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

Spring Barley Off-Station Variety Performance, Havre, MT

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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 variety testing program due to extensive feeding by deer and antelope, which made results meaningless. In northcentral Montana, barley production makes up 22 percent of the state's production. Because farmers base production decisions on variety performance data generated under local conditions, collaboration in the standardized off-station spring barley variety trial was reestablished in 2022.

Methods:

The uniform off-station barley variety performance trial was seeded into chemical fallow ground during 2025. The trial consisted of 25 entries focusing on seed production of three different end use markets including malt, feed or food. The trial was seeded in replicated three-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. If observed, crop lodging and percent sawfly cutting were visually estimated for each plot immediately prior to harvest. A 'Wintersteiger' small plot combine, funded in part by the 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. Plump seed was determined by calculating the percent of barley that remained on top of a 6/64" x 3/4" inch slotted-hole sieve after mechanically shaking for 30 strokes.

Results:

This report contains both single-year and long-term data summaries limited to a maximum of the most recent ten years. It should be noted that the 2025 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, 2025 data shall not constitute in any form a recommendation for or against any variety or breeding line included.

The 2025 Havre off-station dryland spring barley trial data was analyzed across barley types and end uses because there were too few entries of specific types to analyze separately. Spring barley seed yields for the **malt, feed and food** entries at Havre averaged 87 bu/ac (Table 1). The malt barley breeding line 'MT19_M064_04' was the highest yielding entry at nearly 100 bu/ac. 'KWS Enduris' and 'KWS Kayis' along with one other MSU breeding line produced seed yields statistically equal to that of MT19_M064_04. Test weights averaged over 49.9 lb/bu. Percent plump kernels were all very high, averaging 97 percent, due to timely rainfall and lack of high temperatures during grain fill and ripening.

Grain type, seed yield, test weight, protein, plump kernels, heading date, maturity date and plant height for the 2025 Havre off-station dryland spring barley trial are summarized in Table 1.

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. Multi-year yield and test weight data are available in Table 2, while plump kernel and protein data are available in Table 3.

Summary:

Spring barley near Havre had good stand uniformity but received below average precipitation from March through mid-June. Timely rain, beginning in mid-June through July, resulted in better-than-expected seed production. Cooler temperatures coupled with timely precipitation limited environmental stresses during seed fill which contributed to high test weights and high plump kernel percentages.

Producers have been asking for information on spring barley varieties in northcentral Montana for several years. It was decided that the best option for obtaining accurate yield data unaffected by wildlife grazing 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: David Bischoff, Baylor Davis, Ty Golie, Simone Gomes, Brady Kueffler, Lirio McKenzie, Teresa Miller, Jason Rice, and Lily Smith.

TABLE 1. Dryland Fallow Spring Barley Cultivar Evaluation Nursery Grown On-Station at Havre. Northern Agricultural Research Center. Havre, Montana. 2025. (Exp# 25-2702-SB)

ID	TYPE	1/ YIELD bu/ac	TEST WT lb/bu	2/ PROTEIN %	PLUMP %	3/ HEAD date	3/ MATURE date	PLNT HT inches
AAC Synergy	Malt	81.9	48.6	13.4	**99.0**	164	**192**	**26.9**
ABI Eagle	Malt	84.0	48.3	13.8	97.9	163	**193**	23.0
ABI Montana	Malt	90.3	49.1	13.8	98.4	163	**192**	24.2
ABI Voyager	Malt	91.9	48.2	13.7	**98.9**	163	**192**	25.8
AC Metcalfe	Malt/Feed	80.3	50.1	14.5	**98.7**	162	**193**	**27.7**
BC Lexy	Malt	91.2	48.4	13.0	**99.2**	164	196	24.5
Bill Coors 100	Malt	82.7	47.6	14.7	98.5	166	**192**	24.2
Buzz	Malt	92.0	50.6	11.6	**99.3**	160	**193**	26.8
Havener	Food	76.6	**59.3**	14.9	79.2	166	**192**	26.3
Hockett	Malt/Feed	88.3	51.5	14.0	**99.3**	161	**192**	26.2
KWS Enduris	Malt	**98.1**	48.4	13.0	**99.5**	165	**192**	25.2
KWS Kayis	Malt	**98.1**	48.9	13.2	**99.3**	163	194	23.5
LCS Genie	Malt	93.0	49.0	13.6	96.8	163	**193**	24.1
LCS Odyssey	Malt	87.5	50.0	14.0	**99.2**	165	194	23.7
LG Diablo	Malt	90.7	48.3	14.1	**98.8**	167	197	23.6
Merit 57	Malt	87.4	48.7	13.7	96.8	163	195	**27.9**
MT Boy Howdy	Feed	75.1	50.0	12.3	**98.7**	162	196	**27.0**
MT Endurance	Malt	83.9	48.4	13.2	**99.1**	160	**191**	**27.8**
ME031	Malt	91.7	49.0	13.6	**99.0**	164	197	23.0
MT17M01908	Malt	**95.0**	50.0	11.8	**99.3**	160	194	**27.6**
MT19_M064_04	Malt	**99.9**	49.0	12.4	97.9	162	**191**	**28.0**
MT19_M067_02	Malt	87.1	49.4	12.2	**99.2**	160	**193**	25.0
MT19_M080_13	Malt	88.3	48.4	12.2	**98.6**	**157**	**191**	28.7
MT20_H092_13	Food	63.6	57.3	**17.6**	76.3	164	197	**28.7**
MT20_M047_16	Malt	89.6	50.6	11.5	**99.3**	161	**193**	25.0
EXPERIMENTAL MEANS		87.5	49.9	13.4	97.0	162.7	193.4	25.5
LSD (0.05)		8.6	0.8	1.1	0.9	2.4	2.7	1.9
C.V.%		6.0	1.0	4.8	0.6	0.9	0.9	4.5
P-VALUE (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0000

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 traditional barley and 58 lbs/bu as the stadard Canadian test weight for hulless barley.

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

3/ No. of Days from January 1 (163 = June 12, 193 = July 12).

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 (25-2702-SB)

Seeding Date:	April 10, 2025
Harvest Date:	August 14, 2025
Fertility:	46-9-5-5
System:	No-Till
Herbicide:	Brox M (24 oz/ac)
Insecticide:	none
Previous Crop:	Chemical Fallow-Spring Barley
Precipitation:	3.95" seeding to harvest maturity

TABLE 2. Four-Year Yield and Test Weight Summary on Selected Entries from Dryland Fallow Barley Variety Nurseries Grown at Havre. Northern Agricultural Research Center. Havre, Montana. 2025. (Exp# 2702-SB)

			[1/] YIELD (Bushels Per Acre)								TEST WEIGHT (Pounds Per Bushel)							
2/ VARIETY		[3/] No. of YEARS TESTED	2022	2023	2024	2025	2026	[3/] AVE. for YEARS TESTED	[4/] % of CHECK YIELD	[5/] **4-YR COMP. AVE. YIELD**	2022	2023	2024	2025	2026	[3/] AVE. for YEARS TESTED	[4/] % of CHECK TEST WT	[5/] **4-YR COMP. AVE. TEST WT**
Haxby	Feed	3	78.6	54.3	106.0			79.6	109.8	84.0	52.2	52.4	56.8			53.8	105.1	53.9
Lavina	Forage	3	73.1	63.6	100.3			79.0	108.9	83.3	45.6	47.8	51.4			48.3	94.2	48.3
MT Boy Howdy	Feed	4	75.3	57.4	104.9	75.1		78.2	102.2	78.2	50.0	50.3	55.0	50.0		51.3	100.1	51.3
Buzz	Malt	4	67.8	55.8	94.9	92.0		77.6	101.5	77.6	50.6	50.5	55.4	50.6		51.8	101.0	51.8
Hockett	Malt/Feed	4	63.4	54.4	99.8	88.3		76.5	100.0	76.5	49.0	48.6	56.0	51.5		51.3	100.0	51.3
Merit 57	Malt	3	57.7		98.9	87.4		81.3	97.0	74.2	47.8		52.7	48.7		49.7	95.3	48.9
MT Endurance	Malt	4	64.5	54.8	89.4	83.9		73.2	95.7	73.2	46.6	46.6	53.6	48.4		48.8	95.1	48.8
ABI Eagle	Malt	3	60.5		86.0	84.0		76.8	91.6	70.1	48.2		52.3	48.3		49.6	95.2	48.8
MEANS (For Entries Listed)			67.6	56.7	97.5	85.1		77.8	100.8	**77.1**	48.7	49.4	54.1	49.6		50.6	98.3	**50.4**
April-July Precip. (in.)			5.50	6.37	7.60	6.38		6.49										
Total Annual Precip. (in.)			8.20	11.95	14.90	8.99		11.00										
Soil PAW (in.) to SD @ Planting			8.13	6.64	6.44	6.56		6.90										
Total Plant Available Water (in.)			13.60	13.00	14.00	15.60		13.53										
Soil NO3 (lbs.) to SD at Planting			133	175	58	72		110										
SD (Sampling Depth in Inches)			48	48	48	36		45										
Fertilizer Applied		(# N)	46	46	46	44		46										
		(# P2O5)	9	9	9	9		9										
		(# K2O)	5	5	5	4		5										
		(# S)	5	5	5	4		5										

Check Variety is Hockett.

1/ See MCES Bulletin 1094 or the Plant Sciences & Plant Pathology website at http://plantsciences.montana.edu/ for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selecton decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending.

3/ Only the most recent 5 years are shown, but summary calculations include all years noted.

4/ Percent of Hockett yield or test weight for the same data years as those in which a given entry was tested.

5/ 4-Yr Comparable Average = (x/y) * z where x = average yield or test weight of a given entry for years tested, y = average yield or test weight for Hockett for the same years, and z = 4-Yr average yield or test weight for the check variety Hockett.

TABLE 3. Four-Year Plump Kernel and Protein Summary on Selected Entries from Dryland Fallow Barley Variety Nurseries Grown at Havre. Northern Agricultural Research Center. Havre, Montana. 2025. (Exp# 2702-SB)

			1/ PLUMP (%)								1/ PROTEIN % (Values Adjusted to 13% Grain Moisture)							
2/ VARIETY		3/ No. of YEARS TESTED	2022	2023	2024	2025	2026	3/ AVE. for YEARS TESTED	4/ % of CHECK PLUMP	**5/ 4-YR COMP. AVE. PLUMP**	2022	2023	2024	2025	2026	3/ AVE. for YEARS TESTED	4/ % of CHECK PROTEIN	**5/ 4-YR COMP. AVE. PROTEIN**
Buzz	Malt	4	79.4	70.6	97.7	99.3		86.7	115.0	86.7	12.3	13.7	11.4	11.6		12.3	89.3	12.3
MT Boy Howdy	Feed	4	79.9	71.9	94.2	98.7		86.2	114.2	86.2	12.5	13.6	11.1	12.3		12.4	90.1	12.4
MT Endurance	Malt	4	77.7	62.2	97.9	99.1		84.3	111.7	84.3	13.2	13.5	11.8	13.2		13.0	94.3	13.0
Hockett	Malt/Feed	4	63.2	41.9	97.4	99.3		75.4	100.0	75.4	13.7	14.7	12.5	14.0		13.7	100.0	13.7
Haxby	Feed	3	59.0	41.1	88.1			62.7	92.9	70.1	14.3	15.2	11.9			13.8	101.1	13.9
Merit 57	Malt	3	60.3		78.8	96.8		78.6	90.8	68.5	15.5		12.2	13.7		13.8	103.1	14.1
ABI Eagle	Malt	3	64.0		65.7	97.9		75.9	87.6	66.1	14.5		13.3	13.8		13.9	103.5	14.2
Lavina	Forage	3	13.3	54.1	52.4			40.0	59.2	44.7	14.3	14.8	13.3			14.1	103.6	14.2
MEANS (For Entries Listed)			62.1	57.0	84.0	98.5		73.7	96.4	**72.7**	13.8	14.3	12.2	13.1		13.4	98.1	**13.5**
April-July Precip. (in.)			5.50	6.37	7.60	6.38		6.49										
Total Annual Precip. (in.)			8.20	11.95	14.90	8.99		11.00										
Soil PAW (in.) to SD @ Planting			8.13	6.64	6.44	6.56		6.90										
Total Plant Available Water (in.)			13.60	13.00	14.00	15.60		13.53										
Soil NO3 (lbs.) to SD at Planting			133	175	58	72		110										
SD (Sampling Depth in Inches)			48	48	48	36		45										
Fertilizer Applied		(# N)	46	46	46	44		46										
		(# P2O5)	9	9	9	9		9										
		(# K2O)	5	5	5	4		5										
		(# S)	5	5	5	4		5										

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1/ See MCES Bulletin 1094 or the Plant Sciences & Plant Pathology website at http://plantsciences.montana.edu/ for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selecton decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending.

3/ Only the most recent 5 years are shown, but summary calculations include all years noted.

4/ Percent of Hockett plump or protein for the same data years as those in which a given entry was tested.

5/ 4-Yr Comparable Average = (x/y) * z where x = average plump or protein of a given entry for years tested, y = average plump or protein for Hockett for the same years, and z = 4-Yr average plump or protein for the check variety Hockett.