



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



**Spring Wheat Off-Station Variety Performance, Turner, MT**

Principal Investigator:

Peggy Lamb, Research Scientist, Northern Ag Research Center, Havre

Project Personnel:

Jason Cook, Breeder/Geneticist, Spring Wheat, Bozeman  
Hwa-Young Heo, Research Associate, Spring Wheat, Bozeman  
Eleri Haney, Research Associate, Havre  
Tracy Runner, Research Assistant II, Havre  
Julianne Snedigar, Blaine County Extension

Cooperator:

Max Cederberg, Landowner, Turner

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 Blaine County location near Turner entered its fortieth year of spring wheat testing in crop year 2023.

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 Turner averaged just under 34 bu/ac (Table 1), Montana State University breeding line 'MT 21105' was the top yielding entry producing just over 40 bu/ac. 'Lanning', 'Rocker' and 2023 MSU release, 'MT Dutton', produced yields statically the same as the highest yielding line. Test weights of all spring wheat entries for this site averaged just over 61 lb/bu. After years of minimal wheat stem sawfly infestation, cutting in the spring wheat trial at Turner increased to 19 percent, overall. Yield, test weight, protein, falling number, plant height and sawfly cutting data for the 2023 Turner 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. Nine-year comparable averages (2014-2023) for spring wheat seed yield and test weight at Turner are summarized in Table 2, while nine-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, Vida and 'Lanning' are the highest yielding varieties at Turner.

#### Summary:

Snow cover persisted into mid-April, minimally delaying seeding in several areas across the Hi-Line. Once established, the Turner site had good stand uniformity. Quantity and timeliness of precipitation throughout the growing season across northcentral Montana was spotty and the spring wheat variety trial near Turner produced just under its long-term average seed yield.

This work has been strongly supported by producers in the Turner-Hogeland area, and by the Northern Agricultural Research Center Advisory Board. With budget and other resources allowing, it is planned to continue the off-station spring wheat variety and breeding line testing in this area. The Blaine County location near Turner has been a long-term site for various cereal and variety testing trials since 1984, marking 2023 as the Cederberg Family's fortieth year of collaboration.

#### 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 the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2023. (Exp# 23-9951-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	31.5	<b>62.0</b>	<b>15.9</b>	459	22.0	16.7
Corbin	BZ 996434	29.3	61.3	15.1	443	22.1	20.0
Dagmar	PI 690450	35.6	61.4	15.7	427	<b>22.9</b>	16.7
Duclair	PI 660981	36.5	59.9	15.7	430	<b>24.1</b>	<b>11.7</b>
Lanning	PI 676978	<b>37.7</b>	60.7	15.3	427	22.4	26.7
MT Carlson	MT 1939	36.0	60.6	14.8	446	22.3	23.3
MT Dutton	MT 1809	<b>36.9</b>	60.3	<b>15.9</b>	456	22.1	30.0
MT Sidney	MT 1716	32.1	<b>61.7</b>	<b>16.1</b>	455	<b>23.6</b>	23.3
NS Presser CLP	PI 679964	36.1	61.2	14.4	406	<b>24.0</b>	23.3
Reeder	ND 695	32.8	61.4	15.1	432	22.8	23.3
Rocker	BZ 917-277	<b>38.4</b>	<b>62.2</b>	15.1	462	<b>23.3</b>	18.3
SY Ingmar	AGRIPR141	30.0	<b>61.7</b>	<b>16.4</b>	<b>472</b>	21.4	26.7
SY Longmire	SYN 182	32.3	61.1	<b>15.9</b>	<b>480</b>	21.9	18.3
SY Soren	AGRIPR 14	29.9	61.3	<b>16.0</b>	<b>473</b>	21.4	16.7
Vida	PI 642366	35.4	61.1	15.2	424	<b>23.2</b>	15.0
WB9879CLP	WB9879CLP	31.7	60.0	<b>16.0</b>	459	21.7	<b>7.0</b>
MT 2030	LANNING/MT 1338	33.5	61.0	15.1	<b>488</b>	20.1	25.0
MT 2049	LANNING/MT 1415	34.5	<b>62.0</b>	15.4	442	<b>23.5</b>	23.3
MT 2050	MT 1542/MT 1415	36.1	60.7	15.2	440	22.1	13.3
MT 2063	MT 1572/MT1133//CHOTEAU/y	30.9	<b>61.7</b>	15.6	432	21.7	16.7
MT 21016	MT 1542/LANNING	34.2	60.1	<b>15.9</b>	428	22.5	25.0
MT 21037	MT 1570//MT1274/12F5 827	32.7	60.3	<b>16.3</b>	414	21.5	<b>5.0</b>
MT 21074	MT 1525/MT 1348	31.0	61.5	<b>16.1</b>	418	22.0	<b>11.7</b>
MT 21104	MT 1451/MT 1866	31.5	<b>61.6</b>	15.7	421	<b>23.0</b>	25.0
MT 21105	MT 1570/VIDA	<b>40.4</b>	<b>61.7</b>	15.1	424	22.1	16.7
EXPERIMENTAL MEANS		33.9	61.2	15.6	442.4	22.4	19.1
LSD (0.05)		3.9	0.7	0.6	17.2	1.5	7.7
C.V.%		7.0	0.7	2.3	2.4	4.0	24.4
P-VALUE (Varieties)		<.0001	<.0001	<.0001	<.0001	0.0004	<.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).

Management Information (23-9951-SW)

Seeding Date:	May 4, 2023
Harvest Date:	August 17, 2023
Fertility:	46-9-5-5 side banded
System:	No Till
Herbicide:	Vendetta, 32 oz/ac; Discover, 16 oz/ac
Insecticide:	none
Previous Crop:	Chemical Fallow - Winter Wheat
Precipitation:	4.64" seeding to harvest maturity*

\* Precip from NOAA website

**TABLE 2. Nine-Year Yield and Test Weight Summary on Selected Entries from Dryland Fallow Spring Wheat Variety Nurseries Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2014-2023. (Exp# 9951-SW)**

<sup>2/</sup> VARIETY or SELECTION	<sup>3/</sup> No. of YEARS TESTED	<sup>1/</sup> YIELD (Bushels Per Acre)								TEST WEIGHT (Pounds Per Bushel)							
							<sup>3/</sup> AVE. for YEARS TESTED	<sup>4/</sup> % of CHECK YIELD	<sup>5/</sup> 9-YR COMP. AVE. YIELD						<sup>3/</sup> AVE. for YEARS TESTED	<sup>4/</sup> % of CHECK TEST WT	<sup>5/</sup> 9-YR COMP. TEST WT
		2019	2020	2021	2022	2023	TESTED	YIELD	YIELD	2019	2020	2021	2022	2023	TESTED	TEST WT	TEST WT
MT 1939 MT CARLSON (++)	3			18.3	45.9	36.0	33.4	104.8	<b>41.6</b>			54.9	59.3	60.6	58.3	98.1	<b>58.0</b>
MT 1809 MT DUTTON (++)	3			20.2	39.3	36.9	32.1	100.8	<b>40.0</b>			55.2	58.7	60.3	58.1	97.8	<b>57.8</b>
PI642366 VIDA (+)	9	58.5	56.8	20.4	39.8	35.4	39.7	100.0	<b>39.7</b>	57.0	58.7	57.7	59.2	61.1	59.1	100.0	<b>59.1</b>
PI676978 LANNING (+)	9	55.8	54.8	18.8	40.1	37.7	39.3	99.0	<b>39.3</b>	56.0	58.7	56.6	59.1	60.7	58.7	99.5	<b>58.7</b>
AGRIPR141 SY INGMAR (P+)	7	48.2	51.6	17.7	33.6	30.0	33.7	97.9	<b>38.8</b>	58.9	59.8	58.5	60.5	61.7	60.4	102.2	<b>60.4</b>
PI 690450 DAGMAR (++)	6	56.1	53.6	21.1	38.3	35.6	40.0	95.9	<b>38.1</b>	58.1	59.3	58.5	59.4	61.4	59.5	100.9	<b>59.6</b>
PI679964 NS PRESSER CLP (P+)	8	57.1	46.1	23.8	36.1	36.1	36.6	93.4	<b>37.1</b>	54.9	56.6	58.2	59.5	61.2	57.7	98.4	<b>58.1</b>
ND 695 REEDER (+)	9	50.8	54.4	17.9	37.6	32.8	36.8	92.7	<b>36.8</b>	57.0	58.3	57.0	59.4	61.4	59.2	100.3	<b>59.2</b>
PI671855 EGAN (+)	7	49.8	48.3	17.0			36.8	91.3	<b>36.2</b>	56.1	56.5	56.4			57.7	98.2	<b>58.0</b>
MT 1716 MT SIDNEY (++)	5	51.6	51.7	17.8	37.1	32.1	38.1	90.3	<b>35.8</b>	58.0	59.8	58.3	60.4	61.7	59.6	101.5	<b>59.9</b>
PI660981 DUCLAIR (+)(sawfly tol)	9	53.7	49.7	15.8	34.2	36.5	35.6	89.6	<b>35.6</b>	56.1	58.0	53.7	58.7	59.9	57.9	98.0	<b>57.9</b>
WA 8166 ALUM (+)	6	52.8	45.8	14.6			35.2	88.6	<b>35.2</b>	58.2	58.2	57.8			59.1	101.5	<b>60.0</b>
IMICHT-79 WB9879CLP (P+)	9	53.8	50.1	18.8	33.6	31.7	34.9	88.0	<b>34.9</b>	57.1	58.8	57.1	59.2	60.0	59.1	100.1	<b>59.1</b>
BZ902413 WB GUNNISON (P+)(sawfly)	8	47.6	50.7	15.3	37.0		35.1	87.3	<b>34.6</b>	58.8	59.2	56.7	60.4		59.6	101.3	<b>59.8</b>
BZ996434 CORBIN (P+)	9	52.2	48.3	17.1	32.2	29.3	34.1	85.8	<b>34.1</b>	57.2	59.1	57.6	60.2	61.3	59.7	101.1	<b>59.7</b>
PI633974 CHOTEAU (+)(sawfly tol)	8	53.1	46.4	17.5	35.0		34.2	84.9	<b>33.7</b>	56.2	58.5	55.9	59.1		58.4	99.3	<b>58.6</b>
01S0263-28 SY SOREN (P+)	9	52.1	53.3	15.8	33.3	29.9	33.5	84.4	<b>33.5</b>	58.1	59.2	56.6	60.5	61.3	59.5	100.8	<b>59.5</b>
01S0042-10 BRENNAN (P+)	9	51.6	46.4	13.8	32.2	31.5	32.6	82.3	<b>32.6</b>	59.7	60.8	56.3	60.6	62.0	60.6	102.6	<b>60.6</b>
MEANS (For Entries Listed)		52.8	50.5	17.9	36.6	33.7			<b>36.5</b>	57.3	58.7	56.8	59.6	61.1			<b>59.6</b>
<sup>6/</sup> Growing Season Precipitation (in.)		2.99	5.93	3.48	5.22	4.64	5.94										
Soil PAW (in.) to SD @ Planting		6.30	n/a	n/a	n/a	3.70	6.25										
Total Plant Available Water (in.)		9.30	n/a	n/a	n/a	8.30	14.38										
Soil NO3 (lbs.) to SD at Planting		n/a	n/a	n/a	n/a	47	62										
SD (Sampling Depth in Inches)		19	n/a	n/a	n/a	34	39										
Fertilizer Applied	(# N)	100	100	100	46	46	92										
	(# P <sub>2</sub> O <sub>5</sub> )	20	20	20	9	9	18										
	(# K <sub>2</sub> 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/crops/index.html> 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 shown, but summary calculations include all years noted. No harvest in 2014 due to hail.

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

5/ 9-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 = 9-Yr average yield or test weight for the check variety Vida.

6/ Seeding to 14 days prior to harvest maturity.

**TABLE 3. Nine-Year Protein and Sawfly Summary on Selected Entries from Dryland Fallow Spring Wheat Variety Nurseries Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2014-2023. (Exp# 9951-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	4/ % of CHECK	5/ 9-YR COMP. AVE.	3/ AVE. for YEARS	4/ % of CHECK	5/ 9-YR COMP. AVE.				
							TESTED	PROTEIN	PROTEIN	TESTED	SAWFLY	SAWFLY				
PI633974 CHOTEAU (+)(sawfly tol)	8	15.5	16.0	16.3	15.4	15.8	105.3	15.9	0.3	0.0	0.7	2.3	0.4	32.2	0.9	
IMICHT-79 WB9879CLP (P+)	9	15.8	16.0	16.2	15.4	16.0	106.0	16.0	0.3	0.0	1.0	1.0	7.0	1.0	36.8	1.0
BZ902413 WB GUNNISON (P+)(sawfly)	8	14.3	15.0	15.5	14.6	14.8	98.4	14.8	0.3	0.0	0.7	3.7	0.7	54.8	1.5	
PI660981 DUCLAIR (+)(sawfly tol)	9	15.3	15.7	16.4	15.6	15.7	102.9	15.5	0.3	0.3	1.0	3.7	11.7	2.0	69.7	2.0
PI 690450 DAGMAR (++)	6	15.5	16.0	16.2	15.6	15.7	104.8	15.8	0.7	0.0	1.7	5.3	16.7	4.2	100.0	2.8
PI642366 VIDA (+)	9	15.3	14.6	15.3	15.2	15.2	100.0	15.1	0.7	0.3	0.7	8.3	15.0	2.8	100.0	2.8
BZ996434 CORBIN (P+)	9	15.5	15.7	16.4	14.9	15.1	103.0	15.5	1.0	0.0	2.3	3.7	20.0	3.1	111.8	3.1
01S0263-28 SY SOREN (P+)	9	15.7	16.1	17.3	16.2	16.0	108.1	16.3	1.0	0.7	6.7	5.0	16.7	3.5	125.0	3.5
MT 1939 MT CARLSON (++)	3			15.8	15.0	14.8	99.9	15.0			3.7	3.7	23.3	10.2	127.8	3.6
0150042-10 BRENNAN (P+)	9	15.4	16.0	16.8	16.4	15.9	107.5	16.2	1.0	1.0	11.7	3.7	16.7	3.9	136.8	3.9
MT 1716 MT SIDNEY (++)	5	15.6	15.5	16.5	15.9	16.1	105.4	15.9	0.7	0.0	2.0	8.3	23.3	6.9	137.3	3.9
PI679964 NS PRESSER CLP (P+)	8	15.2	16.7	14.9	15.3	14.4	102.0	15.4	0.3	1.0	5.0	5.3	23.3	4.9	153.9	4.3
MT 1809 MT DUTTON (++)	3			16.7	15.5	15.9	105.3	15.9			2.3	5.0	30.0	12.4	155.6	4.4
ND 695 REEDER (+)	9	15.9	15.8	16.1	15.5	15.1	104.0	15.7	0.7	1.0	3.7	11.7	23.3	4.8	171.0	4.8
AGRI141 SY INGMAR (P+)	7	15.7	16.0	16.3	16.1	16.4	107.8	16.2	0.3	0.3	5.0	11.7	26.7	6.3	173.7	4.9
PI676978 LANNING (+)	9	15.6	15.9	15.9	16.1	15.3	105.1	15.8	0.7	0.3	10.0	10.0	26.7	5.5	194.7	5.5
WA 8166 ALUM (+)	6	15.4	15.8	16.5			104.6	15.7	0.3	0.7	6.7			1.4	433.8	12.2
PI671855 EGAN (+)	7	16.7	17.1	17.5			114.3	17.2	0.7	0.7	10.0			1.9	649.4	18.3
MEANS (For Entries Listed)		15.5	15.9	16.2	15.5	15.5		15.8	0.6	0.4	4.1	5.8	20.0			4.6
6/ Growing Season Precipitation (in.)		2.99	5.93	3.48	5.22	4.64	5.94									
Soil PAW (in.) to SD @ Planting		6.30	n/a	n/a	n/a	3.70	6.25									
Total Plant Available Water (in.)		9.30	n/a	n/a	n/a	8.30	14.38									
Soil NO3 (lbs.) to SD at Planting		n/a	n/a	n/a	n/a	47	62									
SD (Sampling Depth in Inches)		19	n/a	n/a	n/a	34	39									
Fertilizer Applied	(# N)	100	100	100	46	46	92									
	(# P <sub>2</sub> O <sub>5</sub> )	20	20	20	9	9	18									
	(# K <sub>2</sub> 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/crops/index.html> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

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3/ Only the most recent 5 years shown, but summary calculations include all years noted. No harvest in 2014 due to hail.

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

5/ 9-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 = 9-Yr average protein or sawfly rating for the check variety Vida.

6/ Seeding to 14 days prior to harvest maturity.