2024 Montana Barley Crop Quality Report

H. Uhlmann, B. McMahon, J. Sherman. Department of Plant Science and Plant Pathology, MSU, Bozeman MT 59717

This is the 15th annual crop quality report for barley grown in Montana. Collection of barley samples was coordinated by the U.S. Department of Agriculture (USDA) National Agriculture Statistics Services (NASS) in Montana. Grain quality evaluations were performed by the Barley, Malt & Brewing Quality Lab at Montana State University and grade information was determined by the Montana State Grain Lab. The Montana Wheat and Barley Committee provided financial support.

Production

According to the USDA – NASS September 2024 Small Grains Summary, 38% of barley acres planted in the and harvested in the US in were in Montana, equalling 900,000 acres of barley planted. Of all barley planted, 710,000 acres were harvested, down 31% from the 1,030,000 acres harvested in 2023.

The USDA reported an average yield of 51 bushels per acre (bu/acre). This was up 2 bu/acre from the 2023 average yield of 49 bu/acre.

Following a national trend, overall barley production in Montana was down 28% with 36.2 million bushels produced, compared to 2023 when 50.4 million bushels were reported.

Materials and Methods

The 2024 Montana barley crop survey consists of four districts within the state (Table 1). The crop quality survey objective was to collect a representative number of samples from each district. The number of barley samples collected was determined by historical barley production in each county.

During harvest, a total of 80 two-rowed barley samples weighing between 1 and 2 pounds was collected from farms and grain elevators in selected Montana counties. The variety represented for each barley sample was provided by the grower or elevator.

Upon receipt, initial moisture content was recorded for each submission and samples in excess of 13.5% were allowed to air-dry prior to subsequent analyses. A portion of each sample was then removed prior to cleaning. These subsamples were later bulked based on suitability for malting to create regional composite samples. After sub-sampling, the remaining grain was cleaned to remove dockage prior to further testing.

Test weight, moisture, protein, and kernel assortment were determined for each of the dockage-free samples. Percent total protein (reported on a dry-matter basis) was determined by near infrared transmittance on a Foss Infratec Nova grain analyzer.

Table 3 displays such results. The values for state and district averages represent results of malting quality or feed quality samples from that region.

Continued on page 3:

Montana Snapshot

- A total of 80 two-rowed malting barley samples from 17 counties in Montana were collected at harvest
- Harvested acreage, yield and production were down from the previous year
- District average malt protein levels ranged from 11.5% in Western Montana to 12.9% in Central Montana
- District average malt test weight ranged from 46.7 lb/bu in Central Montana to 49.6 lb/bu in Western Montana
- The south district was graded at U.S. No. 1 while the west district was graded at or above U.S. No. 2 Two-Rowed Malting Barley, north and central were graded at U.S. No. 3 Two-Rowed Barley
- Malt extracts ranged from 77.9% (Mayflower) to 84.6% (Voyager)

Table 1. 2024 Barley Survey Districts in Montana

District	Counties	% Of Survey Samples
North	Glacier, Liberty, Pondera, Toole	38%
West	Cascade, Lewis and Clark, Teton	23%
Central	Chouteau, Fergus, Hill, Judith Basin	25%
South	Big Horn, Carbon, Gallatin, Treasure, Yellowstone	15%

Table 2. Montana Sample Collection, by Barley Variety

	Metcalfe	Bill Coors 100	Synergy	Hockett	ABI Eagle	Buzz	Voyager	Moravian 165	Other or Unidentified
Number of Samples Collected	29	16	11	5	5	3	3	3	5
Percentage of Samples Collected	36%	20%	14%	6%	6%	4%	4%	4%	6%
Percentage at Malting Grade	55%	81%	82%	60%	100%	0%	67%	33%	100%
Percentage at Feed Grade	45%	19%	18%	40%	0%	100%	33%	67%	0%

Table 3. Montana State and District Two-Rowed Barley Crop Quality

State and District	Number of Samples	% Moisture Content	% Dockage	Test Weight (lb/bu)	% Protein Content	Kernel Assortment % Plump	% Thin
North	**30**	**10.6**	**1.0**	**47.5**	**13.1**	**80.5**	**1.6**
Malt Grade	16	10.6	1.0	48.9	11.7	89.2	1.1
	CV	0.11	0.01	0.05	0.11	0.06	0.52
Feed Grade	14	10.6	1.1	45.9	14.7	70.5	2.2
	CV	0.10	0.00	0.06	0.09	0.22	0.86
West	**18**	**11.1**	**1.2**	**48.3**	**12.3**	**83.6**	**1.6**
Malt Grade	14	11.3	0.7	49.6	11.5	90.0	0.9
	CV	0.05	0.01	0.05	0.08	0.07	0.61
Feed Grade	4	10.8	3.0	43.7	15.2	61.0	4.1
	CV	0.03	0.01	0.06	0.07	0.14	0.09
Central	**20**	**10.0**	**1.1**	**45.9**	**13.6**	**77.1**	**1.6**
Malt Grade	12	10.2	0.8	46.7	12.9	83.0	1.2
	CV	0.08	0.00	0.04	0.06	0.07	0.47
Feed Grade	8	9.9	1.5	44.8	14.6	68.1	2.0
	CV	0.05	0.01	0.02	0.11	0.18	0.50
South	**12**	**9.8**	**0.7**	**52.1**	**10.8**	**95.7**	**0.60**
Malt Grade	12	9.8	0.7	52.1	10.8	95.7	0.60
	CV	0.09	0.01	0.04	0.08	0.03	1.20
Feed Grade	0	—	—	—	—	—	—
	CV	—	—	—	—	—	—
State Ave	**80**	**10.5**	**1.0**	**48.0**	**12.7**	**82.6**	**1.4**
Malt Grade	54	10.5	0.82	49.3	11.7	89.5	1.0
	CV	0.10	0.01	0.06	0.10	0.08	0.65
Feed Grade	26	10.4	1.5	45.2	14.7	68.3	2.4
	CV	0.09	0.01	0.05	0.09	0.20	0.67

Table 4. Montana Barley Grades

District	Dockage (%)	Grade**	Test Weight (lb/bu)	Protein (%)	Sound Barley*** (%)	Skinned and Broken Kernels (%)	Thin Barley (%)
North	0.50	U.S. No. 3 Two-Rowed Barley	48.0	11.8	93.9	1.7	1.0
West	0.33	U.S. No. 2 Two-Rowed Malting Barley	49.0	11.6	99.1	1.9	3.5
Central	0.39	U.S. No. 3 Two-Rowed Barley	46.0	12.8	95.3	0.5	1.7
South	0.27	U.S. No. 1 Two-Rowed Malting Barley	51.5	11.1	99.8	0.8	2.1

***Grade specifications provided in United States Department of Agriculture, Marketing and Regulatory Programs, Agricultural Marketing Service, Federal Grain Inspection Service, Washington, D.C., Grain Inspection U.S. Standards, Subpart B—United States Standards for Barley, August 2018 Subpart B -- www.ams.usda.gov/sites/defaultt/files/media/BarleyStandards.pdf*
****Injured-by-frost kernels and injured-by-mold kernels are not considered damaged or considered against sound barley.*

Continued from page 1:

Barley samples were deemed to have suitable malting quality based on protein and plump values. Barley having protein greater than 14% or plumps over a 6/64th sieve less than 70% were rejected as not suitable quality. District composite samples were made from suitable barley samples and submitted to the Montana State Grain Inspection Service for determination of grade, noted in Table 4.

Barley samples having suitable malting quality were sorted and pooled within variety (Eagle, Endurance, Expedition, Hockett, Moravian 165, Mayflower, Raptor, Voyager and Buzz) or within variety and region for varieties having more entries (Metcalfe, BC-100, and Synergy). Pooled grain was then malted in a malting profile using MSU's CLP micromalters. Malt quality data was obtained and is reported in Table 4.

Varieties

The majority of barley acreage in Montana was planted to malting varieties (NASS). AC Metcalfe, Bill Coors 100, and Synergy are among the most commonly planted two-rowed malting varieties in Montana. The most collected barley variety in 2024 was AC Metcalfe. It comprised 36% of the samples (Table 2). Bill Coors 100 and Synergy were the next most collected varieties (20% and 14%, respectively). They were followed by Hockett and ABI Eagle at 6%.

Quality of Two-Rowed Malting Barley Varieties

State and district averages of individual two-rowed malting barley samples are presented in Table 3. Of the 80 samples collected, 54 were of acceptable malting quality. The average moisture of the 54 two-rowed barley samples was 10.5%. The average two-rowed barley test weight was 49.3 lb/bu and average barley protein content was 11.7%. The average kernel assortment was 89.5% plump with 1.0% thin kernels.

North District

The north district had the most samples rejected with 53% of samples collected being of suitable malting quality. Of those the average test weight was 48.9 lb/bu. Barley protein content was 11.7%. The average kernel plumpness was 89.2% with 1.1% thin kernels.

West District

The west district only had four samples rejected with 78% deemed suitable malting quality. The average test weight was 49.6 lb/bu. Barley protein content was 11.5%. The average kernel plumpness was 90.0% with 0.9% thin kernels.

Central District

60% of central samples were of suitable malting quality. This district had the highest average protein at 12.9%. The average test weight was 46.7 lb/bu. The central district had an average kernel plumpness of 83.0% with 1.2% thin kernels.

South District

The south district had no samples rejected with 100% being of suitable malting quality. These samples had the highest average test weight at 52.1 lb/bu, and the lowest protein content at 10.8%. The district also had the highest average kernel plumpness at 95.7% plump with 0.60% thin kernels.

Barley Grades

Montana district composite samples were inspected for an official grade by the State Grain Lab in Great Falls, MT (Table 4). The south district composite sample was graded as U.S. No. 1 Two-Rowed Malting Barley and had the highest test weight at 51.5 lb/bu and the lowest protein at 11.1%. The west district was graded as U.S. No. 2 and had a test weight of 49.0 lb/bu and protein of 11.6%. The north and central district composites were both graded as U.S. No. 3 Two-Rowed Barley with test weights of 48.0 lb/bu and 46.0 lb/bu, respectively. The central district composite had the highest protein content at 12.8%. All four composites had minimal dockage and two of the four had a rating of greater than 99% for sound barley (west and south), with central having a slightly reduced rate of 95.3% and north being reported at 93.9%. Central had the lowest skinned and broken percentage at 0.5%, while the north had the lowest level of thin kernels at 1.0%.

Table 4. 2024 Average Malt Quality by Variety

Variety	Region	# of Samples	Extract FG DB %	Total Protein (%)	Soluble Protein %	S/T %	B-Glucan mg/L	FAN mg/L	DP *ASBC	AA D.U.
BC-100	South	7	83.3	11.0	5.4	49.5	21	315	166	103
BC-100	North/ West	6	78.9	11.4	5.9	51.4	13	326	169	109
Eagle	MT	5	82.0	11.0	5.5	49.8	16	308	161	42
Endurance	MT	1	81.2	11.4	5.4	47.4	58	288	159	95
Expedition	MT	1	82.2	11.3	4.0	35.8	45	201	140	71
Hockett	MT	3	78.9	12.3	5.1	41.5	36	257	197	95
Moravian 165	MT	1	80.4	9.5	4.5	47.5	10	252	123	96
Mayflower	MT	1	77.9	11.7	5.6	47.6	26	290	173	80
Metcalfe	South/ Central	8	78.5	12.4	5.4	43.5	10	295	194	113
Metcalfe	North/ West	8	80.5	11.5	5.2	45.3	15	284	178	112
Raptor	MT	2	80.5	11.7	5.6	47.9	10	306	189	99
Synergy	South	4	81.8	11.2	5.3	47.2	31	278	165	99
Synergy	West/ Central	5	80.5	11.8	5.6	47.7	7	325	170	112
Voyager	MT	2	84.6	11.2	5.1	45.8	5	317	169	111

Malting Process

Barley samples were pooled based on variety to generate representative statewide samples. If enough samples could be collected for a region, those were isolated for representation. Malts were generated at the MSU Barley, Malt & Brewing Quality Lab with a program that consisted of 3 steeps (10 hours wet, 18 hrs. rest, 6 hrs. wet, 10 hrs. rest, 4 hrs. wet) and 96 hours of germination time. Malting was held at 15 °C during the steeping phase and 18 °C during the germination phase. Malts were kilned in a base malt profile consisting of 12 hrs. at 60 °C, 6 hrs. at 65 °C, 2 hrs. at 75 °C, and 3 hrs. at 85 °C. Samples were manually de-culmed and malt quality analysis was performed directly.

Malting Observations

Most varieties demonstrated extract of 80% or better, with Voyager, BC-100 (south district) and Expedition having the three highest values of 84.6%, 83.3%, and 82.2%, respectively. Mayflower had the lowest extract at 77.9%. All varieties had good breakdown of B-glucan with all under 100 mg/L. Synergy, BC-100, Eagle, and Raptor had the highest FAN values with all being over 300 mg/L. All varieties generated appropriate enzyme content for brewing and distilling. Hockett had the highest DP value at 197 °ASBC with Metcalfe right behind it at 194 °ASBC. Moravian 165 was the lowest at 123 °ASBC. A-amylase ranged from 42 DU to 113 DU with Eagle at the low end and Metcalfe at the high end.

References

Small Grains 2022 Summary (September 2022), USDA, National Agricultural Statistics Service.

United States Department of Agriculture, Marketing and Regulatory Programs, Agricultural Marketing Service, Federal Grain Inspection Service, Washington, D.C. Grain Inspection U.S. Standards, Subpart B—United States Standards for Barley, August 2018 Subpart B -- www.ams.usda.gov/sites/defaultt/files/media/BarleyStandards.pdf