# 2023 Montana Barley Crop Quality Report

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This is the fourteenth 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 Department of Plant Sciences and Plant Pathology 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 2023 Small Grains Summary, 1.19 million acres of barley were planted in Montana. Of these barley acres, 1.02 million acres were harvested. This is up 19.4% from the 850 thousand acres harvested in 2022.

The USDA reported an average yield of 49 bushels per acre (bu/acre) (3.28 metric tons per hectare (mt/ha)). This was up 8 bu/acre (0.53 mt/ha) from the 2022 average yield of 41 bu/acre (2.75 mt/ha).

A trend of high planting rates continued in 2023 following the challenges of 2021. This led to a 42.7 percent increase in production from 2022. Barley production in 2023 was estimated by the USDA to be 49.8 million bushels (1.08 million metric tons), up from 34.9 (759 thousand metric tons) in 2022.

**Materials and Methods**

The 2023 Montana barley crop survey consists of four districts within the state (Table 1). The objective of the crop quality survey was to collect a representative number of samples from each district. The number of barley samples collected was determined by previous and projected barley production in the counties of each district.

During harvest, a total of 88 two-rowed barley samples weighing between 1 and 2 pounds were collected from farms and grain elevators in selected counties in Montana. The variety of individual barley samples was provided by the grower.

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 (additional drying was not needed for any of the 2023 samples). 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, protein, kernel assortment, 1,000 kernel weight, and plumpness 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.

Continued on page 3.

## Montana Two-Rowed Malting Barley Quality Snapshot

- A total of eighty eight two-rowed malting barley samples from 21 counties in Montana were collected at harvest
- Harvested acreage, yield and production were slightly up from the previous year
- District average malt protein levels ranged from 11.3% in Central Montana to 11.8% in Northern and Southern Montana
- District average malt test weight ranged from 49.9 lb/bu in Northern Montana to 52.9 lb/bu in Southern Montana
- The South district was graded at or above U.S. No. 1 Two-Rowed Malting Barley while the North and Central districts were graded at U.S. No. 2 Two-Rowed Malting Barley

**Table 1. 2023 Barley Survey Districts in Montana**

| District | Counties | % Of Survey Samples |
|---|---|---|
| **North** | Glacier, Liberty, Pondera, Roosevelt, Toole | 42% |
| **West** | Cascade, Lewis and Clark, Teton | 17% |
| **Central** | Blaine, Chouteau, Fergus, Golden Valley, Hill, Judith Basin, Meagher | 30% |
| **South** | Big Horn, Carbon, Gallatin, Stillwater, Treasure, Yellowstone | 11% |

## Table 2. Montana Sample Collection, Broken out by Barley Variety

| | AC Metcalfe | Bill Coors 100 | Hockett | Buzz | ABI Voyager | Synergy | Eagle | Other or Unidentified |
|---|---|---|---|---|---|---|---|---|
| Number of Samples Collected | 33 | 16 | 11 | 9 | 5 | 5 | 4 | 5 |
| Percentage of Samples Collected | 38% | 18% | 13% | 10% | 6% | 6% | 5% | 6% |
| Percentage at Malting Grade | 73% | 81% | 100% | 78% | 100% | 80% | 100% | 40% |
| Percentage at Feed Grade | 27% | 19% | 0% | 22% | 0% | 20% | 0% | 60% |

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

| State and District | Number of Samples | % Moisture Content | % Dockage | Test Weight (lb/bu) | 1000 Kernel Weight (g) | % Protein Content | Kernel Assortment % Plump | Kernel Assortment % Thin |
|---|---|---|---|---|---|---|---|---|
| **North** | **37** | **9.7** | **1.4** | **49.6** | **39.3** | **12.9** | **72.9** | **2.7** |
| Malt Grade | 26 | 9.8 | 1.2 | 49.9 | 41.4 | 11.8 | 82.4 | 1.2 |
| | CV | 0.06 | 0.6 | 0.04 | 0.11 | 0.12 | 0.14 | 0.50 |
| Feed Grade | 11 | 9.6 | 1.8 | 48.7 | 34.2 | 15.3 | 50.4 | 6.2 |
| | CV | 0.05 | 0.4 | 0.07 | 0.13 | 0.09 | 0.45 | 0.54 |
| **West** | **15** | **9.9** | **1.4** | **50.1** | **42.4** | **12.0** | **96.2** | **1.9** |
| Malt Grade | 13 | 10.0 | 1.3 | 50.7 | 43.8 | 11.6 | 90.7 | 1.1 |
| | CV | 0.05 | 0.5 | 0.03 | 0.08 | 0.09 | 0.07 | 0.88 |
| Feed Grade | 2 | 9.3 | 2.0 | 45.9 | 33.1 | 14.4 | 56.8 | 7.4 |
| | CV | 0.02 | 0.06 | 0.01 | 0.04 | 0.08 | 0.18 | 0.22 |
| **Central** | **26** | **9.9** | **1.5** | **49.5** | **41.7** | **11.97** | **81.7** | **1.7** |
| Malt Grade | 21 | 9.9 | 1.3 | 50.2 | 43.5 | 11.3 | 86.8 | 1.1 |
| | CV | 0.06 | 0.9 | 0.05 | 0.12 | 0.10 | 0.11 | 0.72 |
| Feed Grade | 5 | 9.9 | 2.4 | 46.6 | 34.2 | 14.8 | 60.2 | 4.4 |
| | CV | 0.06 | 0.6 | 0.02 | 0.09 | 0.13 | 0.25 | 0.83 |
| **South** | **10** | **10.2** | **1.4** | **52.9** | **47.4** | **11.8** | **94.5** | **0.88** |
| Malt Grade | 10 | 10.2 | 1.4 | 52.9 | 47.4 | 11.8 | 94.5 | 0.88 |
| | CV | 0.03 | 0.5 | 0.04 | 0.08 | 0.08 | 0.05 | 1.08 |
| Feed Grade | 0 | — | — | — | — | — | — | — |
| | CV | — | — | — | — | — | — | — |
| **State Ave** | **88** | **9.9** | **1.4** | **49.3** | **41.5** | **12.3** | **80.2** | **2.1** |
| Malt Grade | 70 | 9.9 | 1.3 | 50.5 | 43.4 | 11.6 | 86.9 | 1.1 |
| | CV | 0.06 | 0.63 | 0.04 | 0.11 | 0.10 | 0.12 | 0.70 |
| Feed Grade | 18 | 9.7 | 2.0 | 47.8 | 34.1 | 15.1 | 53.8 | 5.8 |
| | CV | 0.06 | 0.48 | 0.06 | 0.11 | 0.10 | 0.36 | 0.57 |

**Table 4. Montana Barley Grades**

| District | Dockage (%) | Grade** | Test Weight (lb/bu) | Protein (%) | Sound Barley*** (%) | Skinned and Broken Kernels (%) | Thin Barley (%) |
|---|---|---|---|---|---|---|---|
| North | 0.42 | U.S. No. 2 Two-Rowed Malting Barley | 49.5 | 12.0 | 99.5 | 0.8 | 6.8 |
| West | 0.30 | U.S. No. 1 Two-Rowed Malting Barley | 51.0 | 11.6 | 99.7 | 2.1 | 3.4 |
| Central | 0.44 | U.S. No. 2 Two-Rowed Malting Barley | 50.0 | 11.7 | 99.9 | 1.4 | 5.1 |
| South | 0.18 | U.S. Sample Grade | 51.5 | 12.1 | 96.9 | 1.4 | 3.7 |

***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.*

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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 Inc. for determination of grade.

**Varieties**

The majority of barley acreage in Montana was planted to malting varieties (NASS). AC Metcalfe, Bill Coors 100, MT Hockett, and MT Buzz are among the most commonly planted two-rowed malting varieties in Montana. The most collected barley variety in 2023 was AC Metcalfe. It comprised thirty-eight percent of the samples (Table 2). Bill Coors 100 and MT Hockett were the next most collected varieties, at eighteen and thirteen percent, respectively. They were followed by MT Buzz at ten percent.

**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 88 samples collected, 70 were of acceptable malting quality. The average moisture of the 70 two-rowed barley samples was 9.9 percent. The average two-rowed barley test weight was 50.5 lb/bu and average one thousand kernel weight was 43.4 grams. Average barley protein content was 11.6 percent. The average kernel assortment was 86.9 percent plump with 1.1 percent thin kernels.

***North District***

The North district had the most samples rejected with 70% of samples collected being of suitable malting quality. Of those the average test weight was 49.9 lb/bu. The average one thousand kernel weight was 41.4 grams. Barley protein content was 11.8 percent. The average kernel plumpness was 82.4 percent with 1.2 percent thin kernels.

***West District***

The west district only had two samples rejected with 87% being of suitable malting quality. The average test weight was 50.7 lb/bu. The average one thousand kernel weight was 43.8 grams. Barley protein content was 11.6 percent. The average kernel plumpness was 90.7 percent with 1.1 percent thin kernels.

***Central District***

81% of Central samples were of suitable malting quality. This district had the lowest average protein at 11.3%. The average test weight was 50.2 lb/bu. Central had an average one thousand kernel weight of 43.5 grams and average kernel plumpness of 86.8 percent with 1.1 percent thin kernels.

***South District***

The south district had no samples rejected with 100% being of suitable malting quality. The samples had the highest average test weight at 52.9 lb/bu. The district also had the highest average kernel plumpness at 94.5 percent plump with 0.88 percent thin kernels. The-average one thousand kernel weight was also the highest at 47.4 grams and the average barley protein content was 11.8 percent.

***Barley Grades***

Montana district composite samples were inspected for an official grade (Table 4). The South district composite sample had the highest test weight at 51.5 lb/bu, while the West district had a test weight of 51.0 and was graded as U.S. No. 1 Two-Rowed Malting Barley. The Central and North district composite samples had test weights of 50.0 lb/bu and 49.5 lb/bu respectively and were graded as U.S. No. 2 Two-Rowed Malting Barley. All four composites had minimal dockage and three of the four had a rating of greater than 99% sound barley, with the South having a slightly reduced rate of 96.9%. The North had the lowest skinned and broken percentage at 0.8%, while the West had the lowest level of thin kernels at 3.4%.

**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*