 | 5.0 | 20.0 | 18.2 | -- | -- | ;1- | + | 1.5 | 1.7 | 8.0 | 6.8 | 54.0 | 4.0 | 2.8 | 18.6 |
| | 2022 | -- | -- | 20.0 | 69.2 | 10 | I | -- | + | 2.2 | 2.3 | -- | -- | -- | 13.2 | 37.5 | -- |
| Overall | | | MR | | I | | | I | | | | | | I | | | |
| CDC Rattan | 2021 | 36.2 | 28.0 | 18.0 | 0.0 | -- | -- | 1- | + | 2.5 | 1.5 | 8.8 | 7.0 | 61.3 | 6.0 | 5.1 | 6.0 |
| | 2022 | -- | 24.0 | 16.0 | 42.9 | 3 | MR | 1- | + | 2.2 | 1.3 | -- | -- | -- | 8.3 | 16.6 | -- |
| Overall | | | I | | I | | | R | | | | | | MR | | | |
| CDC Fibar | 2021 | 0 | 24.0 | 20.0 | 69.2 | - | - | 23- | - | 4.0 | 2.3 | 8.3 | 6.5 | 53.5 | 12.3 | 7.8 | 9.3 |
| | 2022 | -- | 8.0 | -- | 62.5 | 40 | S | 12- | - | 2.7 | 1.8 | -- | -- | -- | 27.0 | 21.1 | -- |
| Overall | | | MR | | MS | | | MS | | | | | | I | | | |
| CDC Clear | 2021 | 7.1 | dng | 15.0 | 0.0 | -- | -- | ;1- | + | 1.5 | 1.0 | 8.0 | 6.8 | 54.0 | 5.0 | 1.5 | 15.7 |
| | 2022 | -- | -- | -- | 0.0 | 1 | R | -- | + | 1.3 | 1.2 | -- | -- | -- | 12.8 | 10.2 | -- |
| Overall | | | R | | R | | | R | | | | | | MR | | | |
| HB21355 | 2021 | 13.2 | 12.0 | 30.0 | 0.0 | | | ; | + | 3.0 | 2.7 | 8.0 | 7.0 | 55.5 | 6.5 | 4.2 | 12.6 |
| | 2022 | - | - | - | 0.0 | 5 | I | ;1- | + | 1.2 | 1.5 | -- | -- | -- | 13.7 | 14.5 | -- |
| Overall | | | MR | | R | | | I | | | | | | MR | | | |

Table 8. Average malting characteristics for HB21355 and checks from 2021 Western Cooperative Hulless Barley Test.

| Entry | Barley | | | | | | | | | Malt | | | | | | |
|----------------|--------------|--------------|--------------|--------------|---------------|----------------------|-------------|-------------|--------------|---------------|---------------|---------------|--------------|---------------|-------------------------|---------------------------|
| | Plump | | K.Wt. (g) | Prot. (%) | Starch (%) | β -Gluc (%) | G.E. | | RVA (RVU) | Steep. | | Friab. (%) | Adh. | | Diast. Power (°L) | Alpha- Amylase (DU) |
| | >7/64 (%) | >5/64 (%) | | | | | 4 ml (%) | 8 ml (%) | | Moist. (%) | Moist. (%) | | Hulls (%) | Prot. (%,) | | |
| AAC Synergy | 81.8 | 99.3 | 50.8 | 13.9 | -- | -- | 99 | 97 | -- | 45.6 | 3.8 | 78.3 | 97.3 | 13.8 | 184 | 90.5 |
| CDC Clear | 23.5 | 98.2 | 50.3 | 14.3 | -- | -- | 96 | 95 | -- | 46.9 | 4.1 | 44.9 | 0.7 | 14.6 | 188 | 94.2 |
| HB21355 | 8.1 | 98.3 | 43.3 | 14.7 | -- | -- | 97 | 96 | -- | 48.4 | 3.8 | 60.9 | 0.4 | 15.1 | 216 | 93.6 |
| Station Years | 3 | 3 | 3 | 3 | -- | -- | 3 | 3 | -- | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

Table 8. (cont.)

| Entry | Wort | | | | | | | | |
|----------------|------------------------|--------------------------|--------------------------|----------------------|-------------------------|---------------|-------------------------|---------------|------|
| | Fine Extract (%) | Coarse Extract (%) | F-C Difference (%) | Sol. Prot. (%) | Kolbach Index (%) | FAN (mg/L) | β -Gluc (mg/L) | Visc. (cP) | |
| | AAC Synergy | 80.3 | 80.3 | 0.1 | 5.7 | 41.5 | 212 | 85 | 1.42 |
| CDC Clear | 85.2 | 84.2 | 1.0 | 6.0 | 41.1 | 212 | 205 | 1.60 | |
| HB21355 | 85.4 | 84.9 | 0.5 | 6.7 | 44.3 | 257 | 89 | 1.53 | |
| Station years | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |

Table 9. Average malting characteristics for HB21355 and checks from 2022 Western Cooperative Hulless Barley Test.

| Entry | Barley | | | | | | | | | Malt | | | | | | | |
|----------------|--------------|--------------|-------------|--------------|--------------|---------------|---------------|-------------|---------------|--------------|---------------|---------------|------------|----------------------|-------------------------|---------------|---------------------------|
| | Plump | | | K.Wt. (g) | Prot. (%) | Starch (%) | β-Gluc (%) | G.E. | | RVA (RVU) | Steep. | | | Adh. Hulls (%) | Diast. Prot. (%,) | Power (°L) | Alpha- Amylase (DU) |
| | >7/64 (%) | >5/64 (%) | 4 ml (%) | | | | | 8 ml (%) | Moist. (%) | | Moist. (%) | Friab. (%) | | | | | |
| AAC Synergy | 77.3 | 98.2 | 48.1 | 11.1 | 59.7 | 4.5 | 100 | 89 | 143 | 45.3 | 3.5 | 84.9 | 97.3 | 11.0 | 141 | 81.9 | |
| CDC Clear | 12.9 | 98.8 | 50.0 | 11.3 | 63.9 | 4.8 | 96 | 95 | 163 | 45.0 | 4.1 | 53.6 | 0.5 | 11.3 | 149 | 89.4 | |
| HB21355 | 4.2 | 97.7 | 40.4 | 11.2 | 63.6 | 4.2 | 97 | 97 | 142 | 47.7 | 3.6 | 79.9 | 1.1 | 11.1 | 165 | 95.2 | |
| Station Years | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |

Table 9. (cont.)

| Entry | Wort | | | | | | | | |
|----------------|------------------------|--------------------------|--------------------------|----------------------|-------------------------|---------------|------------------|---------------|------|
| | Fine Extract (%) | Coarse Extract (%) | F-C Difference (%) | Sol. Prot. (%) | Kolbach Index (%) | FAN (mg/L) | β-Gluc (mg/L) | Visc. (cP) | |
| | AAC Synergy | 82.9 | 82.5 | 0.4 | 5.0 | 45.0 | 195 | 204 | 1.47 |
| CDC Clear | 88.8 | 87.1 | 1.7 | 4.9 | 43.8 | 175 | 376 | 1.66 | |
| HB21355 | 89.4 | 88.8 | 0.6 | 5.5 | 49.3 | 228 | 128 | 1.52 | |
| Station years | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |