



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



Spring Wheat Off-Station Variety Performance, Loma, MT

Principal Investigator:

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Project Personnel:

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Cooperators:

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Objectives:

Commercially available spring 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 spring wheat variety performance trial was seeded into chemical fallow ground during 2023. 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 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.

Spring wheat seed yields at Loma averaged just under 65 bu/ac (Table 1). 'Lanning' was the top yielding entry producing 75 bu/ac, with 'MT Carlson', 'MT Dutton' (both released by Montana State University in 2023) and 2022 release 'MT Sidney' and three breeding producing yields statically equal to that of Lanning. Test weights of all spring wheat entries for this site averaged just under 60 lb/bu. Wheat stem sawfly cutting in the spring wheat trial near Loma was nearly non-existent. Yield, test weight, protein, falling number, plant height and sawfly cutting data for the 2023 Loma dryland spring 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 (2014-2023) for spring wheat seed yield and test weight at Loma are summarized in Table 2, while ten-year comparable averages for protein content and wheat stem sawfly cutting are summarized in Table 3. Based on the comparable average calculations, MT Carlson, MT Dutton, 'Dagmar' and 'Vida' are the highest yielding varieties at Loma.

Summary:

Snow cover persisted into early April, minimally delaying seeding in several areas across the Hi-Line. Once established, the Loma spring wheat trail had good stand uniformity. With timely and above average precipitation throughout the growing season, the spring wheat variety trial near Loma produced its highest seed yield in more than ten years.

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 26 years, beginning in 1998.

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. Dryland Fallow Spring Wheat Cultivar Evaluation Nursery Grown Off-Station at McKeever Farm & Seed, Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2023. (Exp# 23-9957-SW)

ID	ORIGIN or PEDIGREE	1/ YIELD bu/ac	TEST WT lb/bu	2/ PROTEIN %	3/ FN seconds	PLNT HT inches	4/ SAWFLY %
Brennan	AGRIPR 10	60.9	62.4	13.3	447	29.7	0.0
Corbin	BZ 996434	53.4	59.5	13.5	400	30.6	0.3
Dagmar	PI 690450	66.3	60.4	13.5	453	33.6	0.0
Duclair	PI 660981	63.2	59.5	12.5	403	35.0	0.0
Lanning	PI 676978	75.2	59.9	12.2	398	32.9	0.0
MT Carlson	MT 1939	70.8	59.5	12.7	410	30.9	0.0
MT Dutton	MT 1809	70.9	60.1	12.0	416	34.0	0.0
MT Sidney	MT 1716	68.5	61.6	12.4	428	32.4	0.0
NS Presser CLP	PI 679964	62.2	58.1	12.6	419	33.2	0.7
Reeder	ND 695	64.5	60.1	13.4	416	33.2	0.0
Rocker	BZ 917-277	59.5	59.1	13.4	456	29.9	0.3
SY Ingmar	AGRIPR141	65.2	61.2	12.8	467	31.0	0.3
SY Longmire	SYN 182	59.7	58.1	13.6	457	29.8	0.0
SY Soren	AGRIPR 14	63.1	60.5	13.3	449	29.4	0.0
Vida	PI 642366	61.6	58.3	13.0	418	33.2	0.3
WB9879CLP	WB9879CLP	59.3	59.6	13.2	415	30.6	0.0
MT 2030	LANNING/MT 1338	69.0	58.8	12.9	406	32.2	0.0
MT 2049	LANNING/MT 1415	69.1	61.5	12.7	424	32.4	0.0
MT 2050	MT 1542/MT 1415	64.0	59.5	12.8	410	33.3	0.0
MT 2063	MT 1572/MT1133//CHOTEAL	67.8	60.0	12.1	401	33.3	0.0
MT 21016	MT 1542/LANNING	67.9	60.4	13.1	412	32.0	0.0
MT 21037	MT 1570//MT1274/12F5 827	68.6	59.7	12.9	400	31.5	0.7
MT 21074	MT 1525/MT 1348	55.8	58.6	13.8	406	29.9	0.3
MT 21104	MT 1451/MT 1866	68.2	60.7	11.6	403	33.4	0.0
MT 21105	MT 1570/VIDA	64.0	60.0	13.1	399	30.1	0.0
EXPERIMENTAL MEANS		64.7	59.9	12.9	420.6	31.9	0.1
LSD (0.05)		6.9	1.2	0.8	16.8	1.7	NS
C.V.%		6.5	1.2	3.6	2.4	3.2	257.6
P-VALUE (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001	0.1496

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 (23-9957-SW)

Seeding Date: May 4, 2023
Harvest Date: August 9, 2023
Fertility: 46-9-5-5 side banded
System: No Till
Herbicide: none
Insecticide: none
Previous Crop: Chemical Fallow - Spring Wheat
Precipitation: 7.09" seeding to harvest maturity

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. 2014-2023. (Exp# 9957-SW)

2/ VARIETY or SELECTION	3/ No. of YEARS TESTED	1/ YIELD (Bushels Per Acre)							TEST WEIGHT (Pounds Per Bushel)								
		2019	2020	2021	2022	2023	3/ AVE. for YEARS TESTED	4/ % of CHECK YIELD	5/ 10-YR COMP. AVE.	2019	2020	2021	2022	2023	3/ AVE. for YEARS TESTED	4/ % of CHECK TEST WT	5/ 10-YR COMP. AVE.
MT 1939 MT CARLSON (++)	3			16.5	32.7	70.8	40.0	112.2	40.7			55.1	54.1	59.5	56.3	100.9	55.7
MT 1809 MT DUTTON (++)	3			15.2	28.9	70.9	38.3	107.5	39.0			53.2	53.2	60.1	55.5	99.6	55.0
PI 690450 DAGMAR (++)	6	51.9	52.1	17.0	33.7	66.3	43.1	107.2	38.9	56.3	60.4	56.0	55.8	60.4	57.4	102.6	56.6
PI642366 VIDA (+)	10	48.8	52.2	15.4	29.9	61.6	36.3	100.0	36.3	55.8	59.6	54.4	54.6	58.3	55.2	100.0	55.2
PI676978 LANNING (+) (++)	9	45.3	42.6	10.5	25.8	75.2	34.7	97.6	35.4	52.6	58.4	53.5	53.0	59.9	53.6	97.1	53.6
BZ92413R WB GUNNISON (P+)(sawfly)	9	48.5	50.5	18.0	28.4		32.2	96.3	34.9	56.3	59.3	56.5	54.9		55.8	101.7	56.1
PI660981 DUCLAIR (+)(sawfly tol)	10	47.8	48.0	15.8	27.1	63.2	34.8	95.9	34.8	55.4	58.2	53.1	54.0	59.5	54.9	99.4	54.9
PI679964 NS PRESSER CLP (P+)	8	49.2	49.7	12.5	25.1	62.2	34.3	95.2	34.6	54.4	56.5	52.5	52.0	58.1	53.4	96.5	53.3
0150042-10 BRENNAN (P+)	10	42.8	52.6	15.3	28.1	60.9	34.1	93.9	34.1	57.2	61.4	57.5	57.0	62.4	57.9	104.9	57.9
BZ996434 CORBIN (P+)	10	46.8	50.2	19.6	25.3	53.4	34.0	93.5	34.0	55.9	59.8	56.3	55.3	59.5	55.9	101.3	55.9
MT 1716 MT SIDNEY (++)	5	32.6	50.9	12.7	26.4	68.5	38.2	91.9	33.4	54.7	60.8	55.2	55.9	61.6	57.7	102.0	56.3
AGRI PR141 SY INGMAR (P+)	7	42.3	41.1	9.1	24.0	65.2	35.5	91.0	33.0	56.0	57.9	56.4	53.7	61.2	56.1	101.1	55.8
IMICHT-79 WB9879CLP (P+)	10	45.9	50.3	15.3	25.6	59.3	33.0	91.0	33.0	56.2	59.3	54.2	54.9	59.6	55.4	100.3	55.4
01S0263-28 SY SOREN (P+)	9	28.3	45.0	15.8	25.7	63.1	31.1	87.4	31.7	53.2	58.6	55.1	53.8	60.5	55.1	99.7	55.1
PI633974 CHOTEAU (+)(sawfly tol)	9	48.5	45.3	13.9	25.5		29.2	87.3	31.7	54.7	59.0	54.5	54.5		54.6	99.5	54.9
ND 695 REEDER (+)	10	25.7	36.0	10.9	24.5	64.5	29.9	82.5	29.9	51.5	58.4	53.8	54.5	60.1	55.0	99.6	55.0
MEANS (For Entries Listed)		43.2	47.6	14.6	27.3	64.6			34.7	55.0	59.1	54.8	54.5	60.1			55.4
6/ Growing Season Precipitation (in.)		n/a	n/a	n/a	0.99	7.09	4.81										
Soil PAW (in.) to SD @ Planting		n/a	9.81	7.94	5.31	n/a	8.50										
Total Plant Available Water (in.)		n/a	9.81	n/a	6.30	n/a	11.59										
Soil NO3 (lbs.) to SD at Planting		n/a	197	193	120	n/a	153										
SD (Sampling Depth in Inches)		n/a	48	45	42	n/a	47										
Fertilizer Applied	(# N)	100	100	100	46	46	92										
	(# P ₂ O ₅)	20	20	20	9	9	18										
	(# K ₂ O)	10	10	10	5	5	9										
	(# S)	10	10	10	5	5	6										

Check variety is Vida.

1/ See MCES Bulletin 1093 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 selection 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 Vida 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 Vida for the same years and z = 10-Yr average yield or test weight for the check variety Vida.

6/ Seeding 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. 2014-2023. (Exp# 9957-SW)

2/ VARIETY or SELECTION	3/ No. of YEARS TESTED	1/ PROTEIN % (Adjusted to 13% Grain Moisture)					SAWFLY RATING (% of Cut and Lodged Stems)										
		2019	2020	2021	2022	2023	3/ AVE. for YEARS TESTED	4/ % of CHECK PROTEIN	5/ 10-YR COMP. AVE. PROTEIN	2019	2020	2021	2022	2023	3/ AVE. for YEARS TESTED	4/ % of CHECK SAWFLY	5/ 10-YR COMP. AVE. SAWFLY
BZ92413R WB GUNNISON (P+)(sawfly)	9	16.0	14.1	15.3	15.8		15.9	97.7	15.6	0.3	1.0	0.0	3.7		0.7	9.1	0.7
IMICHT-79 WB9879CLP (P+)	10	15.8	14.9	16.2	16.7	13.2	16.3	102.1	16.3	1.0	1.0	2.3	5.3	0.0	1.2	16.7	1.2
PI 690450 DAGMAR (++)	6	15.6	15.0	15.8	16.5	13.5	15.7	103.1	16.5	1.0	2.3	11.7	7.0	0.0	3.8	36.0	2.7
PI633974 CHOTEAU (+)(sawfly tol)	9	15.7	15.1	15.6	16.6		16.7	102.3	16.4	1.0	6.7	5.3	13.3		3.4	41.4	3.0
BZ996434 CORBIN (P+)	10	16.6	15.2	15.9	16.9	13.5	16.6	103.9	16.6	1.0	5.0	12.0	10.0	0.3	3.1	42.1	3.1
PI660981 DUCLAIR (+)(sawfly tol)	10	15.7	15.2	16.5	16.7	12.5	16.4	102.4	16.4	2.3	5.0	12.0	8.7	0.0	3.7	49.8	3.7
MT 1939 MT CARLSON (++)	3			14.7	16.0	12.7	14.5	98.5	15.8			23.3	30.0	0.0	17.8	99.4	7.3
PI642366 VIDA (+)	10	15.7	14.2	15.1	15.9	13.0	16.0	100.0	16.0	4.0	5.0	21.7	31.7	0.3	7.4	100.0	7.4
MT 1809 MT DUTTON (++)	3			16.3	16.7	12.0	15.0	102.2	16.3			26.7	48.3	0.0	25.0	139.8	10.3
PI679964 NS PRESSER CLP (P+)	8	15.2	15.6	15.6	16.1	12.6	16.2	101.3	16.2	5.0	21.7	25.0	53.3	0.7	13.9	162.9	12.0
MT 1716 MT SIDNEY (++)	5	16.1	14.5	15.3	16.4	12.4	14.9	101.0	16.2	10.0	18.3	23.3	78.3	0.0	26.0	207.5	15.3
AGRIPR141 SY INGMAR (P+)	7	15.8	15.0	15.7	16.8	12.8	16.1	102.6	16.4	5.3	16.7	40.0	73.3	0.3	21.3	235.3	17.3
0150263-28 SY SOREN (P+)	9	16.5	15.3	16.1	17.0	13.3	16.9	105.6	16.9	11.7	16.7	43.3	63.3	0.0	19.4	238.6	17.6
0150042-10 BRENNAN (P+)	10	15.7	14.6	15.6	16.2	13.3	16.2	101.2	16.2	16.7	13.3	46.7	71.7	0.0	17.8	241.2	17.8
ND 695 REEDER (+)	10	16.5	14.8	15.7	16.2	13.4	16.3	102.2	16.3	16.7	13.3	51.7	70.0	0.0	19.6	266.0	19.6
PI676978 LANNING (+) (++)	9	15.6	14.8	15.5	16.9	12.2	16.5	102.8	16.4	6.7	6.7	66.7	78.3	0.0	24.3	298.6	22.0
MEANS (For Entries Listed)		15.9	14.9	15.7	16.5	12.9			16.3	5.9	9.5	25.7	40.4	0.1			10.1
6/ Growing Season Precipitation (in.)		n/a	n/a	n/a	0.99	7.09	4.81										
Soil PAW (in.) to SD @ Planting		n/a	9.81	7.94	5.31	n/a	8.50										
Total Plant Available Water (in.)		n/a	9.81	n/a	6.30	n/a	11.59										
Soil NO3 (lbs.) to SD at Planting		n/a	197	193	120	n/a	153										
SD (Sampling Depth in Inches)		n/a	48	45	42	n/a	47										
Fertilizer Applied	(# N)	100	100	100	46	46	92										
	(# P ₂ O ₅)	20	20	20	9	9	18										
	(# K ₂ O)	10	10	10	5	5	9										
	(# S)	10	10	10	5	5	6										

Check variety is Vida.

1/ See MCES Bulletin 1093 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 selection 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 Vida protein or sawfly rating 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 Vida for the same years, and z = 10-Yr average protein or sawfly rating for the check variety Vida.

6/ Seeding to 14 days prior to harvest.