



**On-Farm Cereal Variety and Advanced Breeding Line
Testing across Montana for Environment Specific
Cultivar Recommendations:**



Spring Barley Off-Station Variety Performance, Havre, MT

Principal Investigator:

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Objectives:

Commercially available spring barley varieties and advanced breeding lines were evaluated for agronomic performance and fit at on-farm locations across the state of Montana. Sites chosen for the research considered the environment, growing conditions and soil types, and represent the major land areas for producers in those regions served by Northern Agricultural Research Center (NARC). In 2009, three off-station spring barley variety trials were dropped from the NARC off-station testing program due to extensive feeding by deer and antelope, which made results meaningless. In northcentral Montana, barley production makes up over 20 percent of the state's production, and because producers need to make decisions based on variety performance data generated under local conditions, we decided to collaborate in the standardized off-station spring barley variety trial beginning again in 2022.

Methods:

The uniform off-station barley variety performance trial was seeded into chemical fallow ground during 2023. The trial consisted of 25 entries focusing on four different end uses including malt, feed, forage, or food. The trial was seeded in replicated, 3-row, 22-foot plots on a 12-inch row spacing, utilizing a self-propelled cone seeder with Atom Jet paired row openers. All rows of each plot were trimmed to a harvest length of approximately 17 feet with a three-point rototiller. Plant height was measured from the soil surface to the top of the head, excluding awns, and percent sawfly cutting was visually estimated for each plot immediately prior to harvest. A 'Wintersteiger' small plot combine, funded in part by Montana Wheat and Barley Committee, was used to harvest each 3-row plot. Prior to measuring plot weight for yield determination, seed was either cleaned or weighed in-dirt as per protocols. Protein, test weight and moisture content were determined on a clean sample using a Foss Infratec 1241 near infrared analyzer. Falling number was determined using a Perten FN1700 according to the FGIS Directive 9180.38. Other variables specific to each individual trial are listed with the current year data tables.

Please note that research trial seed yield results recorded under wheat stem sawfly pressure are likely much higher than a producer should expect. Small plot variety trials are managed to assess maximum

yield potential and are harvested in such a way that all stems and heads are picked up by the combine, regardless of lodging or cutting due to wheat stem sawfly. Pickup guards coupled with an extremely slow ground speed and an exceptionally low cutting height help researchers collect all heads in order to assess seed yield potential. If you are a producer in a wheat stem sawfly environment, although hollow stemmed varieties may be high yielding in research trials in your area, we strongly recommend against growing those hollow stemmed varieties. Please be aware that if you seed hollow stemmed varieties with wheat stem sawfly present, you are only creating a breeding ground for future generations of sawfly in your area and not helping combat the pest population.

Results:

This report contains both single-year and long-term data summaries limited to the most recent ten years. It should be noted that the 2023 data table in this report represents varietal performance for a single crop year at a single location, therefore cannot be considered representative of performance expected when differing conditions due to location, year and management are imposed. By itself, 2023 data shall not constitute in any form a recommendation for or against any variety or breeding line included.

The 2023 Havre off-station dryland spring barley trial data was analyzed by barley type or end use. Spring barley seed yields for the **malt and feed** entries at Havre averaged just under 53 bu/ac (Table 1). The feed barley 'MT Boy Howdy' was the highest yielding entry at just over 57 bu/ac. 'Buzz', 'Haxby', 'Hockett', 'MT Endurance' and five MSU breeding lines also produced seed yields statistically equal to that of MT Boy Howdy. Test weights averaged 49 lb/bu, with Haxby being the heaviest at over 52 lb/bu. Protein averaged 14.4 percent, with MT Endurance coming in at 13.5 percent protein.

Seed yields for the **forage barley** entries averaged 56.9 bu/ac and 'Lavina' was the highest yielding entry at just over 63 bu/ac (Table 2). Breeding line 'MT17F02410' was the only entry to produce a seed yield statistically equal to that of Lavina.

Seed yields for the **food barley or hulless barley** entries averaged just over 43 bu/ac, with breeding line 'MT19_H11_04' producing the highest yield at nearly 46 bu/ac. 'Havener' and 'MT19_H11_05' produced seed yields statistically equal to the highest yielding entry (Table 3).

Seed yield, test weight, protein, plump kernels, heading date, maturity date and plant height, as appropriate, for the 2023 Havre off-station dryland spring barley trial are summarized according to end use in Tables 1-3.

Comparable averages are calculated using a standard check variety when not all entries are present in a specific trial for all years. Variety means are adjusted by multiplying the actual check mean by the ratio of the individual variety mean compared to the check mean for the same years as tested. All varieties are then directly comparable to each other when in the same nursery. A minimum of three years of data is necessary to be included in the comparable average calculation. Because the barley trial was initiated near Havre in crop year 2022, comparable averages for this site will not be available until 2024.

Summary:

Snow cover and below average temperatures persisted into early April, slightly delaying spring seeding in several areas across the Hi-Line. Spring barley near Havre had great stand uniformity and received timely and above average precipitation in May and during the first week of June, resulting in increased

tillering and biomass production, however, much needed precipitation did not continue after June 9. This coupled with higher-than-average temperatures May through August resulted in below average seed yields and a low percentage of plump kernels, with increased seed protein in 2023.

Producers have been asking for information on spring barley varieties in northcentral Montana for several years. Since named varieties were dropped from the intrastate trial grown at the research center, and consistent data could not be obtained from farmers' fields due to deer and antelope grazing, it was decided that the best option would be to grow the off-station trial at Northern Agricultural Research Center, behind the protection of a permanent deer fence. With budget and other resources allowing, it is planned to continue growing the standardized off station spring barley variety trial on-station to better serve producers in northcentral Montana with public and private variety information.

Recognition:

This research would not have been possible without the assistance of the following seasonal employees: Clara Haslem, Brady Kueffler, Cleta Lamb, Teresa Miller, and Nevaeh Phillips.

TABLE 1. MALT & FEED - Dryland Fallow Spring Barley Evaluation Nursery Grown On-Station at Havre. Northern Agricultural Research Center. Havre, Montana. 2023. (Exp# 23-2702-SB)

ID	BARLEY TYPE	1/	2/	3/	3/	PLNT HT inches		
		YIELD bu/ac	TEST WT lb/bu	PROTEIN %	PLUMP %		HEAD date	MATURE date
Buzz	Malt	55.8	50.5	13.7	70.6	171	197	72.7
Haxby	Feed	54.3	52.4	15.2	41.1	172	191	76.2
Hockett	Malt	54.4	48.6	14.7	41.9	174	193	69.5
LCS Odyssey	Malt	43.7	47.3	15.0	63.7	180	197	63.8
MT Boy Howdy	Feed	57.4	50.3	13.6	71.9	172	198	73.9
MT Endurance	Malt	54.8	46.6	13.5	62.2	171	192	75.7
MT18M10106	Malt/Feed	52.4	49.8	14.5	55.7	175	195	74.2
MT18M11004	Malt/Feed	55.5	50.4	13.8	35.2	174	197	74.0
MT16M01801	Malt	51.0	48.6	13.8	61.2	174	198	79.5
MT18M11002	Malt	48.1	48.1	15.5	23.9	174	196	76.6
MT19_M034_16	Malt	53.0	48.1	14.7	33.2	175	195	71.4
MT19_M064_04	Malt	54.6	48.8	15.2	28.3	174	194	71.5
MT19_M065_05	Malt	53.3	48.0	14.7	45.0	175	197	72.1
EXPERIMENTAL MEANS		52.9	49.0	14.4	48.8	174.0	195.4	73.1
LSD (0.05)		5.0	2.2	1.1	7.2	1.8	2.2	4.6
C.V.%		5.6	2.6	4.5	8.7	0.6	0.7	3.7
P-VALUE (Varieties)		0.001	0.001	0.005	<.0001	<.0001	<.0001	<.0001

1/ Volumetric yields are based on plot weights adjusted to uniform 13 percent grain moisture and 48 lbs/bu as the standard test weight for barley.

2/ Protein values are adjusted to 13 percent grain moisture.

3/ No. of Days from January 1 (174 = June 23, 195= July 14).

Bold indicates the highest or lowest value within a column (whichever is most desirable for the specific characteristic).

Bold indicates values equal to the underlined value within a column based on Fisher's protected LSD (P=0.05).

Management Information (23-2702-SB)

Seeding Date:	April 28, 2023
Harvest Date:	July 26, 2023
Fertility:	46-9-5-5
System:	No-Till
Herbicide:	Vendetta (24 oz/ac)
Insecticide:	none
Previous Crop:	Chemical Fallow - Winter Wheat
Precipitation:	5.68" seeding to harvest maturity

TABLE 2. FORAGE - Seed Components. Dryland Fallow Spring Barley Evaluation Nursery Grown On-Station at Havre. Northern Agricultural Research Center. Havre, Montana. (Exp# 23-2702-SB)

ID	BARLEY TYPE	1/ YIELD bu/ac	TEST WT lb/bu	2/ PROTEIN %	3/ HEAD date	3/ MATURE date	PLNT HT inches
Haymaker	Forage	54.6	47.0	<u>17.1</u>	173	192	79.8
Lavina	Forage	63.6	<u>47.8</u>	14.8	171	192	79.6
MT Cowgirl	Forage	56.8	45.3	16.2	173	192	83.4
MT16F01601	Forage	57.7	47.6	15.1	<u>170</u>	193	77.3
MT17F02410	Forage	58.9	46.1	15.7	176	193	71.9
MT18F00507	Forage	52.2	45.8	16.1	174	192	73.2
MT18F00803	Forage	55.8	42.3	15.7	175	192	74.2
MT19_F04_02	Forage	55.7	46.6	14.9	174	193	79.2
EXPERIMENTAL MEANS		56.9	46.1	15.7	173.2	192.4	77.3
LSD (0.05)		5.9	2.1	0.9	1.6	NS	4.3
C.V.%		5.9	2.6	3.2	0.5	0.3	3.2
P-VALUE (Varieties)		0.0359	0.0015	0.0012	<.0001	0.0516	0.0007

1/ Volumetric yields are based on plot weights adjusted to uniform 13 percent grain moisture and 48 lbs/bu as the standard test weight for barley.

2/ Protein values are adjusted to 13 percent grain moisture.

3/ No. of Days from January 1 (173 = June 22, 192= July 11).

Bold indicates the highest or lowest value within a column (whichever is most desirable for the specific characteristic).

Bold indicates values equal to the underlined value within a column based on Fisher's protected LSD (P=0.05).

NS for non-significant replaces the LSD when the probability value (P-Value) exceeds 0.05.

Management Information (23-2702-SB)

Seeding Date:	April 28, 2023
Harvest Date:	July 26, 2023
Fertility:	46-9-5-5
System:	No-Till
Herbicide:	Vendetta (24 oz/ac)
Insecticide:	none
Previous Crop:	Chemical Fallow - Winter Wheat
Precipitation:	5.68" seeding to harvest maturity

TABLE 3. FOOD - Dryland Fallow Spring Barley Evaluation Nursery Grown On-Station at Havre. Northern Agricultural Research Center. Havre, Montana. 2023. (Exp# 23-2702-SB)

ID	BARLEY TYPE	1/ YIELD bu/ac	TEST WT lb/bu	2/ PROTEIN %	3/ HEAD date	3/ MATURE date	PLNT HT inches
Havener	Food	45.0	54.8	16.2	176	193	75.1
MT18H02702*	Food	38.2	58.9	15.7	173	196	78.9
MT19_H11_04	Food	45.9	57.4	15.9	175	196	74.6
MT19_H11_05	Food	43.9	56.8	16.5	179	195	77.9
EXPERIMENTAL MEANS		43.3	57.0	16.1	175.8	195.0	76.6
LSD (0.05)		4.4	2.7	NS	2.6	1.8	NS
C.V.%		5.1	2.3	3.8	0.7	0.5	2.6
P-VALUE (Varieties)		0.0191	0.0466	0.4048	0.0118	0.0064	0.0936

1/ Volumetric yields are based on plot weights adjusted to uniform 13 percent grain moisture and 58 lbs/bu as the standard Canadian test weight for hullless barley, as there is currently no standard in the US.

2/ Protein values are adjusted to 13 percent grain moisture.

3/ No. of Days from January 1 (176 = June 25, 195= July 14).

Bold indicates the highest or lowest value within a column (whichever is most desirable for the specific characteristic

Bold indicates values equal to the underlined value within a column based on Fisher's protected LSD (P=0.05).

NS for non-significant replaces the LSD when the probability value (P-Value) exceeds 0.05.

*private release in 2023 pending industry interest

Management Information (23-2702-SB)

Seeding Date:	April 28, 2023
Harvest Date:	July 26, 2023
Fertility:	46-9-5-5
System:	No-Till
Herbicide:	Vendetta (24 oz/ac)
Insecticide:	none
Previous Crop:	Chemical Fallow - Winter Wheat
Precipitation:	5.68" seeding to harvest maturity