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

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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 spring 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 spring wheat varieties.

Methods: Off station spring wheat nurseries consist of 20 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. Spring 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. The Irrigated off-station spring wheat nursery was mowed out by a well intentioned farmhand. 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 where 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. 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 spring wheat plots were seeded into soil that had good soil moisture storage from the summer and fall of 2016. Overall, considering the lack of moisture and heat this past summer, the spring wheat did quite well.

Top yielding varieties at Choteau were Duclair, Vida, and Montana State University line MT 1525. The yields of the top three varieties at Choteau were 52.7, 52.5, and 50.7 bu/ac, respectively (Table 1). Reeder was again the top yielder at Devon with WB Gunnison and Duclair the other high yielding varieties at, 41.7, 37.7, and 37.0 bu/ac (Table 5). The 'Knees' high yielders at 44.3, 44.3, and 43.0 bu/ac, were Duclair, Montana State University line MT 1525, and LCS Pro (Table 7). The best yielding varieties, at the Cut Bank location were Vida, Reeder, and Montana State University line MT 1525 (Table 3) Yields at Cut Bank were 60.8, 55.9, and 54.7 bu/ac (Table 3).

At Devon the 2017 yield was about the same as the five year average; with slightly higher grain protein and a half pound lower test weight (Tables 5 and 6). The 'Knees' location had higher yields by about 2 bu/ac, 1% higher grain protein and 2 lb/bu higher test weight when compared to the five year mean (Tables 7 and 8). When compared to the five year averages, yields at Cut Bank ranged from 53.4 to 37.7 bu/ac, with average protein for the year, with slightly higher test weights (Tables 3 and 4). When comparing the five year means at Choteau the yields were 3.7 bushels higher, seed protein was about one half percent lower and the test weights were about 2 lbs/bu lower. Spring wheat at Choteau had lodging in all varieties, with some being much worse than others. With the exception of Devon, there was some lodging at the other off station sites.

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 are unique to the western triangle area. No insect incidence or damage was noticed in any of the varieties.

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 FY2016 Grant Submission Plans: A similar project will be proposed for FY 2016. The continuation of on and off-station variety trials help to elucidate researchers and farmers which varieties are better suited for that particular region in Montana.

Table 1. Off-station spring wheat variety trial located north of Choteau, MT. Teton County. Western Triangle Ag. Research Center. 2017.

Variety	Class	Yield[1] (bu/ac)	Test Wt[1] (lb/bu)	Height (inch)	Lodging (%)	Protein (%)
Duclair	**	52.7	54.4	27.7	23.3	15.3
Vida	*	52.5	56.8	27.3	40.0	14.0
MT 1525	-	50.7	58.1	27.0	20.0	14.8
Alum	-	50.3	57.3	26.3	60.0	14.0
WB Gunnison	*	50.2	56.3	24.3	8.3	14.2
MT 1543	-	50.0	55.1	26.0	23.3	14.6
WB9879CLP	CL	49.1	54.9	27.0	11.7	15.6
NS Presser 2 CL+	CL	48.2	55.4	26.0	53.3	14.3
Fortuna	**	48.0	57.2	33.7	40.0	15.0
LCS Pro	-	47.7	55.9	29.0	76.7	14.7
Choteau	-	46.9	56.1	27.0	30.0	15.2
MT 1570	-	46.3	55.1	27.0	16.7	14.9
Lanning (MT 1316)	-	46.1	55.1	27.0	91.0	15.6
Corbin	-	46.1	55.2	25.0	40.0	15.4
SY Soren	-	43.0	56.1	22.3	68.3	15.2
Egan	-	43.0	55.1	25.7	87.7	15.4
Brennan	-	42.1	56.9	25.3	63.3	15.2
SY Ingmar	-	41.9	55.9	26.3	65.0	15.6
Reeder	-	40.4	55.0	25.3	86.0	15.7
ONeal	-	37.7	55.3	26.3	43.3	15.9
Mean		46.6	55.7	26.6	47.4	15.0
LSD (.05)		NS	NS	3.1	26.3	NS
C.V. 1 (%) (S/mean)*100		10.5	2.5	7.0	33.5	5.3
P-Value		0.0227	0.1710	<0.0001	<0.0000	0.1079

Cooperator and Location: Inbody Farms, Teton County.
Planted on 5/5/17 on chemical fallow. Harvested on 8/29/17.
Fertilizer: actual pounds/ac of N-P-K: 11-22-0 applied with seed and 0-0-20 was applied through the opener while seeding. Fertilizer rates are based on a yield goal of 50 bu/ac.
Herbicide: The plots were sprayed with Roundup RT3 at 40 oz/ac and Sharpen at 1 oz/ac on 5/6/17
** = Solid stem sawfly-resistant (solid stem score of 19 or higher).
* = Less preferred by sawfly (behavioral preference) in small plots.
CL = Clearfield
[1] Yield and test weight are adjusted to 13% seed moisture.
Conducted by MSU Western Triangle Ag. Research Center.

Table 2. Five-year means, Spring Wheat varieties, Inbody, Teton County. 2013-2017.

Variety or ID	5-Year Mean			
	Yield (bu/ac)	Test weight (lbs/bu)	Height (inch)	Protein (%)
Duclair	46.7	56.1	28.1	15.4
Vida	45.1	57.4	26.9	15.1
WB9879CLP	44.7	56.8	26.8	15.4
WB Gunnison	44.6	58.2	26.8	14.7
Corbin	44.1	57.8	27.1	15.7
Egan	43.5	56.9	26.5	16.4
Choteau	42.6	56.9	26.9	15.7
ONeal	42.0	57.1	28.1	15.9
Brennan	41.9	59.3	25.3	15.5
Reeder	41.4	57.8	27.1	15.7
SY Soren	40.3	58.8	24.8	15.6
Fortuna	37.8	58.6	33.7	15.5
Mean	42.9	57.6	27.4	15.6

Cooperator and Location: Inbody Farms, Teton County.
Conducted by MSU Western Triangle Ag. Research Center.

Table 3. Off-station spring wheat variety trial located at the Cut Bank, MT. Glacier County. Western Triangle Ag. Research Center. 2017.

Variety	Class	Yield (bu/ac[1)])	Test Wt (lb/bu[1)])	Height (inch)	Lodging (%)	Protein (%)
Vida	*	60.8	58.8	32.7	3.3	13.0
Reeder	-	55.9	58.8	32.3	1.7	14.8
MT 1525	-	54.7	61.5	28.7	0	13.9
Duclair	**	52.3	56.6	30.3	1.7	13.7
Lanning (MT 1316)	-	52.1	58.0	30.0	1.7	14.9
Choteau	**	51.8	58.7	30.3	3.3	14.1
ONeal	*	51.4	58.4	30.1	0	13.8
Brennan	-	49.4	60.8	28.0	0	14.1
SY Soren	-	49.0	57.9	28.3	0	15.0
Alum	-	48.4	58.8	30.1	0	13.4
Corbin	*	48.4	57.9	31.7	5	13.5
NS Presser	-	47.8	56.3	32.0	1.7	14.2
SY Ingmar	-	47.2	58.3	28.3	3.3	15.8
WB Gunnison	*	46.6	57.4	27.3	3.3	13.9
WB 9879 CLP	CL	44.7	57.9	28.7	1.7	15.1
Egan	-	44.3	56.9	28.3	0	15.7
MT 1570	-	41.9	58.7	27.3	3.3	15.1
LCS Pro	-	41.4	57.1	34.3	6.7	15.2
MT 1543	-	40.2	56.9	27.7	3.3	15.1
Fortuna	*	36.2	58.9	39.0	5	14.7
Mean		48.2	58.2	30.3	2.3	14.4
LSD (.05)		9.32	2.1	2.3	NS	1.3
C.V. 1 (%) (S/mean)*100		11.7	2.2	4.5	112.3	5.4
P-Value		<0.0012	<0.0013	<0.0000	0.0565	<0.0013

Cooperator and Location: Bradley Farms, Glacier County.
Planted on 5/9/17 on chemical fallow. Harvested on 8/6/17.
Fertilizer: actual pounds/ac of N-P-K: 11-22.5-0 applied with seed and 11-0-20 was applied through the double shoot openers while seeding. Fertilizer rates are based on a yield goal of 50 bu/ac.
Herbicide: The plots were sprayed with Roundup RT3 at 32 oz/ac and Sharpen at 1 oz/ac on 5/8/17.
** = Solid stem sawfly-resistant (solid stem score of 19 or higher).
* = Less preferred by sawfly (behavioral preference) in small plots. CL = Clearfield
[1] Yield and test weight are adjusted to 13% seed moisture.
Conducted by MSU Western Triangle Ag. Research Center.

Table 4. Five-year means, Spring Wheat varieties, Cut Bank, Glacier County. 2011-2016.

Variety or ID	5-Year Mean			
	Yield (bu/ac)	Test weight (lbs/bu)	Height (inch)	Protein (%)
Duclair	53.4	57.0	34.1	14.2
Vida	50.8	57.6	36.3	13.6
WB Gunnison	50.6	57.8	32.5	13.3
Choteau	49.1	56.9	33.5	14.4
Reeder	49.1	57.7	35.6	14.8
Corbin	47.8	58.5	33.1	14.0
Brennan	47.4	59.4	31.9	14.7
WB 9879 CL	46.8	56.7	32.3	14.8
Egan	44.7	57.1	31.3	15.9
Oneal	42.9	55.7	34.2	14.5
SY Soren	42.5	56.8	32.6	14.2
Fortuna	37.7	57.9	35.5	14.5
Mean	46.9	57.5	33.6	14.4

Table 5. Off-station spring wheat variety trial located north of Devon, MT. Toole County. Western Triangle Ag. Research Center. 2017.

Variety	Class	Yield[1] (bu/ac)	Test Wt[1] (lb/bu)	Height (inch)	Protein (%)
Reeder	-	41.7	58.2	24.0	15.3
WB Gunnison	*	37.7	58.1	24.3	13.8
Duclair	**	37.0	57.1	23.3	13.8
NS Presser CLP	CL	36.5	57.8	24.7	14.7
Vida	*	36.4	57.7	24.0	14.6
Alum	-	35.3	59.0	23	13.9
ONeal	*	34.7	57.8	24.0	15.2
MT 1543	-	34.4	57.3	23.3	14.9
Corbin	*	34.0	57.6	24.3	14.8
Lanning(MT 1316)	-	33.3	58.0	23.3	15.8
SY Soren	-	32.8	58.7	23.7	16.0
WB9879CLP	CL	32.0	58.4	22.3	15.4
Choteau	**	30.7	57.3	22.3	15.6
Brennan	-	30.4	59.0	22.0	15.5
LCS Pro	-	30.4	58.7	23.3	15.1
Egan	-	29.4	55.9	24	17.2
MT 1570	-	28.9	58.9	22.0	15.1
MT 1525	-	28.8	60.2	22.7	14.6
Fortuna	**	28.2	57.2	27.7	14.6
SY Ingmar	-	25.2	58.3	23.3	15.6
Mean		32.9	58.1	23.6	15.1
LSD (.05)		5.9	1.2	1.6	0.8
C.V. 1 (%) (S/mean)*100		10.8	1.2	4.2	3.1
P-Value		<0.0003	<0.0000	<0.0000	<0.0000

Cooperator and Location: Brian Aklestad, Toole County.
Planted on 5/8/17 on chemical fallow. Harvested on 8/22/17
Fertilizer: actual pounds/ac of N-P-K: 11-22.5-0 applied with seed and 11-0-20 was applied through the double shoot openers while seeding. Fertilizer rates are based on a yield goal of 50 bu/ac.
Herbicide: The plots were sprayed with Roundup RT3 at 32 oz/ac and Sharpen at 1 oz/ac on 5/4/17.
** = Solid stem sawfly-resistant (solid stem score of 19 or higher).
* = Less preferred by sawfly (behavioral preference) in small plots. CL = Clearfield
[1] Yield and test weight are adjusted to 13% seed moisture.
Conducted by MSU Western Triangle Ag. Research Center.

Table 6. Five-year means, Spring Wheat varieties, Devon, Toole County. 2013-2017.

Variety or ID	5-Year Mean			
	Yield (bu/ac)	Test weight (lbs/bu)	Height (inch)	Protein (%)
Reeder	35.8	59.4	25.2	14.4
Vida	34.8	58.5	24.5	14.0
Duclair	34.7	57.7	24.0	14.3
WB Gunnison	33.9	58.9	23.9	13.6
WB9879CLP	33.5	58.5	22.3	15.4
Egan	31.8	57.1	24.6	15.9
SY Soren	31.8	59.0	22.7	15.2
Brennan	30.8	59.7	22.2	15.3
Oneal	30.6	59.4	23.9	14.5
Choteau	30.5	58.1	23.0	14.9
Corbin	29.8	58.8	24.1	14.5
Fortuna	28.0	58.2	27.6	14.7
Mean	32.2	58.6	24.0	14.7

Table 7. Off-station spring wheat variety trial located at the Knees area, Chouteau County. Western Triangle Ag. Research Center. 2017.

Variety	Class	Yield[1] (bu/ac)	Test Wt[1] (lb/bu)	Height (inch)	Lodging (%)	Protein (%)
Duclair	**	44.3	58.6	24.7	0.0	14.6
MT 1525	-	44.3	61.1	25.0	0.0	15.3
LCS Pro	-	43.0	58.2	28.7	3.7	14.9
WB Gunnison	*	42.0	57.9	25.3	0.0	14.0
MT 1543	-	42.0	56.7	25.3	0.3	15.1
Lanning (MT 1316)	*	41.4	57.4	26.3	3.0	15.9
NS Presser 2 CLP	CL	41.4	57.8	26.7	1.7	14.5
WB9879CLP	CL	41.1	57.7	24.0	0.0	15.2
MT 1570	-	40.8	58.3	24.3	0.7	15.2
Vida	*	38.6	58.9	24.3	1	14.2
ONeal	*	37.9	58.8	27.0	0.7	14.9
Alum	-	37.2	60.4	25.7	0.7	14.4
Egan	-	37.1	56.1	25.3	4.7	16.6
SY Ingmar	-	36.8	57.8	23.0	1.3	15.5
Reeder	-	36.0	58.2	25.7	1.0	15.6
Corbin	*	35.9	58.8	26.0	0.3	15.0
Fortuna	-	34.4	58.3	30.7	0.7	15.5
Choteau	**	34.3	58.0	23.7	0.0	15.8
SY Soren	-	34.1	58.3	24.0	1.3	15.8
Brennan	-	32.8	59.2	25.7	0.7	15.9
Mean		38.8	58.3	25.6	.8	15.9
LSD (.05)		7.4	2.0	2.3	1.3	0.7
C.V. 1 (%) (S/mean)*100		9.4	1.7	5.5	75.9	2.2
P-Value		0.0024	<0.0003	<0.0000	<0.0000	<0.0000

Cooperator and Location: Aaron Killion, Chouteau County.
Planted on 5/5/2017 on chemical fallow. Harvested on 8/17/2017
Fertilizer: actual pounds/ac of N-P-K: 11-22-0 applied with seed and 26-0-20 was applied through the double shoot openers while seeding. Fertilizer rates are based on a yield goal of 50 bu/ac.
Herbicide: The plots were sprayed with Roundup RT3 at 32oz/ac and Sharpen at 1 oz/ac on 5/6/17
** = Solid stem sawfly-resistant (solid stem score of 19 or higher). * = Less preferred by sawfly (behavioral preference) in small plots. CL = Clearfield
[1] Yield and test weight are adjusted to 13% seed moisture.
Conducted by MSU Western Triangle Ag. Research Center.

Table 8. Five-year means, Spring Wheat varieties, Knees area, Chouteau County. 2011-2017.

Variety or ID	5-Year Mean			
	Yield (bu/ac[1])	Test weight (lbs/bu)	Height (inch)	Protein (%)
Duclair	42.9	56.2	24.9	14.4
Vida	39.6	56.1	25.7	14.5
WB Gunnison	39.1	57.9	25.3	14.2
Choteau	38.3	56.6	24.1	14.8
Reeder	37.9	57.5	25.9	14.9
Egan	37.9	55.9	24.8	16.4
WB 9879 CL	36.9	56.2	25.1	13.8
Corbin	35.4	57.2	25.6	14.5
Brennan	35.3	57.5	24.3	15.9
SY Soren	34.6	56.5	23.8	15.7
Oneal	32.6	56.4	26.2	14.2
Fortuna	30.7	57.5	29.7	15.8
Mean	36.8	56.8	25.5	14.9

Cooperator and Location: Aaron Killion, Chouteau County.
[1]Yields were affected by stripe and tan rust for the 2016 crop year. All varieties had some level of infection.
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)[1]	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

[1]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