



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



Winter Wheat Off-Station Variety Performance, Loma, MT

Principal Investigator:

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Project Personnel:

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Cooperators:

Lyle McKeever, Terry McKeever and Kendrick McKeever, Landowners, Loma

Objectives:

Commercially available winter wheat 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. The Chouteau County location, between Big Sandy and Loma, has been used for various trials since 1998.

Methods:

The uniform off-station winter wheat variety performance trial was seeded into chemical fallow ground during 2024. The trial consisted of 25 entries 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 plots 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 the Montana Wheat and Barley Committee, was used to harvest each three-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 2024 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, 2024 data shall not constitute in any form a recommendation for or against any variety or breeding line included.

Numerous rain events occurred following maturity, delaying harvest, and negatively influencing seed quality while accentuating the effects of wheat stem sawfly cutting. At the Loma winter wheat site, seed yields averaged over 55 bu/ac (Table 1). The Montana State University release 'Bobcat' was the highest yielding entry at over 64 bu/ac. 'Bridger CL Plus', 'Flathead', 'StandClear CLP', 'SY Monument', 'Yellowstone' and four MSU breeding lines produced yields statistically equal to that of Bobcat. Test weights of all entries averaged just over 53 lb/bu. Due to the extreme delay in harvest, wheat stem sawfly cutting was severe in the winter wheat trials averaging over 79 percent cut and lodged. Yield, test weight, protein, falling number, plant height and sawfly cutting data for the 2024 Loma dryland winter wheat 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. Ten-year comparable averages for seed yield and test weight at Loma are summarized in Table 2, while ten-year comparable averages for protein content and sawfly cutting are summarized in Table 3. Based on the comparable average calculations, Bobcat is the highest yielding variety at the Loma site and has the least amount of wheat stem sawfly cutting across the years.

Summary:

Following establishment in the fall, the Loma winter wheat trial had good stand uniformity. Precipitation was sporadic and spotty from tillering through grain fill limiting seed yield potential. Untimely and repeated rain events following grain maturity delayed harvest and severely reduced grain quality.

This work has been strongly supported by producers in the Loma-Big Sandy area, and by the Northern Agricultural Research Center Advisory Board. With budget and other resources allowing, it is planned to continue off-station winter wheat variety and breeding line testing in this area. The Chouteau County location between Loma and Big Sandy has been hosting various trials for 27 years, beginning in 1998.

Recognition:

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

TABLE 1. Dryland Fallow Winter Wheat Cultivar Evaluation Nursery Grown Off-Station at McKeever Farm & Seed, Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2024. (Exp# 24-3853-WW)

ID	1/ YIELD bu/ac	TEST WT lb/bu	2/ PROTEIN %	3/ FN seconds	PLNT HT inches	4/ SAWFLY %
AAC Coldfront	54.9	54.2	14.4	82	26.4	97.7
AAC Wildfire	49.1	52.4	14.1	237	24.1	90.0
Bobcat	64.5	55.6	14.5	228	25.3	18.3
Brawl CL Plus	55.7	54.2	14.5	111	25.5	66.7
Bridger CL Plus	57.8	53.3	14.5	88	21.6	93.0
Flathead	59.2	53.8	13.8	91	26.5	93.3
Fortress	56.1	51.6	14.5	123	23.7	85.0
FourOsix	53.0	52.3	15.0	173	24.9	85.0
Keldin	53.5	52.5	14.5	108	24.8	78.3
Loma	54.4	53.6	14.2	243	24.5	96.0
MT WarCat	43.8	54.2	15.3	251	23.3	90.0
Northern	49.1	52.9	14.5	106	24.5	90.0
StandClear CLP	58.3	55.0	13.7	173	26.2	85.0
SY Monument	57.1	51.9	13.1	219	25.0	86.7
Warhorse	50.0	54.0	14.7	289	24.3	51.7
Yellowstone	61.5	53.2	14.0	158	26.9	96.3
MT2019	51.4	52.0	14.6	238	22.2	90.0
MT2270	50.1	53.7	14.1	121	25.6	81.7
MTAX22120	58.8	52.8	13.3	268	23.8	83.3
MTCL2010	64.0	54.3	13.8	84	25.2	93.0
MTCS20151	62.9	54.2	14.1	106	26.6	63.3
MTCS20156	63.4	55.7	14.2	201	26.6	36.7
MTS1908	48.6	54.7	14.1	321	26.8	48.3
MTS2110	55.4	53.6	14.9	179	27.2	90.0
MTV2164	55.6	52.9	14.0	284	24.5	86.7
EXPERIMENTAL MEANS	55.5	53.5	14.3	179.3	25.0	79.0
LSD (0.05)	8.2	0.9	0.5	50.5	1.6	22.3
C.V.%	9.0	1.0	2.3	17.2	4.0	17.2
P-VALUE (Varieties)	0.0001	<.0001	<.0001	<.0001	<.0001	<.0001

1/ Volumetric yields are based on plot weights adjusted to uniform 13 percent grain moisture and 60 lbs/bu as the standard test weight for wheat.

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

3/ FN is the falling number value reported in seconds adjusted to 14 percent flour moisture.

4/ Sawfly rating is reported as the percentage of cut stems.

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

Seeding Date:	October 18, 2023
Harvest Date:	September 3, 2024
Fertility:	92-50-7-7 side banded
System:	No Till
Herbicide:	Vandetta (24 oz/ac)
Insecticide:	none
Previous Crop:	Chemical Fallow - Spring Wheat
Precipitation:	2.42" *

*Precip from July12- Sept 3, only

TABLE 2. Ten-Year Yield and Test Weight Summary on Selected Entries from Dryland Fallow Spring Wheat Variety Nurseries Grown Off-Station at McKeever Farm & Seed, Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2015-2024. (Exp# 3853-WW)

Seed, Inc., Loma: Northern Agricultural Research Center: Havre, Montana: 2015-2024: (Exp# 5853-VVV)																	
		1/ YIELD (Bushels Per Acre)									TEST WEIGHT (Pounds Per Bushel)						
	3/ No. of YEARS TESTED						3/ AVE. for YEARS	4/ % of CHECK	5/ 10-YR COMP. AVE.						3/ AVE. for YEARS	4/ % of CHECK	5/ 10-YR COMP. AVE.
2/ VARIETY		2020	2021	2022	2023	2024	TESTED	YIELD	YIELD	2020	2021	2022	2023	2024	TESTED	TEST WT	TEST WT
BOBCAT (++) (sawfly tol)	8	59.2	31.8	41.5	74.8	64.5	57.7	108.0	55.9	60.4	54.3	56.7	60.7	55.6	58.9	103.0	58.6
NORTHERN (+)	10	67.8	28.1	34.7	88.3	49.1	53.3	102.8	53.3	60.0	52.8	55.1	60.5	52.9	57.1	100.3	57.1
BRAWL CLP (++) (CL)	8	62.1	36.3	36.1	75.8	55.7	54.7	102.2	53.0	61.5	55.2	59.1	62.7	54.2	59.7	104.4	59.4
SY MONUMENT (P+)	8	59.4	26.7	34.0	76.1	57.1	53.9	100.7	52.2	58.9	52.2	58.7	59.4	51.9	57.7	100.9	57.4
YELLOWSTONE (+)	10	59.6	27.5	40.2	84.6	61.5	51.8	100.0	51.8	59.8	52.5	56.0	58.5	53.2	56.9	100.0	56.9
KELDIN (P+)	9	58.4	27.2	35.9	77.4	53.5	52.1	99.4	51.5	59.5	53.5	55.3	59.8	52.5	57.6	101.1	57.5
LOMA (++)	10	61.7	30.5	36.5	85.8	54.4	50.0	96.5	50.0	59.8	53.0	56.4	58.5	53.6	57.0	100.2	57.0
FOUROSIX (++)	8	56.4	29.9	32.4	74.9	53.0	51.4	96.0	49.8	59.6	51.9	57.6	58.8	52.3	57.6	100.7	57.3
STANDCLEAR CLP	7	56.1	29.1	40.1	80.8	58.3	52.8	95.9	49.7	61.2	54.5	58.0	60.5	55.0	58.7	103.2	58.7
FLATHEAD (++)	7	61.0	29.3	31.4	78.1	59.2	52.6	95.5	49.5	59.7	54.4	58.7	60.5	53.8	58.5	102.8	58.5
MT WARCAT (++)	5	57.3	26.9	39.2	88.0	43.8	51.0	93.3	48.3	59.9	52.7	56.4	58.7	54.2	56.4	100.7	57.3
AAC WILDFIRE (++)	6	56.3	22.5	35.6	78.2	49.1	50.3	92.4	47.9	58.6	51.4	56.1	58.4	52.4	56.1	99.3	56.5
WARHORSE (+) (sawfly tol)	10	52.4	28.1	27.7	73.6	50.0	44.1	85.2	44.1	59.8	52.2	56.8	58.7	54.0	57.6	101.2	57.6
MEANS (For Entries Listed)		59.1	28.8	35.8	79.7	54.6			50.5	59.9	53.1	57.0	59.7	53.5			57.7
6/ Growing Season Precipitation (in.)		n/a	n/a	1.60	8.43	n/a	5.11										
Soil PAW (in.) to SD @ Planting		7.35	7.94	7.12	n/a	7.34	7.21										
Total Plant Available Water (in.)		n/a	n/a	8.72	n/a	9.76	11.73										
Soil NO3 (lbs.) to SD at Planting		115	97	299	n/a	114	149										
SD (Sampling Depth in Inches)		48	45	48	n/a	45	47										
Fertilizer Applied		(# N)	125	125	125	89	92	108									
		(# P ₂ O ₅)	20	20	20	14	50	22									
		(# K ₂ O)	10	10	10	7	7	9									
		(# S)	10	10	10	7	7	6									

Check Variety is Yellowstone.

1/ See MCES Bulletin 1098 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, winter hardiness, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending, CL = Clearfield Line, HW = Hard White.

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

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

5/ 10-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 Yellowstone for the same years, and z = 10-Yr average yield or test weight for the check variety Yellowstone.

6/ April 1 to 14 days prior to harvest

TABLE 3. Ten-Year Protein and Sawfly Summary on Selected Entries from Dryland Fallow Spring Wheat Variety Nurseries Grown Off-Station at McKeever Farm & Seed, Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2015-2024. (Exp# 3853-WW)

Seed, Inc., Loma: Northern Agricultural Research Center: Havre, Montana: 2013-2024: (Exp# 5555-VVV)																		
		^{1/} PROTEIN % (Adjusted to 13% grain moisture)									SAWFLY RATING (% of cut and lodged stems)							
		^{3/} No. of YEARS TESTED						^{3/} AVE. for YEARS	^{4/} % of CHECK	^{5/} 10-YR COMP. AVE.						^{3/} AVE. for YEARS	^{4/} % of CHECK	^{5/} 10-YR COMP. AVE.
^{2/} VARIETY			2020	2021	2022	2023	2024	TESTED	PROTEIN	PROTEIN	2020	2021	2022	2023	2024	TESTED	SAWFLY	SAWFLY
BOBCAT (++) (sawfly tol)		8	13.5	14.8	15.0	12.3	14.5	13.8	99.7	14.2	4.3	15.9	1.0	2.3	18.3	9.9	16.5	8.2
WARHORSE (+) (sawfly tol)		10	13.9	15.1	15.1	12.4	14.7	14.7	103.4	14.7	3.9	16.9	7.0	2.3	51.7	13.0	26.0	13.0
MT WARCAT (++)		5	14.2	15.3	14.9	12.5	15.3	14.4	105.6	15.0	6.0	52.5	8.3	31.7	90.0	37.7	60.2	30.0
LOMA (++)		10	13.8	15.1	15.1	11.7	14.2	14.5	101.9	14.5	13.1	68.0	13.3	35.0	96.0	33.5	67.1	33.5
STANDCLEAR CLP		7	13.7	14.5	14.5	12.3	13.7	13.6	99.7	14.2	11.6	57.5	16.7	58.3	85.0	46.1	71.4	35.7
BRAWL CLP (++) (CL)		8	13.0	14.7	14.6	12.1	14.5	14.0	100.7	14.3	2.4	61.1	45.0	55.0	66.7	46.8	77.7	38.8
AAC WILDFIRE (++)		6	13.9	15.2	14.6	11.8	14.1	13.8	101.2	14.4	10.9	79.4	58.3	36.7	90.0	49.3	80.6	40.3
FLATHEAD (++)		7	13.5	15.0	14.7	11.6	13.8	13.6	99.7	14.2	6.1	62.6	11.7	73.3	93.3	52.6	81.5	40.7
SY MONUMENT (P+)		8	12.3	13.6	14.1	11.3	13.1	12.9	92.6	13.2	3.4	74.8	51.7	40.0	86.7	51.8	85.9	42.9
NORTHERN (+)		10	13.9	15.5	15.5	11.1	14.5	14.7	103.1	14.7	4.7	57.9	65.0	70.0	90.0	46.3	92.7	46.3
YELLOWSTONE (+)		10	13.5	14.6	14.8	11.5	14.0	14.2	100.0	14.2	5.5	81.4	56.7	73.3	96.3	49.9	100.0	49.9
KELDIN (P+)		9	13.4	14.3	15.4	12.0	14.5	14.2	99.7	14.2	14.6	76.8	73.3	41.7	78.3	55.4	103.0	51.4
FOUROSIX (++)		8	13.9	14.9	14.8	11.8	15.0	13.9	100.3	14.3	17.4	84.1	53.3	66.7	85.0	63.1	104.6	52.3
MEANS (For Entries Listed)			13.6	14.8	14.9	11.9	14.3			14.3	8.0	60.7	35.5	45.1	79.0			37.2
6/ Growing Season Precipitation (in.)			n/a	n/a	1.60	8.43	n/a	5.11										
Soil PAW (in.) to SD @ Planting			7.35	7.94	7.12	n/a	7.34	7.21										
Total Plant Available Water (in.)			n/a	n/a	8.72	n/a	9.76	11.73										
Soil NO3 (lbs.) to SD at Planting			115	97	299	n/a	114	149										
SD (Sampling Depth in Inches)			48	45	48	n/a	45	47										
Fertilizer Applied																		
(# N)			125	125	125	89	92	108										
(# P ₂ O ₅)			20	20	20	14	50	22										
(# K ₂ O)			10	10	10	7	7	9										
(# S)			10	10	10	7	7	6										

Check Variety is Yellowstone.

1/ See MCES Bulletin 1098 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, winter hardiness, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 Pending, CL = Clearfield Line, HW = Hard White.

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

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

5/ 10-Yr Comparable Average = (x/y) * z where x = average protein or sawfly rating of a given entry for years tested, y = average protein or sawfly rating for Yellowstone for the same years, and z = 10-Yr average protein or sawfly rating for the check variety Yellowstone.

6/ April 1 to 14 days prior to harvest