

Title: Spring wheat variety evaluations with a special reference to insect infestations in the Western Triangle Region

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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. Also, monitor the insect pest incidence on various spring wheat varieties so that it will help to develop insect control strategies. 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 plot combine. Spring wheat seed was cleaned prior to collecting data. The insect monitoring activity was initiated in all the entries. The plant samples were collected randomly and brought to the laboratory. The wheat stems were cut and noticed for the diapausing stages of the larvae of the wheat stem sawfly. Orange wheat blossom midge pheromone traps were also installed at each off station plot.

Results: Results are tabulated in Tables 1 thru 10. Results are tabulated in Table 1 for the irrigated off-station spring wheat nursery and Table 2 is six year averages for selected varieties in the irrigated off-station spring wheat nursery. Table 3 is for the Choteau location, with multi-year data presented in Table 4. Tables 7 and 8 are for the Devon location, with Table 9 and 10 representing the 'Knees' location. The Cut Bank location sustained a hailstorm affecting the yield and protein data (Tables 5 and 6). Soil test values are presented in Table 11.

Overall, the crop year was a little over 3 degrees cooler than the 28 year average at the research center with a little over an inch more moisture than the 28 year average. The winter, with the exception of January was cooler than usual. February was quite cold when compared to the 28 year average. The spring was quite cool with April being slightly cooler and wetter than the average.

Soil temperatures at the station under chemical fallow stubble stayed under 40 degrees at a depth of eight inches until mid April. May was cool and dry. Early in June we received 0.9 inches, then it warmed up and remained dry for about 10 days. At that time the winter wheat was running out of water as it was beginning to head. About that time we started getting significant rain for a five day span. The cool temps associated with the rain slowed the spring wheat growth.

Just as things were getting mature or close to mature the rain in August came at a very poor time. To further exacerbate the harvest situation we received snow on September 10th and 11th.

Top yielding varieties at Choteau were two Montana State University lines, MT1172, MT1203, and WB Gunnison with protein averaging 14.7% across all varieties (Tables 3 and 4). The top three yielding varieties at Choteau were 50.1, 49.7, and 49.7 bu/ac, respectively. MT1172, Vida, and Reeder were the high yielding varieties at Devon, 47.6, 45.7, and 44.2 bu/ac, while averaging 14.6% protein across all varieties (Tables 7 and 8). The 'Knees' high yielders at 58.7, 53.7, and 52.3 bu/ac, were Mott, MT1172, and WB Gunnison with 15.4% protein across all varieties (Tables 9 and 10). The best yielding varieties, after the hail storm at the Cut Bank location were Duclair, WB Gunnison, and Vida with 15.9% protein across all varieties. Yields for Duclair, WB Gunnison, and Vida at Cut Bank were 44.3, 43.7, and 39.8 bu/ac. The top yielders in the irrigated trial were Volt, MT1103, and Duclair, at 117.8, 114.0, and 111.4 bu/ac, with protein averaging 13.2 percent.

Yields in the irrigated off-station spring wheat trial ranged from 78.9 to 117.8 bu/ac. When compared to the five year averages, the irrigated off-station spring wheat nursery had much higher yields, with average test weight, and with similar grain protein (Tables 1 and 2). At Devon the 2014 yield was up 3.8 bu/ac from the four year average; with similar grain protein and slightly higher test weight (Tables 7 and 8). The 'Knees' location had lower yields, higher grain protein and lower test weight when compared to the four year mean (Tables 9 and 10). Yields at Cut Bank ranged from 26.1 to 44.3 bu/ac, with 15.9% seed protein across all varieties, with low test weights (Tables 5 and 6).

No insect incidence (wheat stem sawfly or wireworms) was noticed in any of the spring wheat varieties. This is because of the high number of parasitoids of the wheat stem sawfly are present Devon area. None of the traps got any adults of orange wheat blossom midge 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. 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 probably 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 Irrigated Spring Wheat variety trial located at WTARC, Pondera County. 2014.

Variety	Class	Yield bu/ac	Test Wt lb/bu	Height in.	Head Date	Protein %
Volt	-	117.8	63.6	32.3	184.7	13.1
MT1103	-	114.0	63.2	32.3	187.0	12.5
Duclair	**	111.4	61.4	31.7	186.0	13.0
SY Tyra	*	107.8	62.5	31.0	185.0	12.1
MT1172	-	107.6	61.5	31.3	187.7	13.0
Vida	*	107.0	62.0	34.0	186.3	13.3
MT1236	-	104.3	61.2	33.0	186.3	13.7
WB9879CL	**CL	103.5	62.0	35.0	185.0	13.5
WB Gunnison	*	103.2	63.0	32.0	187.3	12.8
McNeal	-	100.9	62.1	33.7	184.0	13.2
Corbin	*	99.5	62.3	32.0	186.0	13.3
MT1203	-	98.1	61.7	33.0	185.3	13.7
Choteau	**	97.6	61.5	30.3	185.0	13.1
Brennan	-	97.5	62.6	29.7	185.7	13.9
Reeder	-	96.8	62.7	34.3	185.3	13.1
Egan	-	95.7	61.7	32.7	186.3	14.5
ONeal	*	91.5	62.1	32.7	186.7	12.6
Mott	-	86.6	61.2	36.0	184.0	12.9
Fortuna	**	85.4	62.4	39.7	184.0	14.2
Jedd	CL	78.9	60.9	28.0	185.3	12.3
Mean		100.2	62.1	32.7	185.7	13.2
LSD (.05)		10.1	1.0	5.1	2.6	
C.V. 1 (%) (S/mean)*100		6.1	0.9	9.4	0.8	
P-Value		<0.0001	<0.0001	<0.0477	0.1697	

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL= Clearfield

Cooperator and Location: WTARC, Pondera County.

Planted May 1, 2014 on chemical fallow barley stubble. Harvested September 6, 2011.

Fertilizer: actual pounds/ac of N-P-K: 11-22-0 applied with seed and a 240-0-20 blend of urea and potash was broad cast at planting. Fertilizer rates are based on a yield goal of 80 bu/ac.

Herbicide: The plot area was pre-plant sprayed with 20 oz/ac RT3 5/1/2014. The plots were sprayed with Huskie at 11 oz/ac and Axial XL at 16.4 oz/ac on 6/10/2014.

Irrigation: 4.0 inches

Precipitation during growing season: 8.35 in.

Table 2. Five year means, Irrigated Spring Wheat Varieties, Conrad, MT. 2010 – 2014.

Variety	Class	Yield bu/ac	Test Wt lb/bu	Head date	Height in.	Protein %
Duclair	**	96.6	61.5	186.7	32.1	13.6
SY Tyra	*	90.1	62.4	188.5	30.6	12.7
Volt	-	90.0	63.6	189.4	32.1	13.1
WB Gunnison	*	88.7	62.4	188.7	32.1	13.4
WB9879CL	**CL	88.4	61.4	188.1	33.9	13.8
Choteau	**	85.9	61.6	188.1	31.1	13.9
Corbin	*	82.0	62.5	187.6	33.4	13.5
O Neal	*	82.0	62.4	188.5	34.4	12.8
Vida	*	79.7	61.5	188.4	33.5	13.4
McNeal	-	78.8	61.8	188.3	33.7	13.3
Jedd	CL	76.6	61.5	187.4	27.6	12.7
Reeder	-	75.4	62.5	188.3	33.6	13.6
Fortuna	**	69.7	62.0	187.9	39.6	14.1
Means		83.0	62.1	188.1	32.8	13.3

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL= Clearfield

Table 3. Off-station Spring Wheat variety trial located northeast of Choteau, MT. Teton County. 2014.

Variety	Source	Class	Yield bu/ac	Test Wt lb/bu	Height in.	Protein %
MT1172		-	50.1	54.4	30.0	14.2
MT1203		-	49.7	55.2	29.7	15.0
WB Gunnison	WestBred	*	49.7	57.1	32.0	13.1
Brennan		-	49.0	57.5	27.0	14.5
Vida	MSU	*	47.9	55.1	30.0	14.3
Duclair	MSU	**	47.6	54.0	30.3	14.2
Volt	WestBred	-	46.6	58.7	28.0	14.1
McNeal	MSU	-	45.5	55.4	31.3	15.1
MT1103		-	44.9	53.5	29.0	13.8
Egan		-	44.9	54.7	27.7	16.4
WB9879CL		**CL	44.1	54.3	29.0	14.7
Corbin	WestBred	*	43.9	55.5	30.3	15.0
Mott	N.Dak	-	43.5	55.6	32.7	14.8
SY Tyra	Syngenta	*	42.5	56.0	26.0	13.2
Reeder	N.Dak	-	42.5	55.8	30.7	15.1
ONeal	WestBred	*	41.7	56.9	29.7	15.3
Fortuna	N.Dak	**	40.8	57.4	37.0	14.2
Choteau	MSU	**	40.1	53.5	28.0	15.1
Jedd	WestBred	CL2	39.6	54.1	24.7	15.1
MT1236		-	39.0	50.3	28.7	16.0
Mean			44.7	55.3	29.6	14.7
LSD (.05)			6.5	2.1	3.1	
C.V. (%)			8.9	2.3	6.3	
P-Value			0.0121	<0.0001	<0.0001	

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL = Clearfield

Cooperator and Location: Inbody Farms, Teton County.

Planted May 6, 2014 on chemical fallow. Harvested September 6, 2014.

Fertilizer: actual pounds/ac of N-P-K: 11-22-0 applied with seed and a 100-0-20 blend of urea and potash was broadcast at planting. Fertilizer rates are based on a yield goal of 50 bu/ac.

Sprayed: none

Precipitation: N/A

Conducted by MSU Western Triangle Ag. Research Center.

Table 4. Three-year means, Spring Wheat varieties, Choteau area, Teton County. 2012 - 2014.

Variety	3-Year Mean				
	Class	Yield bu/ac	Test weight	Height in.	Protein %
WB Gunnison	*	43.1	58.0	28.1	14.8
Volt	-	42.9	60.2	27.7	15.0
McNeal	-	42.2	56.5	30.6	15.9
WB9879CL	**CL	41.3	56.9	27.7	15.5
ONeal	*	40.6	57.3	28.8	16.2
Duclair	**	40.2	56.0	29.7	15.5
Vida	*	40.1	57.0	27.5	15.3
Corbin	*	38.8	58.1	28.1	15.9
Choteau	**	38.2	56.5	26.8	15.7
Reeder	-	37.9	58.3	28.3	15.9
SY Tyra	*	37.3	57.1	24.7	14.7
Jedd	CL	36.7	56.8	24.1	15.7
Fortuna	**	36.6	59.2	35.1	15.2
Mean		39.5	57.6	28.3	15.5

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL = Clearfield

Table 5. Off-station spring wheat variety trial located north of Cut Bank, MT. Glacier county. Western Triangle Ag. Research Center. 2014.

Variety	Class	Yield bu/ac	Test Wt lb/bu	Height in.	Protein %
Duclair	**	44.3	56.1	30.3	15.5
WB Gunnison	*	43.7	55.3	26.7	14.6
Vida	*	39.8	55.2	27.0	15.4
Choteau	**	39.5	55.3	28.0	15.8
Volt	-	38.0	56.3	29.3	15.5
Corbin	*	37.4	56.7	28.3	14.9
MT1172	-	37.2	54.3	27.7	15.7
Brennan	-	37.1	57.3	25.3	15.8
MT1103	-	37.0	56.9	29.3	15.3
McNeal	-	35.2	55.7	28.0	16.8
WB9879CL	**CL	35.2	55.2	28.7	16.0
ONeal	*	33.7	55.5	28.7	16.1
MT1203	-	33.2	54.9	27.7	17.4
Jedd	CL	33.1	54.4	24.0	14.5
SY Tyra	*	32.2	56.0	24.5	15.1
Egan	-	31.5	55.4	26.7	17.9
MT1236	-	30.3	54.8	28.0	16.5
Reeder	-	30.2	54.4	28.7	16.5
Fortuna	**	28.5	55.7	35.7	15.5
Mott	-	26.1	56.1	32.0	16.9
Mean		35.1	55.6	28.3	15.9
LSD (.05)		ns	1.8	3.1	
C.V. 1 (%) (S/mean)*100		17.4	1.6	5.4	
P-Value		0.0691	0.0058	<0.0001	

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL = Clearfield

Cooperator and Location: Bradley Farms, northern Glacier County.

Planted May 22, 2014 on chemical fallow. Harvested September 18, 2014.

Fertilizer: actual pounds/ac of N-P-K: 11-22-0 applied with seed and a 75-0-20 blend of urea and potash was broadcast at planting. Fertilizer rates are based on a yield goal of 50 bu/ac.

Herbicide: The plots were sprayed with Huskie at 11 oz/ac and Axial XL at 16.4 oz/ac on 6/23/2014.

Conducted by MSU Western Triangle Ag. Research Center.

Table 6. Three-year averages, dryland Spring Wheat varieties, Cut Bank, MT. Glacier County. 2011, 2013-2014.

Variety	3-Year Average				
	Class	Yield bu/ac	Test Weight	Height in.	Protein %
Choteau	**	64.1	58.1	30.6	14.0
Volt	-	63.9	61.9	31.2	13.4
Corbin	*	60.7	60.1	31.2	13.4
Vida	*	59.3	58.4	31.4	13.8
Duclair	**	57.4	57.2	31.9	14.0
WB Gunnison	*	57.4	60.5	31.0	12.8
Reeder	-	56.1	59.0	33.0	14.2
ONeal	*	55.9	56.1	32.0	14.4
McNeal	-	53.4	57.4	31.6	13.6
WB9879CL	**CL	52.1	58.1	30.8	14.1
SY Tyra	*	48.0	57.6	28.3	13.0
Fortuna	**	48.0	60.7	38.4	13.8
Jedd	CL	47.8	55.4	26.9	13.5
Mean		55.7	58.5	31.5	13.6

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL = Clearfield System (2-gene).

Cooperator and Location: Bradley Farms, northern Glacier County.

Table 7. Off-station spring wheat variety trial located north of Devon, MT. Toole county. 2014.

Variety	Class	Yield bu/ac	Test Wt lb/bu	Height in.	Protein %
MT1172	-	47.6	59.7	25.0	14.0
Vida	*	45.7	59.8	25.0	14.0
Reeder	-	44.2	60.9	25.3	14.5
MT1103	-	43.1	58.7	23.3	14.6
Duclair	**	43.0	58.6	23.3	14.3
WB9879CL	**CL	42.7	59.1	23.3	14.7
Mott	-	42.5	60.0	25.3	14.8
MT1203	-	42.5	59.1	23.7	15.8
SY Tyra	*	42.1	61.3	22.0	13.9
Volt	-	41.9	61.5	24.3	13.6
Brennan	-	40.0	60.4	21.0	15.2
Corbin	*	39.8	59.9	24.3	14.3
McNeal	-	39.4	59.7	24.7	14.4
Choteau	**	39.4	59.1	22.7	14.6
WB Gunnison	*	39.3	60.4	20.7	13.9
MT1236	-	39.3	56.9	23.0	15.3
Egan	-	39.2	57.9	24.7	15.8
Oneal	*	37.4	60.9	22.3	14.0
Fortuna	**	34.1	59.5	28.3	15.4
Jedd	CL	32.9	60.4	20.3	14.0
Mean		40.8	59.7	23.6	14.6
LSD (.05)		4.5	1.2	2.5	
C.V.		6.7	1.2	6.4	
P-Value		<0.0001	<0.0001	<0.0001	

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL = Clearfield

Cooperator and Location: Brian Aklestad, northeast of Devon.

Planted May 21, 2014 on chemical fallow barley stubble. Harvested September 7, 2014.

Fertilizer: actual pounds/ac of N-P-K: 11-22-0 applied with seed and a 90-0-20 blend of urea and potash was broadcast at planting. Fertilizer rates are based on a yield goal of 35 bu/ac.

Herbicide: The plot area was pre-plant sprayed with 20 oz/ac RT3 on 5/21/2014. The plots were sprayed with Huskie at 11 oz/ac and Axial XL at 16.4 oz/ac on 6/16/2014.

Growing season precipitation: 3.8 inches

Conducted by MSU Western Triangle Ag. Research Center.

Table 8. Four-year means, Spring Wheat varieties, Devon area, Eastern Toole County. 2010-2012, 2014.

Variety	4-Year Mean				
	Class	Yield bu/ac	Test weight	Height in.	Protein %
Vida	*	41.2	58.4	26.3	13.6
WB Gunnison	*	39.6	58.6	24.9	14.6
Volt	-	39.3	61.0	25.5	14.0
Duclair	**	39.0	56.0	26.3	14.4
Reeder	-	37.6	58.5	26.9	14.7
ONeal	*	37.1	59.8	26.1	14.7
Fortuna	**	37.0	58.6	30.6	14.7
Corbin	*	36.4	58.6	26.2	14.7
Choteau	**	36.0	57.3	24.3	14.7
McNeal	-	35.8	57.9	26.9	15.0
SY Tyra	*	33.4	58.7	23.2	13.8
Jedd	CL	32.2	58.7	23.3	14.5
Mean		37.0	58.5	25.8	14.4

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL = Clearfield System (2-gene).

Table 9. Off-station spring wheat variety trial located near the Knees. Chouteau County. 2014.

Variety	Class	Yield bu/a	Test Wt lb/bu	Height in.	Protein %
Mott	-	58.7	58.4	30.7	16.3
MT1172	-	53.7	58.0	27.7	14.3
WB Gunnison	*	52.3	58.6	27.7	14.8
Duclair	**	47.4	55.8	28.3	15.5
Volt	-	46.7	58.8	27.7	14.9
McNeal	-	46.5	57.6	29.7	15.3
MT1103	-	46.5	58.3	26.0	15.0
Vida	*	46.2	56.8	29.3	15.3
MT1203	-	46.1	57.5	27.7	15.9
Choteau	**	45.3	56.8	26.0	15.4
Brennan	-	44.5	58.0	25.0	15.8
MT1236	-	43.6	56.3	24.3	15.4
Egan	-	42.7	57.2	26.3	16.7
Fortuna	**	42.6	58.8	32.0	15.5
Jedd	CL2	41.2	57.3	23.3	14.9
Reeder	-	40.3	59.6	26.3	15.5
WB9879CL	**CL	39.3	57.4	26.0	15.3
ONeal	*	38.9	58.4	28.0	15.3
SY Tyra	*	38.0	55.9	23.7	15.1
Corbin	*	31.1	57.5	26.3	15.2
Mean		44.2	57.6	27.1	15.4
LSD (.05)		ns	3.6	2.8	
C.V. 1 (%) (S/mean)*100		16.7	2.1	6.3	
P-Value		0.0965	0.0511	<0.0000	

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL = Clearfield System

Cooperator and Location: Aaron Killion, western Chouteau County.

Planted May 21, 2014 on chemical fallow. Harvested September 7/ 2014.

Fertilizer: actual pounds/ac of N-P-K: 11-22-0 applied with seed and a 100-0-20 blend of urea and potash was broadcast at planting. Fertilizer rates are based on a yield goal of 45 bu/ac.

Herbicide: The plot area was pre-plant sprayed with 20 oz/ac RT3 on 5/21/2014. The plots were sprayed with Huskie at 11 oz/ac and Axial XL at 16.4 oz/ac on 6/16/2014.

Conducted by MSU Western Triangle Ag. Research Center.

Table 10. Five-year averages, dryland Spring Wheat varieties, Knees, MT. Chouteau County. 2010-2014.

Variety	Class	5-Year Average			
		Yield bu/a	Test Weight	Height in.	Protein %
Duclair	**	52.6	58.6	27.6	14.2
WB Gunnison	*	51.0	60.4	27.5	14.0
Vida	*	49.3	59.4	28.4	13.9
WB9879CL	**CL	49.2	59.6	26.1	14.3
Choteau	**	48.5	59.2	26.1	14.5
Corbin	*	46.5	59.7	26.7	14.2
Volt	*	45.7	61.0	26.3	13.6
ONeal	*	45.4	59.8	28.1	13.8
McNeal	-	45.3	58.5	28.9	14.4
Reeder	-	45.0	60.0	27.3	14.6
Jedd	CL	41.7	58.9	22.5	14.2
SY Tyra	*	41.1	58.2	24.0	13.8
Fortuna	**	40.0	60.2	32.4	14.9
Mean		46.0	59.5	27.2	14.2

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

* = Less preferred by sawfly (behavioral preference) in small plots.

CL = Clearfield System

Table 11. Soil test values for off-station and on-station plots, WTARC, 2014.

Location	N (lbs/a) ¹	Olsen-P (ppm)	K (ppm)	pH	OM (%)	EC (mmhos/cm)
Cut Bank	54.6	18	394	7.9	2.4	0.44
Devon	11.9	18	408	6.6	1.0	0.18
Choteau	26.5	11	550	8.0	2.7	0.62
WTARC	17.6	18	346	7.5	2.7	0.38

¹Nitrogen 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