2022 HULLESS BARLEY VARIETY TRIAL

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Hulless barley (also known as naked barley) has generated interest from specialty food markets. Specialty grains, such as hulless barley, can support local farm viability by diversifying crop rotations and revenue streams. Unlike malting barley, hulless barley is free threshing. This means the hull easily separates from the grain kernel during harvest and cleaning, producing whole grain barley for human consumption. This eliminates the pearling processing necessary to produce culinary barley for food markets. Because it is a whole grain, hulless barley has higher flavor and nutritional value than pearled barley, which goes through an abrasion process to remove the hull and bran. In 2022, the University of Vermont Extension's Northwest Crops and Soils Program continued the third year of a field trial of seventeen heirloom hulless barley varieties with seed provided by Sylvia Davatz of Solstice Seeds (Hartland, VT). Seven additional hulless varieties under development in various breeding programs were provided by Cornell University for evaluation in the 2022 trial.

MATERIALS AND METHODS

The trial was established at Borderview Research Farm in Alburgh, VT. Plots were managed with practices similar to those used by organic producers in the surrounding area. Four replicates of 24 varieties were planted for evaluation (Table 1). Plots were seeded with a Great Plains Cone Seeder at a rate of 350 live seeds m^{-2} on 18-Apr into 5' x 20' plots (Table 2). The previous crop was grain corn and the soil type was Benson rocky silt loam.

Table 1. Hulless barley varieties, Alburgh, VT, 2022.

Variety	Source
Arabian Blue	Solstice Seeds
Burbank	Solstice Seeds
Burbank Purple	

Variations in agronomic characteristics can occur because of variations in genetics, soil, weather, and other growing conditions. Statistical analysis makes it possible to determine whether a difference among treatments is real or whether it might have occurred due to other variations in the field. At the bottom of each table, a LSD value is presented for each variable (e.g. yield). Least Significant Differences (LSD's) at the 10% level of probability are shown.

Where the difference between two treatments within a column is equal to or greater than the LSD value at the bottom of the column, you can be sure in 9 out of 10 chances that there is a real difference between the two values. Treatments that were not significantly lower in performance than the highest value in a particular column are indicated with an asterisk. In this example, treatment A is significantly different from treatment C but not from treatment B. The difference between A and B is equal to 200, which is less than the LSD value of 300. This means that these treatments did not differ in yield. The difference between A and C is equal to 400, which is greater than the LSD value of 300. This means that the yields of these treatments were significantly different from one another.

RESULTS

Seasonal precipitation and temperature recorded at a weather station at Borderview Research Farm are displayed below in Table 3. The growing season was cooler than normal overall, although the month of May was warmer than average. There were 3510 Growing Degree Days (GDDs) in the season, 36 growing degree days less than normal. There were 20.1 inches of precipitation, 4.97 inches more than normal.

Table 3. Temperature and precipitation summary for Alburgh, VT, 2022.

symptoms. These individual disease ratings were combined into a single foliar disease rating for statistical analysis. Diseases and symptoms noted in the hulless barley trial were rust, mosaic virus, brown spots and lesions that could be a characteristic of several foliar diseases, and powdery mildew (in order from most severe to least). L94 had the highest incident rate of disease damage at 16.2%. The trial average for foliar damage was 6.06% with CH-2909n-162-95 having the lowest rating at 3.35% and was statistically similar to all but five varieties. Arthropod damage found on this trial were mites, thrips, and cereal leaf beetle (in order from most severe to least). The trial average for foliar damage was 4.65% with Dolma having the lowest rating at 3.30% and was not statistically different from any of the varieties.

Height and lodging information was collected prior to harvest. Taller plants are generally more desirable to outcompete weeds, but barley that grows too tall risks lodging in wet weather. The tallest variety in the 2022 trial was Excelsior Purple at 91.8 cm and was statistically similar to all except nine varieties. The average trial lodging was 51.2%, with Excelsior Purple having the lowest rate of lodging at 18.8%. Harvest moisture below 14% is necessary for grain storage. Grain above this moisture content has to be dried down after harvest, adding time and cost to the farm. All hulless barley varieties tested well above the 14% moisture threshold and required additional drying. Sangatsuga had the lowest harvest moisture at 19.5% and was statistically similar to all other varieties.

Test weight is the measure of grain density, which is determined by weighing a known volume of grain. The industry standard test weight for malting barley is 48 lbs bu^{-1}. There is not currently a standard test weight for hulless barleys in US markets, but Canadian grain grading standards call for a test weight of 58 lbs bu^{-1} for highest grading, similar to desired test weights for wheat. Test weights for hulless barley are higher than malting barley because the hull is not a component. Hulls are lighter weight and take up volume which would reduce the test weight. Purple had the highest test weight of 58.1 lbs bu^{-1}, however not statistically different from the other varieties.

Yields were good across the trial with average yields over a ton per acre (Table 4). CDC Carter had the highest yield at 3392 lbs ac

CDC Carter	15-Jun	3.50*	4.90	89.3*	26.3	26.0	53.4	**3392**
CDC Clear	15-Jun	5.90*	4.15	89.0*	45.0	25.0	55.4	2744
CH-2909n-162-95	14-Jun	**3.35***	6.15	87.1*	45.0	20.5	50.7	2936
Dolma	15-Jun	6.50*	**3.30**	80.8*	31.3	21.5	52.8	2448
Dolma Purple	13-Jun	5.05*	4.70	70.2	71.3	20.2	53.0	2053
Excelsior	15-Jun	6.75*	3.85	83.1*	56.3	25.6	54.2	1957
Excelsior Purple	18-Jun	3.60*	4.40	**91.8***	**18.8**	24.2	54.6	2864
Faust	13-Jun	3.60*	4.90	84.7*	31.3	25.2	55.2	

varieties. All but four varieties (Arabian Blue, Burbank, Dolma, Zwerggeste) were above the industry standard of 95% for germination.

Table 5. Spring hulless barley varieties and quality parameters, Alburgh, VT, 2022.

Variety	Crude protein @ 12% moisture %	Falling number seconds	Plumpness %	Germination %
Arabian Blue	12.7*	451	78.2	94.3
Burbank	11.8*	424	78.9	94.8
Burbank Purple	11.4	326	69.2	96.8*
CDC Ascent	10.3	417	**88.7**	95.3
CDC Carter	11.2	472	83.2	98.3*
CDC Clear	11.5	400	84.6	96.3*
CH-2909n-162-95	12.3*	363	77.2	96.0*
Dolma	11.0	292	54.9	91.0
Dolma Purple	12.1*	466	69.0	96.3*
Excelsior				

Figure 1. Spring hulless barley yield and protein, Alburgh, VT, 2022.

DISCUSSION

Market outreach has been generating demand for hulless barley in recent years. Hulless barley in general shows potential as a specialty food grain in the Northeast. Though this data is only based on a single growing season, agronomic performance shows potential for hulless barley as a crop in Vermont and the Northeast. This was only the third year that enough seed was available to conduct multiple replications and quality analysis for this trial