

**Project Title:** Off-station winter wheat cultivar evaluations for the Western Golden Triangle area of Montana

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**Personnel:** John H. Miller, Research Scientist and Julie Prewett, Research Assistant, WTARC, Conrad, MT, and Phil Bruckner and Jim Berg, MSU Plant Science Dept., Bozeman, MT.

**Cooperators:** Bradley Farms, North of Cut Bank, MT  
Brian Aklestad, North of Devon, MT  
Aaron Killion, East of Brady, MT  
Inbody Farms, Northeast of Choteau, MT

**Objectives:** There are diverse cropping environments within the area served by Western Triangle Agricultural Research Center. Each off station location has its own unique environment and soils. Producers in the various locations are interested in variety performance in the local area. To this end the objective is to evaluate winter wheat varieties under the local conditions with respect to yield, test weight, plant height, and seed protein. The environmental conditions at the off station nurseries can vary greatly from those at WTARC. The research center strives to provide growers of the western triangle area unbiased information of various winter wheat varieties.

**Methods:** Off station winter wheat nurseries consist of 25 entries replicated three times, seeded with a four row plot seeder on one foot spacing. All plots were planted on no-till chemical fallow. Plots were trimmed, measured for length, and then harvested with a Hege 140 or a Wintersteiger Classic plot combine. Winter wheat seed was cleaned prior to collecting data. Wheat midge pheromone baited traps were also installed at each off station plot.

**Results:** Results are tabulated in Tables 1 thru 8. Table 1 is for the Choteau location, with multi-year data presented in Table 2. Tables 5 and 6 are for the Devon location, with Table 7 and 8 representing the ‘Knees’ location. The Cut Bank data are presented in Tables 3 and 4. Table 9 is the soil test results from each location.

Overall, the crop year temperatures were much warmer than 31 year average at the research center, July was 4.9 degrees warmer than the average. But the overall average temperature for the year from September to August was 1 degree cooler than the 31 year average. The winter temperature was well below average, with the exception of November being about 7 degrees warmer than usual. December and January were 10 and 6 degrees colder than the 31 year average while May thru August were warmer than the 31 year average. While we had the colder than normal temperatures in December and January, there was snow cover on the winter wheat. July was 5 degrees warmer than the normal. Precipitation was generally above the average from September to April, then below normal from May to August. Overall, precipitation was average for the year.



The chemical fallowed soils generally had good moisture while seeding winter wheat during the fall of 2016. Overall, considering the lack of moisture and heat this past summer, the winter wheat did quite well.

Grain yields and test weights at Choteau were about 2 bu/ac lower and three fourths lb/bu lower than the five year average. Seed protein at Choteau was 1 percent lower than the five year average. The top yielding varieties at Choteau include the Montana State University experimental lines MTW1491, MTS1573, and Brawl CLP at 63.1, 59.8, and 59.4 bu/ac (Table 1 and 2). Grain yields and test weights at Cut Bank were 14.8 bu/ac higher and 3.6 lb/bu higher than the five year average. Seed protein at Cut Bank was 2.7 percent lower than the five year average. At Cut Bank, the top yielding wheat's were Keldin, SY Monument, and the Montana State University experimental line MT1465 with yields of 98.0, 94.1, and 91.5 bu/ac (Table 3 and 4).

Grain yields and test weights at Devon were 2.8 bu/ac higher and 0.7 lb/bu higher than the five year average. Seed protein at Devon was about 0.4 percent higher than the five year average. Top yielders at Devon include Montana State University experimental lines MTW1491, MT1348, and the MT1265 at 75.2, 72.9, and 70.4 bu/ac (Table 5 and 6). Grain yields and test weights at the 'Knees' were 19.8 bu/ac higher and 0.6 lb/bu higher than the five year average. Seed protein at the 'Knees' was 0.5 percent lower than the five year average. The top yielding varieties at the 'Knees' include Brawl CLP, SY Monument, and Keldin at 90.2, 90.0, and 89.9 bu/ac (Table 7 and 8).

All off station plots had some level of sawfly cutting in the winter wheat. Insignificant amount of adult wheat midge were found at the off station locations.

**Summary:** The data from the off station plots is supported by the local producers and advisory committee as well as the seed industry. It is planned to continue the off station variety plots at the same locations as the environmental conditions at each location is unique to the western triangle area.

These data should be used for comparative purposes rather than using absolute numbers. Statistics are used to indicate that treatment or variety differences are really different and are not different due to chance or error. The Least Significant Difference (LSD) and Coefficient of Variability (CV) values are useful in comparing treatment or variety differences. The LSD value represents the smallest difference between two treatments at a given probability level. The LSD at  $p=0.05$  or 5 % probability level is usually the statistic reported, and it means that the odds are 19 to 1 that treatment differences by the amount of the LSD are truly different. The CV value measures the variability of the experiment or variety trial, and a CV greater than 15 % indicates a high degree of variability and less accuracy.

**Funding Summary:** Office of Special Projects will provide expenditure information. No other grants support this project.



MWBC FY2018 Grant Submission Plans: A similar project will be proposed for FY 2018. The continuation of on and off-station variety trials help elucidate researchers and farmers which varieties are better suited for that particular region in Montana.



Table 1. Off-station Winter Wheat variety trial located near the Choteau. Teton County. Western Triangle Ag. Research Center. 2017.

Variety	Yield (bu/ac)	Test Wt (lb/bu)	Height (inch)	Lodging (%)	Protein (%)
MTW1491	63.1	59	30.9	79.1	13.5
MTS1573	59.8	60.5	29.1	47.1	13.4
Brawl CLP	59.4	61.6	28.4	39.4	12.8
Keldin	57.6	59.6	29.1	77.3	13.8
MT1465	56.8	57.9	29.5	75.4	13.9
SY Clearstone 2CL	56.0	56.3	33.4	79.7	13.3
MT1348	55.9	58.3	29.2	77.4	13.3
MTF1435	55.4	56.9	33.3	84.7	13.9
SY Monument	55.4	55.8	27.3	72.0	13.1
MT1444	54.9	57.9	33.3	65.9	14.1
MT1265	54.9	57.0	31.7	74.7	13.6
MTF1432	53.3	56.5	33.9	75.4	13.7
MTS1588	52.6	58.3	26.5	6.3	14.1
MT1471	52.5	57.0	28.3	74.8	14.8
SY Wolf	52.2	59.6	31.5	69.8	14.1
Northern	52.2	57.6	30.9	74.0	14.0
Warhorse	52.0	57.4	29.5	16.8	14.2
CDC Falcon	51.0	57.7	28.6	58.3	14.3
Yellowstone	50.6	56.1	27.4	62.1	14.3
Bearpaw	49.4	57.1	28.3	45.0	14.5
Loma	49.1	57.1	29.5	30.6	13.7
Judee	48.8	58.3	30.5	52.9	14.6
Decade	48.6	59.3	28.5	64.4	13.5
MT1488	47.4	56.8	30.2	64.2	14.0
WB Quake	40.7	56.9	31.1	17.8	14.3
Mean	53.2	57.9	30.0	59.4	13.9
LSD (.05)	8.5	1.6	2.6	22.8	0.8
C.V. (%)	8.9	1.5	4.8	21.7	3.3
P-Value	0.0061	<0.0001	<0.0001	<0.0001	0.0010

Cooperator and Location: Inbody Farms western Chouteau County.

Planted on 10/3/16 on chemical fallow durum stubble. Harvested on 8/4/17.

Fertilizer, actual lbs/ac: 11-22-0 with seed at planting, 40-0-20 broadcast while planting. Spring top dressing took place on 3/27/17 with 96-0-0. For fertilizer rates a yield goal of 70 bu/ac was used.

Herbicide: Pre-plant sprayed with RT3 @ 16 oz/ac on 10/3/2016. Plots were sprayed on 6/13/17 with Axiel XL @ 16 oz/ac and Vendetta @ 2 pints per acre.

Conducted by MSU Western Triangle Ag. Research Center.

\*\* = Solid stem sawfly-resistant (solid stem score of 19 or higher). \* = Less preferred by sawfly (behavioral preference) in small plots. Conducted by MSU Western Triangle Ag. Research Center



Table 2. Five-year means, Winter Wheat varieties, Choteau area, Teton County.  
2012-2014, 2016, 2017.

Variety Or ID	**	5-Year Mean			
		Yield (bu/ac)	Test weight (lbs/bu)	Height (inch)	Protein (%)
Yellowstone		60.3	58.0	31.1	14.8
SY Clearstone 2CL		58.0	58.0	32.2	14.8
Northern (MT0978)		56.6	58.4	30.3	15.2
Judee	**	56.3	57.5	29.8	15.0
CDC Falcon		55.9	58.1	29.2	14.7
Decade		55.2	59.5	29.7	15.0
Bearpaw	**	54.6	59.2	29.4	14.8
Warhorse	**	54.2	58.4	29.1	14.8
WB-Quake	**	49.5	58.6	29.4	14.9
Mean		55.6	58.6	30.0	14.9

\*\* = Solid stem sawfly-resistant (solid stem score of 19 or higher).

Cooperator and Location: Inbody Farms, Teton County.

Conducted by MSU Western Triangle Ag. Research Center.



Table 3. Off-station Winter Wheat variety trial located north of Cut Bank, MT.  
Glacier County. Western Triangle Ag. Research Center. 2017.

Variety	Yield (bu/ac)	Test Wt (lb/bu)	Height (inch)	Protein (%)	Lodging (%)
Keldin	98.0	63.2	32.3	9.6	3.3
SY Monument	94.1	61.1	33.0	9.4	1.7
MT1465	91.5	62.4	32.0	9.6	1.7
MT1265	91.4	61.6	37.3	9.8	3.3
MT1444	90.5	62.1	37.0	9.7	0.0
Northern	87.3	61.7	35.3	10.0	6.7
MTS1588	86.7	63.2	30.0	10.0	0.0
MT1348	86.7	62.7	34.7	9.8	0.0
MT1488	86.0	62.8	34.3	10.6	1.7
SY Clearstone 2CL	85.4	60.9	37.7	10.1	0.0
Yellowstone	84.9	61.5	35.0	9.6	3.3
MTW1491	84.3	62.4	35.0	9.7	3.3
MTF1432	82.8	60.5	39.0	9.3	1.7
SY Wolf	82.4	64.4	31.7	10.5	0.0
CDC Falcon	82.0	62.5	32.3	9.8	0.0
Loma	80.9	62.1	33.0	9.7	1.7
Judee	79.9	63.8	33.7	10.1	1.7
MT1471	79.9	62.9	33.0	10.6	3.3
Warhorse	79.7	62.5	34.7	10.4	0.0
Brawl CLP	79.7	63.9	30.3	10.8	3.3
MTF1435	78.6	61.3	43.3	9.9	1.7
Decade	78.2	62.7	33.7	10.1	3.3
MTS1573	77.1	63.4	32.7	10.6	0.0
Bearpaw	75.0	63.0	33.0	10.1	0.0
WB-Quake	74.5	62.8	34.0	9.9	0.0
Mean	83.9	62.4	34.3	10.0	1.7
LSD (.05)	8.0	1.1	2.0	0.7	NS
C.V. (%)	5.3	1.0	3.5	3.9	160
P-Value	<0.0001	<0.0001	<0.0001	0.0018	0.2529

Cooperator and Location: Bradley Farms, northern Glacier County.

Planted on 9/30/2016 on chem-fallow. Harvested on 8/18/2017.

Fertilizer, actual lbs/ac: 11-22.5-0 with seed at planting, topdressed with 100-0-20 on 3/28/2017. For fertilizer rates a yield goal of 70 bu/ac was used.

Herbicide: Sprayed with Discover NG @ 16 oz/ac and Axial XL at 16.4 oz/ac on 5/2/2017.

\*\* = Solid stem sawfly-resistant (solid stem score of 19 or higher). \* = Less preferred by sawfly (behavioral preference) in small plots.

Conducted by MSU Western Triangle Ag. Research Center.



Table 4. Four-year means, Winter Wheat varieties, Cut Bank area, northern Glacier County. 2014-2017.

Variety Or ID	**	4-Year Mean			
		Yield (bu/ac)	Test weight (lbs/bu)	Height (in)	Protein (%)
SY Wolf		76.2	59.9	31.1	12.7
Yellowstone		74.2	58.6	32.8	12.9
Northern (MT0978)		73.2	59.1	31.9	12.7
Loma		72.1	59.0	29.7	12.4
CDC Falcon		69.9	57.6	30.1	12.7
SY Clearstone CL2		69.3	58.4	33.5	13.1
Decade		68.0	58.6	30.7	12.6
Bearpaw	**	67.2	58.0	30.9	12.8
Judee	**	69.7	59.9	30.5	12.6
WB-Quake	**	61.9	59.1	31.4	12.5
Warhorse	**	60.7	58.9	30.5	12.6
Mean		69.1	58.8	31.1	12.7

\*\* = Solid stem sawfly-resistant (solid stem score of 19 or higher).

Cooperator and Location: Bradley Farms, Glacier County.

Conducted by MSU Western Triangle Ag. Research Center.



Table 5. Off-station Winter Wheat variety trial located near the Devon. Toole County.  
Western Triangle Ag. Research Center. 2017.

Variety	Yield (bu/ac)	Test Wt (lb/bu)	Height (inch)	Lodging (%)	Protein (%)
MTW1491	75.2	61.5	26.6	23	12.7
MT1348	72.9	60.9	24.9	18	12.7
MT1265	70.4	60.2	28.9	28	12.6
SY Monument	69.4	59.5	24.9	15	12.5
Loma	67.7	61.4	23.8	13	12.8
MTS1588	67.7	61.6	24.9	0	12.5
SY Clearstone 2CL	67.6	60.3	28.9	26	12.5
MT1444	67.5	61.3	24.0	27	12.6
CDC Falcon	66.6	60.6	23.5	20	13.0
Yellowstone	66.5	60.7	26.2	13	13.0
Keldin	65.5	61.1	24.2	26	12.9
MTF1432	65.3	58.7	28.9	38	12.9
MT1488	65.1	61.8	23.8	24	12.4
SY Wolf	65.0	62.9	23.5	38	12.4
Northern	64.7	60.9	25.8	24	13.4
MT1465	64.3	61.7	24.1	43	12.8
MTS1573	64.2	62.0	23.9	10	12.6
Brawl CLP	63.9	63.3	23.8	26	13.2
Bearpaw	63.2	61.8	22.0	11	12.9
Decade	62.5	60.6	24.5	14	12.6
Judee	62.4	61.3	25.7	6	12.8
WB-Quake	62.1	61.4	27.0	7	13.1
Warhorse	61.8	61.4	23.7	6	13.3
MTF1435	59.8	60.4	30.7	28	12.8
MT1471	58.4	60.8	25.4	30	13.7
Mean	65.6	61.1	25.3	20.6	12.8
LSD (.05)	NS	0.9	2.5	16.8	NS
C.V. (%)	9.6	0.8	5.5	45.3	4.3
P-Value	0.5007	<0.0001	<0.0001	0.0003	0.5443

Cooperator and Location: Brian Akelstad, Toole County.

Planted on 9/28/16 on chem-fallow. Harvested on 8/2/2017.

Fertilizer, actual lbs/ac: 11-22-0 with seed at planting, 30-0-20 broadcast while planting. Spring topdressing took place on 3/28/17 with 77-0-0. For fertilizer rates a yield goal of 70 bu/ac was used.

Herbicide: Pre-plant sprayed with and RT3 @ 16 oz/ac on 9/28/2016. Sprayed with Huskie @ 11 oz/ac and Axial XL @ 16.4 oz/ac on 5/1/17.

\*\* = Solid stem sawfly-resistant (solid stem score of 19 or higher). \* = Less preferred by sawfly (behavioral preference) in small plots.

Conducted by MSU Western Triangle Ag. Research Center.



Table 6. Five-year means, Winter Wheat varieties, Devon area, Toole County, MT.  
2012-2014, 2016 and 2017.

Variety Or ID	**	5-Year Mean			
		Yield (bu/ac)	Test weight (lbs/bu)	Height (inch)	Protein (%)
Northern (MT0978)		66.8	60.4	26.8	12.3
Yellowstone		66.8	60.0	28.9	12.2
Decade		65.0	61.0	27.6	12.2
CDC Falcon		63.0	59.9	25.9	12.4
SY Clearstone 2CL		62.9	59.9	29.4	12.0
Bearpaw	**	61.5	60.4	25.6	12.8
WB-Quake	**	61.3	60.4	27.4	12.3
Warhorse	**	59.3	60.6	26.6	12.6
Judee	**	59.0	60.8	26.4	12.9
Mean		62.8	60.4	27.2	12.4

\*\* = Solid stem sawfly-resistant (solid stem score of 19 or higher).

Cooperator and Location: Aklestad farms, Toole County.

Conducted by MSU Western Triangle Ag. Research Center.



Table 7. Off-station Winter Wheat variety trial located near the Knees. Chouteau County. Western Triangle Ag. Research Center. 2017.

Variety or ID	Yield (bu/ac)	Test Wt. (lb/bu)	Height (inch)	Lodging (%)	Protein (%)
Brawl CLP	90.2	64.1	29.5	19.4	11.5
SY Monument	90.0	59.8	27.5	43.7	11.4
Keldin	89.9	61.9	29.3	53.4	11.8
Loma	88.2	60.9	28.8	25.8	11.9
MTS1573	86.1	62.8	28.5	37.2	12.1
MTW1491	85.6	60.4	30.0	23.0	11.9
SY Wolf	85.3	63.2	27.6	37.2	12.2
Yellowstone	84.9	60.7	28.9	33.8	11.9
MT1265	82.9	59.6	31.5	45.3	12.3
MT1348	82.3	60.1	28.0	54.8	12.4
MTS1588	82.1	62.0	26.4	8.5	12.4
MT1444	81.4	60.2	29.9	34.4	12.1
SY Clearstone 2CL	80.3	60.1	31.9	40.0	11.9
MTF1432	80.2	58.8	34.8	28.8	12.1
Northern	79.9	60.4	29.0	38.9	12.5
MT1471	78.5	61.2	29.5	66.0	12.8
Warhorse	77.1	61.0	26.4	28.9	12.6
MT1465	76.2	60.8	27.4	59.3	12.1
Bearpaw	75.5	61.3	27.1	43.9	12.6
MTF1435	74.7	59.7	35.1	27.5	12.4
Judee	72.9	61.9	29.2	41.7	12.4
CDC Falcon	71.8	60.6	27.1	36.5	12.5
Decade	71.6	61.3	27.7	29.0	12.6
MT1488	70.3	60.1	29.5	19.7	11.8
WB-Quake	65.0	62.1	27.6	43.7	12.5
Mean	80.1	61.0	29.1	36.8	12.2
LSD (.05)	10.7	0.8	1.8	1.3	0.5
C.V. (%)	7.6	0.8	3.5	31.4	2.3
P-Value	0.0004	<0.0001	<0.0001	0.0003	<0.0001

Cooperator and Location: Aaron Killion, western Choteau County.

Planted on 9/29/16 on chem-fallow. Harvested on 7/29/17.

Fertilizer, actual lbs/ac: 11-22-0 with seed at planting, 30-0-20 broadcast while planting, spring fertilized 3/27/17 For fertilizer rates a yield goal of 70 bu/ac was used. Needs at 77.5 for Nitrogen. 22.5 lbs/ac of Phosphorus, 20 lbs/ac of Potassium

Herbicide: Pre-plant sprayed with Olympus @ 0.6 oz/ac and RT3 @ 16 oz/ac on 9/29/2016. The plots were sprayed on 5/12/17 with Huskie @ 11 oz/ac and Discover NG @ 16 oz/ac

Conducted by MSU Western Triangle Ag. Research Center.



Table 7. Five-year means, Winter Wheat varieties, Knees area, Chouteau County, MT. 2013  
2017.

Variety Or ID	**	5-Year Mean			
		Yield (bu/ac)	Test weight (lbs/bu)	Height (inch)	Protein (%)
SY Clearstone 2CL		78.3	59.6	32.5	12.4
Yellowstone		77.8	59.8	30.4	12.2
Northern (MT0978)		74.9	60.0	29.7	12.6
Judee	**	73.9	61.7	29.2	12.9
Decade		70.3	60.8	29.1	12.7
Warhorse	**	68.5	60.6	28.1	12.7
CDC Falcon		65.8	60.1	26.9	12.9
WB-Quake	**	63.2	60.8	28.5	12.9
Bearpaw	**	60.3	60.1	27.8	12.8
Mean		70.4	60.4	29.1	12.7

\*\* = Solid stem sawfly-resistant (solid stem score of 19 or higher).  
Conducted by MSU Western Triangle Ag. Research Center.



Table 9. Soil test values for off-station and on-station plots, 2017.

Location	N (lbs/ac) <sup>1</sup>	Olsen-P (ppm)	K (ppm)	pH	OM (%)	EC (mmhos/cm)
Cut Bank	39.6	17	385	7.5	2.7	0.39
Devon	12.0	14	221	7.2	0.8	0.15
Knees	21.1	28	482	6.9	2.4	0.55
Choteau	44.5	7	412	8.1	2.3	0.82
WTARC Fall	15.5	20	318	7.8	2.6	0.56
WTARC Spring	15.9	30	528	7.4	2.6	0.36
Sweetgrass Hills	3.5	27	336	6.7	2.5	0.23

<sup>1</sup>Nitrogen soil samples were to a depth of four feet in one foot increments. All other soil tests were for zero to six inches in depth.

WTARC- Western Triangle Ag. Research Center

