

Title: North Central Montana Off-Station Winter Wheat Variety Performance Evaluations

Principal Investigator: Peggy Lamb, Research Scientist, Northern Ag Research Center, Havre

Project Personnel: Phil Bruckner, Breeder/Geneticist, Winter Wheat, Bozeman
Jim Berg, Research Associate, Winter Wheat, Bozeman
Kyla McNamara, Research Associate, Havre
Tyler Lane, Chouteau County Extension
Julianne Snedigar, Blaine County Extension

Cooperators: Max Cederberg, Landowner, Turner
Kendrick McKeever, Landowner, Loma

Objectives:

Diverse cropping environments exist within the five-county area most closely served by Northern Agricultural Research Center. Winter wheat, spring wheat, barley, durum and oat production together in the five counties (Blaine, Chouteau, Hill, Liberty and Phillips), represents just over 28 percent of the 2014-2018 statewide cereal production totals (42 percent for winter wheat and 27 percent for spring wheat). Producers are keenly interested in variety performance data generated under local conditions. It is our objective, within budget and other resource limitations, to evaluate small grain variety performance, over time, under conditions representative of specific areas of northern Montana, yet differing from that of the Research Center. Growers are provided reliable, unbiased, up-to-date information to make comparisons among improved winter wheat varieties. This report provides producers in north central Montana the information necessary to select varieties best suited for their specific area and growing conditions.

Methods:

Standard off-station winter wheat variety performance trials were conducted on minimal tillage during 2019 in two northern Montana counties.

Dryland Winter Wheat Trials:

- | | |
|------------------------------------|---------------|
| 1. Cederberg Farm, Blaine County | S13-T36N-R25E |
| 2. McKeever Farms, Chouteau County | S29-T27N-R10E |

Both winter wheat trials consisted of 25 entries and were 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 Classic' plot combine, funded in part by the Montana Wheat and Barley Committee, was used to harvest each 3-row plot. Seed was cleaned prior to measuring plot weight for yield determination. Protein, test weight and moisture content were determined 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 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 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:

Following a cooler than normal summer that was scattered with timely precipitation, winter wheat yields at Turner averaged 61 bu/ac (Table 1). 'Yellowstone', released by Montana State University in 2005, was the highest yielding entry at 74.7 bu/ac. The 2019 MSU wheat stem sawfly tolerant release 'Bobcat' and experimental line 'MT 1683' also produced yields statistically equal to that of Yellowstone. Test weights of all entries averaged 59.2 lb/bu. Sawfly cutting was almost non-existent in the winter wheat at Turner. Plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2019 Turner 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. Eight-year comparable averages for seed yield and test weight at Turner are summarized in Table 2, while eight-year comparable averages for sawfly cutting are summarized in Table 3.

Loma winter wheat yields averaged just over 60 bu/ac with 'SY Monument', a hollow-stemmed, release from Syngenta in 2015, producing the highest yield at 74.2 bu/ac (Table 4). Solid-stemmed Bobcat, along with breeding line 'MT 1642', produced seed yields statistically equal to SY Monument. Stem cutting by sawfly was high this year in the small plot scenario at Loma, with cutting in the winter wheat trial averaging 40 percent. Plant height, yield, test weight, protein, falling number and sawfly cutting data for the 2019 Loma dryland winter wheat trial are summarized in Table 4. Ten-year comparable averages for seed yield and test weight at Loma are summarized in Table 5, while ten-year comparable averages for sawfly cutting are summarized in Table 6.

Summary:

Above average precipitation throughout northcentral Montana in the fall of 2018 made for very good winter wheat establishment conditions for those seeding early and recharged soils to set up a favorable cropping environment. However, fall seeding was delayed in many areas where it was too muddy to return to the field for several weeks following the rain. Overall, the growing season started out cooler and dryer than average with many crops showing drought stress during early June. Heavy rainfall was spotty during the latter part of June and into early July. Precipitation coupled with prolonged cooler temperatures in July allowed for a longer period of grain fill, resulting in better than anticipated crop yields in several areas. The Loma location was seeded into chemical fallow ground that had been minimally tilled to eliminate potential weed issues. That location suffered from lack of precipitation from May through July resulting lower than average winter wheat yields. The Turner location was seeded into ground that had been minimally tilled to eradicate rolling dunes of soil that accumulated over a period of extreme wind and dust storms in the summer of 2017. The Turner area received timely precipitation resulting in higher than average winter wheat yields.

This work has been strongly supported by producers near each of the off-station locations, and by the Northern Agricultural Research Center Advisory Council. With budget and other resources allowing, it is planned to continue off-station cereal variety investigations in the five-county area. The Blaine County location near Turner is entering its tenth year of winter wheat testing, while the Chouteau County location, between Big Sandy and Loma, has been used for various trials since 1998.

Recognition:

This research would not have been possible without the assistance of the following seasonal employees: Tawnya Brown, Wylee Brown, Eleri Haney, Abbey Morse and Tracey Reed.

TABLE 1. Dryland Fallow Winter Wheat Cultivar Evaluation Nursery Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2019. (Exp# 19-3851-WW)

ID	CULTIVAR or SELECTION	PLNT HT Inches	1/ YIELD Bu/Ac	TEST WT Lbs/Bu	2/ PROTEIN %	3/ FN Seconds	4/ SAWFLY %
AAC Wildfire	Alberta: SECAN, 2015	28.7	58.3	58.1	13.8	393	0.7
Bobcat (MTS1588)	Montana, 2019	27.5	73.4	59.8	13.8	392	0.7
Brawl CLP	Colorado Research Foundation, 2011	22.1	46.6	59.8	15.2	322	0.7
Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018	25.9	56.4	59.7	13.2	341	0.7
Decade	Montana/North Dakota, 2010	26.3	59.4	58.9	14.7	359	0.0
Flathead (MT1564)	Montana, 2019	24.1	52.2	59.3	14.7	350	1.0
FourOsix	Montana, 2018 (MT1465)	24.7	61.7	58.6	14.3	393	0.3
Judee	Montana, 2011	28.5	59.0	60.2	14.6	360	0.0
Keldin	Westbred, 2011	26.3	63.9	59.7	13.9	381	1.0
LCS Jet	Limagrain Cereal Seeds, 2015	22.7	55.4	56.4	13.7	360	0.0
Loma	Montana, 2016	23.4	70.9	58.9	<u>14.7</u>	340	0.0
Northern	Montana, 2015	24.5	65.4	59.7	14.3	331	0.3
Ray	Montana, 2018 (MTF1432)	33.9	61.7	57.6	13.8	426	0.7
SY Clearstone 2CL	Montana/Syngenta, 2012	26.9	61.8	59.1	14.4	404	1.0
SY Monument	Syngenta, 2015	24.5	55.2	58.8	13.4	362	0.3
Warhorse	Montana, 2013	25.5	51.9	58.7	14.4	449	0.3
Yellowstone	Montana 2005	28.8	<u>74.7</u>	59.3	14.1	397	1.0
MT1642	Yellowstone/Madsen//Yellowstone	26.9	62.0	58.5	14.3	379	0.3
MT1683	Yellowstone(L)*2/CDC Buteo	29.1	73.3	59.3	14.2	377	1.0
MT1747	MT06103//MTW0881/SD06W166	26.3	60.3	60.2	13.9	363	0.0
MT1750	MT08185//YLL(L)/NX05M4391	24.5	60.9	60.4	14.1	387	0.3
MT1782	MT0859//MT0860/MT0885	25.1	60.1	60.4	14.6	377	0.3
MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL011	25.1	62.4	58.6	14.0	404	0.0
MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3/MTCL	27.4	55.9	60.3	14.0	406	0.3
MTW1491	MT08189//MT08187/(MTW08166, WB3768 :	26.8	61.2	60.2	13.5	380	1.0
EXPERIMENTAL MEANS		26.2	61.0	59.2	14.1	377	0.5
LSD (0.05)		2.4	7.8	0.5	0.2	19.3	0.7
C.V.%		5.5	7.1	0.5	1.0	3.1	85.6
P-VALUE (Varieties)		<.0001	<.0001	<.0001	<.0001	<.0001	0.0037

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 highest value within a column.

Bold indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05).

Management Information (19-3851-WW)

Seeding Date:	September 26, 2018
Harvest Date:	August 30, 2019
Fertility:	125-20-10-10 side banded
System:	Tilled
Herbicide:	Bromac-16oz/ac, Affinity-0.6oz/ac
Insecticide:	none
Previous Crop:	Minimum Till - Durum
Precipitation:	2.98" April 1 to Harvest Maturity

TABLE 2. Eight-Year Yield and Test Weight Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2011-2019. (Exp# 3851-WW).

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)					TEST WEIGHT (Pounds Per Bushel)					8-YR COMP. AVE YIELD 5/	8-YR COMP. AVE TEST WT 5/				
		2015	2016	2017	2018	2019	AVE. for YEARS TESTED 3/	% of CHECK YIELD 4/	2015	2016	2017			2018	2019	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 4/
MTS1588 BOBCAT (++) (saw fly tol)	3			22.9	34.5	73.4	43.6	100.7	46.9			57.6	62.0	59.8	59.8	101.8	60.7
MT00159 YELLOWSTONE (+)	8	40.7	65.0	19.1	36.1	74.7	46.5	100.0	46.5	59.4	59.7	55.5	61.4	59.3	59.6	100.0	59.6
BZ9W05-2043 WB-QUAKE (P+)	6	38.3	66.3	16.9			42.8	98.2	45.7	59.4	59.7	54.7			59.7	100.5	59.9
MTS0721 BEARPAW (+) (saw fly tol)	6	40.4	60.8	19.0			42.3	97.1	45.2	59.1	58.9	56.1			58.9	99.3	59.2
MTS1224 LOMA (++)	5	39.8	59.8	21.3	35.4	70.9	45.4	96.4	44.9	59.7	60.2	57.1	61.8	58.9	59.5	100.8	60.1
S94-4 CDC FALCON (P+)	6	40.3	57.3	17.2			41.0	94.1	43.8	58.9	58.8	56.3			59.3	99.9	59.6
MT0978 NORTHERN (+)	6	38.3	59.0	21.3	38.3	65.4	46.1	92.7	43.2	59.2	60.2	57.3	61.8	59.7	60.0	100.9	60.2
MTCL1077 SY CLEARSTONE 2CL (P+)(CL)	7	38.4	60.6	19.0	33.1	61.8	42.3	91.9	42.7	59.1	59.4	56.6	61.1	59.1	59.4	100.0	59.6
MTS0713 JUDEE (+) (saw fly tol)	8	39.2	63.8	18.1	31.6	59.0	42.1	90.5	42.1	58.3	57.2	55.9	62.6	60.2	59.5	99.8	59.5
MT0552 DECADE (+)	8	42.8	52.7	21.1	35.7	59.4	41.8	89.9	41.8	59.3	58.2	56.7	61.8	58.9	59.7	100.2	59.7
BC01007-7 SY WOLF (P+)	4	38.5	57.6	17.7	30.5		36.1	89.7	41.7	59.0	59.1	58.0	62.1		59.5	100.9	60.1
MT1465 FOUROSIX (++)	3			19.1	34.3	61.7	38.3	88.5	41.2			57.1	61.7	58.6	59.1	100.7	60.0
MTF1432 RAY (++)	3			18.2	34.9	61.7	38.3	88.3	41.1			56.6	60.1	57.6	58.1	98.9	59.0
ACS55017 KELDIN (P+)	4		48.3	20.8	33.4	63.9	41.6	85.4	39.7		59.3	57.5	61.9	59.7	59.6	99.4	59.2
MTS0808 WARHORSE (+) (saw fly tol)	8	34.6	59.9	16.9	31.5	51.9	38.8	83.3	38.8	61.0	60.4	57.7	60.4	58.7	60.3	101.2	60.3
Syngenta, 2015 SY MONUMENT (P+)	3			18.7	27.2	55.2	33.7	77.9	36.2			55.2	61.2	58.8	58.4	99.5	59.3
CO Res., 2011 BRAWL CLP (++) (CL)	3			16.4	22.0	46.6	28.3	65.4	30.5			57.7	62.7	59.8	60.1	102.3	61.0
MEANS (For Entries Listed)		39.2	59.2	19.0	32.8	62.0			41.9	59.3	59.3	56.7	61.6	59.2			59.8
6/ Growing Season Precipitation (in.)		n/a	11.4	2.9	4.7	3.0	7.9										
Soil PAW (in.) to SD @ Planting		3.6	7.9	5.8	7.3	7.6	7.3										
Total Plant Available Water (in.)		n/a	19.4	8.7	12.0	10.5	15.7										
Soil NO3 (lbs.) to SD at Planting		27	26	72	64	115	53										
SD (Sampling Depth in Inches)		48	48	48	38	48	47										
Fertilizer Applied	(# N)	100	100	100	125	125	99										
	(# P ₂ O ₅)	20	20	20	20	20	24										
	(# K ₂ O)	10	10	10	10	10	13										
	(#S)	0	0	0	10	10	2										

Check variety is Yellow stone.

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 Tolerant, HW = Hard White.

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

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

5/ 8-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 Yellow stone for the same years, and z = 8-Yr average yield or test weight for the check variety Yellow stone.

6/ April 1 to 14 days prior to harvest maturity.

TABLE 3. Eight-Year Sawfly Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at the Max Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2011-2019. (Exp# 3851-WW)

			1/ SAWFLY RATING (% of cut and lodged stems)									AVE. for YEARS TESTED	% of CHECK SWFLY 4/	8-YR COMP. AVE. SWFLY 5/
2/ VARIETY or SELECTION	No. of YEARS TESTED		2011	2012	2013	2014 3/	2015	2016	2017	2018	2019			
MTS0808	WARHORSE (+)(saw fly tol)	8	1.0	2.3	0.7		0.0	0.0	0.3	0.3	0.3	0.6	10.6	0.6
MT0978	NORTHERN (+)	6			1.0		0.0	0.0	0.3	0.0	0.3	0.3	18.5	1.1
BC01007-7	SY WOLF (P+)	4					0.0	0.0	0.0	0.3		0.1	25.0	1.5
MTS1224	LOMA (++)	5					0.0	0.0	0.3	0.3	0.0	0.1	28.6	1.7
MTS0713	JUDEE (+)(saw fly tol)	8	7.0	8.3	0.7		0.0	0.0	0.0	0.0	0.0	2.0	33.8	2.0
Syngenta, 2015	SY MONUMENT (P+)	3							0.7	0.0	0.3	0.3	42.8	2.5
CO Res., 2011	BRAWL CLP (++) (CL)	3							0.0	0.3	0.7	0.3	42.8	2.5
MTS0721	BEARPAW (+)(saw fly tol)	6	3.7	20.0	1.0		0.0	0.0	1.0			4.3	56.2	3.3
MT1465	FOUROSIX (++)	3							0.3	0.7	0.3	0.4	57.1	3.4
MTS1588	BOBCAT (++) (saw fly tol)	3							0.7	0.0	0.7	0.4	57.1	3.4
S94-4	CDC FALCON (P+)	6	2.3	18.3	3.7		0.3	0.0	2.3			4.5	59.1	3.5
BZ9W05-2043	WB-QUAKE (P+)	6	20.0	10.0	0.7		0.3	0.0	0.7			5.3	69.3	4.1
MTCL1077	SY CLEARSTONE 2CL (P+) (CL)	7		18.3	1.0		0.3	0.0	0.0	1.0	1.0	3.1	79.3	4.7
MT0552	DECADE (+)	8	11.7	23.3	2.0		0.3	0.0	0.3	1.0	0.0	4.8	81.7	4.8
MTF1432	RAY (++)	3							0.3	1.0	0.7	0.7	85.7	5.1
MT00159	YELLOWSTONE (+)	8	20.0	18.3	6.7		0.0	0.0	0.7	0.7	1.0	5.9	100.0	5.9
ACS55017	KELDIN (P+)	4						0.0	1.0	1.0	1.0	0.8	128.6	7.6
MEANS (For Entries Listed)			9.4	14.9	1.9		0.1	0.0	0.5	0.5	0.5			3.4
6/ Growing Season Precipitation (in.)			8.3	7.5	n/a	17.6	n/a	11.4	2.9	4.7	3.0	7.9		
Soil PAW (in.) to SD @ Planting			8.2	8.9	7.8	8.5	3.6	7.9	5.8	7.3	7.6	7.3		
Total Plant Available Water (in.)			16.5	16.4	n/a	26.2	n/a	19.4	8.7	12.0	10.5	15.7		
Soil NO3 (lbs.) to SD at Planting			55	15	11	93	27	26	72	64	115	53		
SD (Sampling Depth in Inches)			48	48	48	48	48	48	48	38	48	47		
Fertilizer Applied														
(# N)			70	70	100	100	100	100	100	125	125	99		
(# P2O5)			40	40	20	20	20	20	20	20	20	24		
(# K2O)			25	25	10	10	10	10	10	10	10	13		
(#S)			0	0	0	0	0	0	0	10	10	2		

Check variety is Yellow stone.

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/ No harvest in 2014 due to hail.

4/ Percent of Yellow stone saw fly rating for the same data years as those in which a given entry was tested.

5/ 8-Yr Comparable Average = (x/y) * z where x = average saw fly rating of a given entry for years tested, y = average saw fly rating for Yellow stone for the same years, and z = 8-Yr average saw fly rating for the check variety Yellow stone.

6/ April 1 to 14 days prior to harvest maturity.

TABLE 4. Dryland Fallow Winter Wheat Cultivar Evaluation Nursery Grown Off-Station at McKeever Farm & Seed, Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2019. (Exp# 19-3853-WW)

ID	CULTIVAR or SELECTION	PLNT HT Inches	1/ YIELD Bu/Ac	TEST WT Lbs/Bu	2/ PROTEIN %	3/ FN Seconds	4/ SAWFLY %
AAC Wildfire	Alberta: SECAN, 2015	31.4	60.0	59.9	12.9	413	20.3
Bobcat (MTS1588)	Montana, 2019	28.2	73.9	61.8	11.8	414	6.3
Brawl CLP	Colorado Research Foundation, 2011	28.9	61.0	61.6	13.3	429	39.3
Byrd CL Plus	Plainsgold/Col. Wheat Res Fdn, 2018	28.2	60.4	61.4	11.8	406	39.2
Decade	Montana/North Dakota, 2010	32.9	61.3	61.0	11.8	421	34.8
Flathead (MT1564)	Montana, 2019	28.9	54.5	60.9	13.3	451	55.7
FourOsix	Montana, 2018 (MT1465)	25.1	61.3	60.5	12.1	441	65.5
Judee	Montana, 2011	28.3	62.0	62.4	12.1	415	41.0
Keldin	Westbred, 2011	27.8	63.6	60.7	12.5	416	48.9
LCS Jet	Limagrain Cereal Seeds, 2015	24.2	58.3	57.8	11.6	404	52.8
Loma	Montana, 2016	27.8	60.0	60.7	13.3	408	22.3
Northern	Montana, 2015	27.1	60.7	60.3	13.1	510	50.5
Ray	Montana, 2018 (MTF1432)	34.3	61.6	59.6	11.9	453	31.9
SY Clearstone 2CL	Montana/Syngenta, 2012	30.9	55.4	59.4	12.4	496	62.2
SY Monument	Syngenta, 2015	24.7	74.2	60.4	12.0	396	38.2
Warhorse	Montana, 2013	28.6	44.5	61.4	14.1	497	16.6
Yellowstone	Montana 2005	30.6	53.2	59.2	13.3	484	53.5
MT1642	Yellowstone/Madsen//Yellowstone	31.4	70.3	60.6	12.7	469	45.7
MT1683	Yellowstone(L)*2/CDC Buteo	30.9	60.2	60.1	12.2	467	87.8
MT1747	MT06103/MTW0881/SD06W166	24.3	61.8	62.0	11.8	425	20.1
MT1750	MT08185/YLL(L)/NX05M4391	24.2	66.1	62.0	12.4	424	20.8
MT1782	MT0859/MT0860/MT0885	28.8	58.6	62.0	12.5	438	25.8
MTCL1732	AP035-8-1/5/MT08134/4/YLL*4/3/MTCL011	26.1	63.5	60.6	12.6	452	19.5
MTCS1601	MTS0531/7/MTS0532/6/96X17E69/3/MTCL	28.0	50.5	60.9	12.8	434	45.0
MTW1491	MT08189/MT08187/(MTW08166, WB3768 :	28.8	58.6	60.6	11.6	467	61.8
EXPERIMENTAL MEANS		28.4	60.6	60.7	12.5	441	40.2
LSD (0.05)		2.1	8.3	0.7	0.5	25.5	20.6
C.V.%		4.5	8.4	0.7	2.5	3.3	29.2
P-VALUE (Varieties)		<.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 highest value within a column.

Bold indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05).

Management Information (19-3853-WW)

Seeding Date: September 26, 2018
 Harvest Date: September 4, 2019
 Fertility: 125-20-10-10 side banded
 System: no till
 Herbicide: Bromac-16oz/ac
 Insecticide: none
 Previous Crop: Chemical Fallow - Spring Wheat
 Precipitation: n/a

TABLE 5. Ten-Year Yield and Test Weight Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at McKeever Farms and Seed Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2010-2019. (Exp# 3853-WW)

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)							TEST WEIGHT (Pounds Per Bushel)								
		2015	2016	2017	2018	2019	AVE. for YEARS TESTED 3/	% of CHECK YIELD 4/	10-YR COMP. AVE. YIELD 5/	2015	2016	2017	2018	2019	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 4/	10-YR COMP. AVE. TEST WT 5/
MTS1588 BOBCAT (++)	3			49.7	66.5	73.9	63.4	123.0	67.1			61.1	61.0	61.8	61.3	103.3	59.7
Syngenta, 2015 SY MONUMENT (P+)	3			40.0	63.3	74.2	59.2	114.8	62.7			60.1	60.3	60.4	60.3	101.6	58.7
CO Res., 2011 BRAWL CLP (++) (CL)	3			48.8	61.4	61.0	57.1	110.8	60.4			61.7	62.1	61.6	61.8	104.2	60.2
ACS55017 KELDIN (P+)	4		51.6	38.7	62.7	63.6	54.1	109.1	59.5		56.3	60.2	60.2	60.7	59.3	102.1	59.0
MTS0978 NORTHERN (+)	7	55.3	41.3	43.9	63.3	60.7	54.5	106.6	58.2	57.4	51.6	60.2	60.1	60.3	58.7	100.6	58.1
MT1465 FOUROSIX (++)	3			43.4	59.6	61.3	54.8	106.4	58.0			60.8	59.6	60.5	60.3	101.7	58.7
MTF1432 RAY (++)	3			41.4	59.2	61.6	54.1	105.0	57.3			58.4	57.6	59.6	58.5	98.6	57.0
BC01007-7 SY WOLF (P+)	4	48.4	45.6	41.9	58.2		48.5	101.3	55.2	58.9	55.4	61.8	61.5		59.4	103.4	59.7
MT00159 YELLOWSTONE (+)	10	46.2	44.1	42.5	58.9	53.2	54.6	100.0	54.6	56.6	54.5	59.9	58.9	59.2	57.8	100.0	57.8
MTCL1077 SY CLEARSTONE 2CL (P+) (CL)	8	47.5	40.6	38.4	59.9	55.4	51.2	98.3	53.6	56.9	54.1	60.2	58.5	59.4	57.9	99.7	57.6
MTS0713 JUDEE (+) (saw fly tol)	10	43.2	42.1	41.1	56.8	62.0	52.3	95.9	52.3	56.7	53.8	60.9	60.2	62.4	58.8	101.7	58.8
S94-4 CDC FALCON (P+)	8	55.1	43.5	40.2			51.8	95.6	52.1	57.2	53.9	58.3			57.2	99.5	57.5
MTS1224 LOMA (++)	5	44.0	28.1	41.5	57.7	60.0	46.2	94.4	51.5	56.1	53.3	60.5	58.5	60.7	57.8	100.0	57.8
MT0552 DECADE (+)	10	45.4	35.4	40.4	61.5	61.3	50.8	93.0	50.8	56.2	53.5	60.0	60.0	61.0	58.2	100.8	58.2
BZ9W05-2043 WB-QUAKE (P+)	7	43.3	36.8	40.2			47.7	90.9	49.6	56.6	54.8	61.2			58.2	100.1	57.8
MTS0808 WARHORSE (+) (saw fly tol)	9	44.8	36.2	40.6	43.5	44.5	47.9	90.0	49.1	56.8	55.9	60.8	59.5	61.4	59.1	101.3	58.5
MTS0721 BEARPAW (+) (saw fly tol)	8	50.9	37.0	27.9			46.3	85.3	46.6	56.8	53.3	60.4			57.8	100.6	58.1
MEANS (For Entries Listed)		47.6	40.2	41.2	59.5	61.0			55.2	56.9	54.2	60.4	59.8	60.7			58.4
6/ Growing Season Precipitation (in.)		n/a	8.0	n/a	n/a	n/a	8.3										
Soil PAW (in.) to SD @ Planting		3.6	8.7	n/a	7.5	8.2	8.0										
Total Plant Available Water (in.)		n/a	16.7	n/a	n/a	n/a	17.4										
Soil NO3 (lbs.) to SD at Planting		126	194	n/a	147	100	93										
SD (Sampling Depth in Inches)		48	48	48	48	48	48										
Fertilizer Applied																	
	(# N)	100	100	100	100	125	94										
	(# P ₂ O ₅)	20	20	20	20	20	26										
	(# K ₂ O)	10	10	10	10	10	15										
	(#S)	0	0	0	10	10	2										

Check variety is Yellow stone.

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 show n, but summary calculations include all years noted.

4/ Percent of Yellow stone 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 Yellow stone for the same years, and z = 10-Yr average yield or test weight for the check variety Yellow stone.

6/ April 1 to 14 days prior to harvest maturity.

TABLE 6. Ten-Year Sawfly Summary of Selected Entries from Dryland Fallow Winter Wheat Variety Nurseries Grown Off-Station at McKeever Farm and Seed Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2010-2019. (Exp# 3853-WW)

2/ VARIETY or SELECTION		No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems)										AVE. for YEARS TESTED	% of CHECK SWFLY 3/	10-YR COMP. AVE. SWFLY 4/
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019			
MTS0808	WARHORSE (+)(saw fly tol)	9		5.0	5.0	8.3	0.7	1.0	0.0	13.3	17.2	16.6	7.5	20.6	8.8
MTS1588	BOBCAT (++)	3								24.4	7.2	6.3	12.6	22.4	9.5
MTS0721	BEARPAW (+)(saw fly tol)	8	8.3	10.0	13.3	20.0	1.0	3.7	0.0	11.3			8.5	23.6	10.0
BZ9W05-2043	WB-QUAKE (P+)	7		15.0	12.5	33.3	3.7	2.3	2.0	24.6			13.3	49.9	21.2
MTS1224	LOMA (++)	5						13.3	3.7	38.4	32.3	22.3	22.0	59.1	25.1
MTS0713	JUDEE (+)(saw fly tol)	10	53.3	10.0	31.7	30.0	3.7	2.3	0.7	40.6	65.0	41.0	27.8	65.5	27.8
BC01007-7	SY WOLF (P+)	4						6.7	1.0	45.3	59.1		28.0	84.5	35.9
CO Res., 2011	BRAWL CLP (++) (CL)	3								31.3	73.9	39.3	48.2	85.6	36.4
MTF1432	RAY (++)	3								50.7	67.1	31.9	49.9	88.6	37.6
MT0552	DECADE (+)	10	96.3	13.3	71.7	23.3	5.0	2.3	5.0	51.8	76.5	34.8	38.0	89.4	38.0
Syngenta, 2015	SY MONUMENT (P+)	3								53.7	65.8	38.2	52.6	93.3	39.7
MT0978	NORTHERN (+)	7				16.7	3.7	15.0	2.3	31.6	75.7	50.5	27.9	94.8	40.3
S94-4	CDC FALCON (P+)	8	99.7	15.0	86.7	10.0	3.7	5.3	1.0	57.3			34.8	97.2	41.3
MT00159	YELLOWSTONE (+)	10	99.3	21.7	97.7	15.0	5.0	15.0	2.3	30.6	84.8	53.5	42.5	100.0	42.5
MTCL1077	SY CLEARSTONE 2CL (P+) (CL)	8			97.7	20.0	3.7	18.3	3.7	46.0	79.4	62.2	41.4	108.9	46.3
MT1465	FOUROSIX (++)	3								57.9	74.6	65.5	66.0	117.3	49.8
ACS55017	KELDIN (+)	4							6.7	78.0	80.7	48.9	53.5	125.1	53.1
MEANS (For Entries Listed)			71.4	12.9	52.0	19.6	3.3	7.8	2.4	40.4	61.4	39.3			33.1
5/ Growing Season Precipitation (in.)			n/a	9.4	9.4	8.8	6.0	n/a	8.0	n/a	n/a	n/a	8.3		
Soil PAW (in.) to SD @ Planting			7.5	9.6	7.9	9.1	10.4	3.6	8.7	n/a	7.5	8.2	8.0		
Total Plant Available Water (in.)			n/a	19.0	17.3	17.8	16.4	n/a	16.7	n/a	n/a	n/a	17.4		
Soil NO3 (lbs.) to SD at Planting			36	26	68	51	85	126	194	n/a	147	100	93		
SD (Sampling Depth in Inches)			48	48	48	48	48	48	48	48	48	48	48		
Fertilizer Applied															
(# N)			70	70	70	100	100	100	100	100	100	125	94		
(# P2O5)			40	40	40	20	20	20	20	20	20	20	26		
(# K2O)			25	25	25	10	10	10	10	10	10	10	15		
(#S)			0	0	0	0	0	0	0	0	10	10	2		

Check variety is Yellow stone.

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

4/ 10-Yr Comparable Average = (x/y) * z where x = average saw fly rating of a given entry for years tested, y = average saw fly rating for Yellow stone for the same years, and z = 10-Yr average saw fly rating for the check variety Yellow stone.

5/ April 1 to 14 days prior to harvest maturity.