



Department  
of  
Research Centers

47<sup>th</sup> ANNUAL RESEARCH REPORT  
WESTERN TRIANGLE AGRICULTURAL RESEARCH CENTER  
Montana Agricultural Experiment Station  
Conrad, MT

2023 Crop Year

**Submitted by:**

**Dr. Justin M. Vetch**, WTARC Superintendent/Assistant Professor of Agronomy

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College of  
AGRICULTURE &  
MONTANA AGRICULTURAL  
EXPERIMENT STATION



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## INTRODUCTION

The information and data reported are a collaboration of ongoing or new research projects located at or near Western Triangle Agricultural Research Center (WTARC) of Montana State University, College of Agriculture, Conrad, Montana. Many projects are conducted in cooperation with faculty members, research associates and post-doctoral fellows from the Depts. of Plant Science and Plant Pathology (PSPP) and Land Resources and Environmental Science (LRES) located on the campus of Montana State University (MSU), and Agricultural Research Centers: Central (CARC), Northern (NARC), Eastern (EARC), Northwestern (NWARC) Southern (SARC) and Western (WARC) of the Dept. of Research Centers.

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## ACKNOWLEDGEMENTS

The following faculty, research associates, members of the Advisory Committee, cooperating producers and summer staff were involved or cooperated in accomplishing the research mission at Western Triangle Ag. Research Center:

Dr. Darrin Boss- Assistant Director, Department of Research Centers, Superintendent/Animal Science, Northern Ag. Research Center, Montana State University  
 Dr. Jessica Torrion– Department Head, Department of Research Centers, Superintendent/Animal Science, Northern Ag. Research Center, Montana State University  
 Dr. Suchismita Mondal – Winter Wheat Variety Breeding Program  
 Dr. Jason Cook and Hwa-Young Heo – Spring Wheat Variety Breeding Program  
 Dr. Jamie Sherman and Greg Lutgren – Barley Variety Breeding Program  
 Dr. Chengci Chen and Dr. Yusuf Mohammad – Pulse Crop Variety Testing Program  
 Dr. Mike Giroux and Andrew Hogg– Durum Variety Breeding and Testing Program  
 Dr. Patrick Carr and Simon Fordyce– Canola Variety Testing Program

WTARC Advisory Committee and cooperating producers: Cory Crawford, Mark Suta, Katelin Standley, Jim Bjelland, Boyd Standley, Terry Alme, Russ Miner, Tom Stott, Austin Orcutt, Bill McLean, Scott Inbody, Aaron Killian.

Summer/Fall Staff: Cole Waldusky, Natalie Bartsch, Tabitha Vermulm, Zach Durnel, Brenian Evans, Serena Mareno, and Sarah Taylor.



Summary of climatic data by month for the '22-'23 crop year (September to August) at the Western Triangle Agricultural Research Center, Conrad, MT.

Month and Year	Current Year	Precipitation (inches) Average (30 yr.)	Difference	Current year	Mean Temperature (°F) Average (30 yr.)	Difference
September, 2022	2.6	1.03	+1.57	61.9	57	+4.9
October, 2022	0.67	0.63	+0.04	48.7	44	+4.7
November, 2022	0.013	0.29	-0.28	22.6	31.6	-9
December, 2022	0.031	0.21	-0.18	12.9	23.6	-10.7
January, 2023	0.009	0.25	-0.24	27.3	23.6	+3.7
February, 2023	0.014	0.2	-0.19	25.4	23.4	+2
March, 2023	6.5	0.53	+5.97	20.8	31.6	-10.8
April, 2023	4.9	1.18	+3.72	40.5	41.4	-0.9
May, 2023	1.6	1.88	-0.28	58	50.9	+7.1
June, 2023	2	3.16	-1.16	60.7	58.9	+1.8
July, 2023	0.4	1.32	-0.92	68.5	67.6	+0.9
August, 2023	0.41	1.23	-0.82	68.3	66.6	+1.7
Total or Average	19.15	11.91	+7.24	43	43.4	-0.4

Last killing frost in spring (32°F)

2023-----April 27

Average 1993-2023----- May 17

First killing frost in fall (32°F)

2023----- October 6

Average 1993-2023----- September 26

Frost free period (days)

2023-----162

Average----- 132

Maximum summer temperature-----97°F (August 15, 2023)

Minimum winter temperature----- -26°F (December 21, 2022)





# Varietal Testing Program



# Winter wheat



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

**Principal Investigator:** Justin Vetch, Superintendent/Assistant Professor of Agronomy, Western Triangle Ag Research Center

**Personnel:** Wyatt Medina, Research Associate, WTARC, Conrad, MT  
Herb Flores, Assistant Farm Ops Manager, WTARC, Conrad, MT

**Cooperators:** Mark Suta, Ethridge, MT  
Cody Crawford, Valier, 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 soil. 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 the WTARC. The research center strives to provide growers of the western triangle area unbiased information of various winter wheat varieties.

**Methods:** On station plots consist of the Intrastate and Historic nurseries. In the Intrastate and Historical trials, there were 49 and 50 entries, respectively. Off station winter wheat nurseries consist of 25 entries replicated three times, seeded with a six-row plot seeder on four foot spacing. All plots were planted on no-till chemical fallow. Plots were trimmed, measured for length, and then harvested with a Wintersteiger Classic plot combine. Winter wheat seed was cleaned prior to collecting data.

**Results:** Results are tabulated in tables 1 through 4. Grain yields for the Intrastate nursery averaged 30.19 bu/ac, and the Historical nursery exhibited an average of 17.54 bu/ac. Off-station winter wheat nurseries averaged 63.1 bu/ac and 103.74 bu/ac for the Ethridge and Valier nurseries, respectively. Protein percentages for the Intrastate nursery averaged 11.63, while protein percentages for the Historical nursery averaged 9.69. Off-station winter wheat nurseries at Ethridge averaged 12.82 percent, and the Valier nursery averaged 13.42. Moisture percentage averages for all nurseries were similar and within one percentage point of each other. These moisture values were 10.84, 10.09, 9.07, and 9.76 percent for the Intrastate, Historical, Ethridge, and Valier winter wheat nurseries. Highest yielding varieties for the Intrastate nursery were SY Monument at 48.61 bu/ac, MT 1855 at 48.17 bu/ac, CP7909 at 39.57 bu/ac, Langin with 39.40 bu/ac, and MTCL1732 with 39.26 bu/ac. The Historical winter wheat nursery's highest yielding varieties were Ledger with 35.22 bu/ac, Paul with 34.56 bu/ac, Yellowstone with 29.66 bu/ac, Erhardt at 29.24 bu/ac, and Karmount 29.20 bu/ac. For the Ethridge nursery, the top performers were Loma at 83.95 bu/ac, MTCS20158 at bu/ac, MTCL2010 with 74.21 bu/ac, MT2019 with 71.44 bu/ac, and FourOsix with 69.76. Lastly, the Valier nursery's highest yielding varieties were MT2019 at 120.87 bu/ac, Loma at 114.40 bu/ac, Northern with 113.55 bu/ac, MTS1908 at 112.81bu/ac, and MTAX21187 at 112.79 bu/ac.

At the research center, this year's overall crop year temperatures were slightly below the 30-year average, being 0.4 degrees colder than usual. February, April, June, July, and August temps were close to the long-term average. November and December were each 9 and 10.7 degrees colder than the average, along with March, which also trailed the average by 10.8 degrees. The remaining months were 3-4 degrees warmer than the 30-year average.

Precipitation at the research center was a surprising 7.24 inches more than the long-term average. September and October were slightly above the average, while March and April were 5.97 and 3.72 inches above the average, respectively. The remaining months exhibited slightly less than average precipitation. October was closest to the 30-year average, with a 0.04-inch increase from the mean.

**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.

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 change or error. The Coefficient of Variability (CV) values are useful in comparing treatment or variety differences. 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.



Table 1. 2023 Intrastate Winter Wheat Variety Nursery, Western Triangle Ag. Research Center, Conrad, MT.

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
SY Monument	<b>48.61</b>	11.40	10.35	1406.65	60.35
MT1855	48.17	10.80	<b>12.87</b>	<b>1448.70</b>	60.23
CP7909	39.57	10.73	10.40	1144.00	62.40
Langin	39.40	11.27	10.80	1146.90	61.33
MTCL1732	39.26	9.77	11.07	1142.23	61.33
MT1642	38.92	12.50	10.30	789.60	61.05
Incline AX	38.48	10.50	11.00	1121.97	61.37
MT1848	38.14	10.65	10.80	1110.00	62.70
WB4418	37.43	11.70	12.40	1111.10	59.60
MT1867	37.16	11.07	10.77	1078.60	61.83
Bobcat	36.25	11.37	10.50	1052.10	61.97
SY 517 CL2	36.07	10.40	9.90	529.45	62.50
Warhorse	36.01	9.90	10.15	1039.70	62.15
Judee	35.55	11.07	10.50	1030.17	60.30
SY Legend CL2	35.53	11.30	11.35	1036.90	61.25
StandClear CLP	35.21	10.35	10.60	1021.35	61.75
Loma	34.28	10.23	10.23	989.87	61.83
MT1866	33.81	12.30	10.80	980.87	59.80
MT1787	32.98	12.25	12.40	973.60	57.40
MT1793	32.84	11.97	10.93	953.83	61.73
Flathead	32.81	12.20	10.45	658.03	61.95
SY Wolverine	32.79	9.90	10.33	949.20	62.27
WB4269	32.22	10.90	10.27	931.27	62.53
Mpress (SWW)	31.89	13.10	11.00	929.40	57.60
LCS Photon AX	31.50	12.60	10.60	911.80	61.07
Brawl CL Plus	31.49	12.95	10.95	917.95	58.10
WB4311	30.25	13.60	10.70	878.70	62.80
Byrd CL Plus	29.96	11.70	10.60	871.17	60.80
MT1872	29.77	11.55	11.00	865.10	61.85
FourOsix	29.56	12.27	11.77	860.77	60.60
MT1745	28.57	12.15	11.20	649.30	60.80
MTS1831	27.32	9.83	10.43	791.37	61.87
Long Branch	27.21	12.23	10.50	788.93	61.10
Keldin	27.15	11.83	11.13	790.90	60.83
MTS18149	27.04	10.83	11.63	793.07	60.70
MT1683	26.71	12.20	10.30	768.05	60.40

Table 1. Continued

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
LCS-18-7071	26.04	12.07	10.47	752.63	62.95
MTCL1737	25.47	12.10	10.90	741.20	61.33
MTS1810	24.82	9.20	10.80	560.47	62.75
Northern	24.71	<b>14.15</b>	11.25	719.40	61.80
MTS18116	24.69	9.70	10.30	702.53	<b>62.90</b>
AAC Wildfire	19.16	13.05	10.70	555.55	62.30
WB4792	18.23	11.05	10.60	528.75	59.80
LCS Jet	16.97	11.55	10.35	368.07	61.00
Yellowstone	16.97	13.65	10.75	493.85	56.70
MT1845	14.97	12.10	11.13	436.67	61.50
SY Clearstone 2CL	14.40	12.90	10.80	418.20	61.90
LCS15ACC-8-21	12.91	14.00	10.80	375.30	-
MT1746	10.28	13.20	11.10	299.90	-
Mean	30.19	11.63	10.84	845.21	61.13
StDev	8.4	1.18	0.58	257.17	1.41
C.V. (%)	27.82	10.15	5.35	30.43	2.31

Planting date: 10/5/2022

Harvest date: 8/11/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 2. 2023 Historical Winter Wheat Variety Nursery, Western Triangle Ag. Research Center, Conrad, MT.

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
Ledger	<b>35.22</b>	10.40	9.80	<b>1012.90</b>	62.80
Paul	34.56	9.30	10.15	998.75	62.55
Yellowstone	29.66	9.75	10.20	858.35	61.50
Erhardt	29.24	9.15	10.35	846.00	61.60
Karmount	29.20	9.60	10.30	844.50	63.40
Loma	27.40	10.35	10.25	792.45	60.10
Decade	26.95	9.70	10.30	779.40	59.50
Neeley	26.35	11.60	10.00	759.50	<b>64.10</b>
Teton	25.98	9.80	10.00	748.90	63.60
Winoka	25.12	10.00	10.00	724.00	62.70
Crest	25.00	11.50	10.05	720.95	62.00
Rampart	24.77	11.25	9.95	714.70	61.10
Cree	24.11	9.35	10.10	695.85	63.20
MT1159CL	24.02	9.70	10.35	694.95	60.35
CDC Falcon	23.55	9.70	10.10	679.75	61.90
Itana	22.74	9.40	10.20	656.90	60.00
Winridge	22.55	8.70	10.30	652.15	62.20
Turkey Red	22.44	11.90	10.00	646.90	58.20
Judith	22.11	10.70	9.75	635.25	62.45
Spur	21.27	9.40	10.20	614.50	59.20
Norris	20.92	9.85	10.15	603.75	62.25
Vanguard	20.75	9.85	10.30	600.05	60.30
NuWest	20.48	9.20	10.20	591.70	61.50
Bynum	19.60	9.05	10.05	565.35	62.90
Roughrider	19.38	9.50	9.90	557.90	60.80
Colter	19.21	9.20	10.10	554.20	61.60
Hyalite	18.68	8.30	10.20	539.70	59.90
BigSky	17.24	9.50	10.10	497.40	62.80
Morgan	17.01	9.25	9.95	489.75	62.35
Mcguire	16.94	<b>12.50</b>	10.20	489.30	58.90
Cheyenne	16.93	8.75	9.95	487.60	56.00
Tiber	16.41	9.05	9.95	472.50	62.15
FourOsix	15.35	9.20	10.20	443.30	62.20
Newturk	15.11	8.60	10.10	435.90	61.70
Northern	14.74	12.20	9.80	423.80	56.00
Sawmont	13.86	9.90	10.20	384.10	61.30
Bearpaw	13.65	8.10	9.95	393.10	61.40

Table 2. Continued

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
Warhorse	13.56	8.90	10.10	391.20	60.00
Jerry	13.54	9.50	9.90	384.55	61.50
Jagalene	12.80	8.80	9.95	368.80	61.90
Willow Creek	12.76	9.55	9.85	367.05	62.30
Rocky	12.51	9.40	9.90	360.30	-
Warrior	12.44	9.35	10.10	359.15	-
SY Clearstone 2CL	12.29	9.00	10.10	354.70	-
Bobcat	12.10	9.55	10.05	348.85	56.00
Rosebud	11.91	8.60	10.30	344.30	-
Rego	11.82	9.40	10.00	340.80	-
Westmont	11.57	9.00	<b>10.50</b>	326.15	59.80
Genou	11.36	9.60	10.30	328.60	-
NuSky	10.94	10.80	9.70	314.30	-
Winalta	9.82	9.50	10.20	279.90	63.00
Brawl CI Plus	8.52	-	-	221.00	-
Yogo	7.98	-	-	207.00	-
Norstar	7.72	9.60	10.00	218.25	-
Montana No. 36	6.09	-	-	158.00	-
WB3768	5.75	-	-	149.10	-
Judee	5.18	-	-	134.25	-
Redwin	4.92	-	-	127.60	-
Pryor	1.13	-	-	29.35	-
Mean	17.54	9.69	10.09	503.72	61.16
StDev	7.58	0.94	0.17	222.4	1.91
C.V. (%)	43.22	9.7	1.68	44.15	3.12

Planting date: 10/14/2022

Harvest date: 8/11/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 3. Off-station Winter Wheat variety trial located near Ethridge. Toole County. Western Triangle Ag. Research Center. 2023

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Test Weight (lb./bu)	Plot Weight (g)
Loma	<b>83.95</b>	13.17	<b>9.27</b>	58.93	<b>2400.70</b>
MTCS20158	74.21	13.13	8.97	59.97	2114.77
MTCL2010	73.33	12.93	9.07	59.93	2092.13
MT2019	71.44	12.70	9.07	59.53	2037.93
FourOsix	69.76	12.60	9.10	59.23	1990.63
AAC Wildfire	69.07	12.70	8.90	60.07	1967.60
MTS1908	68.10	12.30	8.97	59.70	1940.33
MT WarCat	67.65	13.27	9.17	59.63	1932.87
MTS2197	67.25	13.07	9.13	59.97	1919.67
Keldin	66.70	12.47	9.07	60.70	1902.67
MTCS20151	63.53	12.83	9.10	59.67	1813.00
Flathead	63.41	12.37	9.00	60.17	1807.80
MTV2164	62.97	12.47	9.17	59.40	1798.27
Yellowstone	62.94	12.93	9.10	58.83	1795.57
MTAX21187	60.94	12.53	9.20	58.57	1741.47
MTFH20170	59.83	13.17	9.17	59.23	1709.03
Brawl CL Plus	59.74	<b>13.30</b>	8.93	<b>61.10</b>	1700.77
SY Monument	59.14	12.93	8.87	59.83	1684.63
MTCL19151	58.63	13.27	9.00	59.20	1672.03
MTS2068	58.03	12.57	9.07	59.50	1655.07
Bobcat	57.17	12.23	8.97	59.87	1628.37
Northern	55.23	13.37	9.13	59.17	1575.90
MTCS20156	53.47	12.57	9.13	59.90	1526.13
Warhorse	53.15	13.03	9.10	59.40	1517.10
StandClear CLP	53.04	12.67	9.07	60.70	1514.13
Mean	63.71	12.82	9.07	59.69	1817.54
StDev	7.37	0.33	0.1	0.58	210.69
C.V. (%)	11.57	2.57	1.1	0.97	11.59

Planted: 10/10/2022

Harvested: 9/1/2023

Fertilizer: 40 lbs./ac 11-52-0 at planting

Table 5. Off-station Winter Wheat variety trial located in Valier, Pondera County, Western Triangle Ag. Research Center, 2023

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight
MT2019	<b>120.87</b>	13.00	9.60	<b>3468.70</b>	58.33
Loma	114.40	13.80	<b>10.17</b>	3303.80	57.97
Northern	113.55	13.03	9.77	3264.93	60.23
MTS1908	112.81	13.60	9.73	3241.63	58.50
MTAX21187	112.79	12.77	9.93	3248.30	59.93
MTCS20151	112.46	13.23	9.83	3235.47	59.73
MT WarCat	109.93	13.67	9.73	3158.97	58.73
StandClear CLP	109.84	13.23	9.60	3151.30	60.20
MTCL2010	108.75	13.33	9.60	3120.23	59.53
Keldin	105.99	13.50	9.67	3044.03	60.57
AAC Wildfire	104.84	<b>13.93</b>	9.90	3018.30	57.97
MTS2197	104.40	13.90	9.57	2993.20	60.07
MTS2068	104.24	13.50	9.77	2996.77	58.77
MTCL19151	101.79	13.33	10.00	2933.93	60.27
Bobcat	98.91	13.17	9.70	2840.27	60.07
MTCS20156	98.80	13.43	9.50	2831.77	<b>60.77</b>
Flathead	98.31	12.90	9.73	2823.83	59.97
Brawl CL Plus	98.10	13.73	10.00	2825.90	61.33
MTCS20158	97.71	13.90	9.80	2809.93	60.07
MTFH20170	97.09	13.43	9.67	2787.97	59.70
Warhorse	96.45	13.67	9.70	2770.53	59.00
FourOsix	94.31	13.03	10.10	2720.77	59.80
Yellowstone	94.15	13.70	9.85	2709.60	57.55
MTV2164	93.41	13.03	9.37	2674.60	58.03
SY Monument	86.42	13.70	9.63	2480.90	59.60
Mean	103.61	13.42	9.76	2978.23	59.47
StDev	8.21	0.33	0.18	236.78	0.97
C.V. (%)	7.92	2.46	1.84	7.95	1.63

Planted: 5/17/2023

Harvest date: 9/4/2023

Fertilizer: 40 lbs./ac 11-52-0 at planting

## Spring wheat and durum variety evaluations



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

**Principal Investigator:** Justin Vetch, Superintendent/Assistant Professor of Agronomy, Western Triangle Ag Research Center

**Personnel:** Wyatt Medina, Research Associate, WTARC, Conrad, MT  
Herb Flores, Assistant Farm Ops Manager, WTARC, Conrad, MT

**Cooperators:** Mark Suta, Ethridge, MT  
Cory Crawford, Valier, MT  
Aaron Killian, Knees area, 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 soil. 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 can vary greatly from those at the WTARC. The research center strives to provide growers of the western triangle area unbiased information of various spring wheat varieties.

**Methods:** On-station nursery is the Spring Wheat Advanced Yield Trial (SWAYT) with 64 entries replicated three times. Off-station spring wheat nurseries consist of 25 entries replicated three times, seeded with a six-row plot seeder on four foot spacing. All plots were planted on no-till chemical fallow. Plots were trimmed, measured for length, and harvested with a Wintersteiger Classic plot combine. Spring wheat seed was cleaned prior to collecting data.

**Results:** Results tabulated in tables 1 through 4. Grain yields for the On-Station Spring Wheat Advanced Yield Nursery averaged 37.90 bu/ac. In contrast, off-station spring wheat variety trials showed varying yields: 62.06 bu/ac at Ethridge, 69.46 bu/ac at Valier, and 53.27 bu/ac at Knees. Regarding protein content, the On-Station Spring Wheat Advanced Yield (SWAYT) nursery recorded an average protein level of 11.96, while the off-station trials had higher protein percentages: 15.06 at Ethridge, 14.85 at Valier, and 13.92 at Knees. Moisture percentages across these nurseries were relatively close, with the On-Station Spring Wheat Advanced Yield Nursery at 9.39%, Ethridge at 9.08%, Valier at 9.69%, and Knees at 9.29%. The 5 highest yielding varieties for the on-station SWAYT nursery were MT 21031 with 54.24 bu/ac, MT 21176 with 48.85 bu/ac, MT 21262 with 46.92 bu/ac, MT 21359 at 45.90 bu/ac, and WB 9879 CLP at 45.13 bu/ac. The Ethridge off-station nursery had top yielding lines consisting of MT 2050 with 70.65 bu/ac, WB 9879 CLP with 68.66 bu/ac, BZ 996434 with 67.62 bu/ac, MT 2054 at 67.22 bu/ac, and MT 1716 at 66.97 bu/ac. The Valier off-station nursery's top 5 yielding varieties were PI 679964 with 78.18 bu/ac, MT 2054 with 77.62 bu/ac, MT 2007 with 77.13 bu/ac, MT 1939 at 76.40 bu/ac, and MT 2050 at 75.68 bu/ac. The Knees off-station nursery had similar high yielding varieties to the other trials, but the top 5 were: MT 2050 with 61.15 bu/ac, WB 9879 CLP with 59.73 bu/ac, PI 679964 with 58.97 bu/ac, ND 695 at 57.73 bu/ac, and AGRIPR141 at 57.38 bu/ac.

At the research center, this year's overall crop year temperatures were slightly below the 30-year average, being 0.4 degrees colder than usual. February, April, June, July, and August temps were close to the long-term average. November and December were each 9 and 10.7 degrees colder than the average, along with March, which also trailed the average by 10.8 degrees. The remaining months were 3-4 degrees warmer than the 30-year average.

Precipitation at the research center was a surprising 7.24 inches more than the long-term average.



September and October were slightly above the average, while March and April were 5.97 and 3.72 inches above the average, respectively. The remaining months exhibited slightly less than average precipitation. October was closest to the 30-year average, with a 0.04-inch increase from the mean.

**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 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 these 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 change or error. The Coefficient of Variability (CV) values are useful in comparing treatment or variety differences. 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

Table 1. 2023 Spring Wheat Advanced Yield Nursery, Western Triangle Ag. Research Center, Conrad, MT.

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
MT 21031	<b>54.28</b>	12.50	9.30	<b>1552.40</b>	62.87
MT 21176	48.85	11.93	9.90	1406.20	60.57
MT 21262	46.92	14.23	9.33	1341.63	59.00
MT 21359	45.90	12.40	9.50	1314.03	60.30
WB 9879 CLP	45.13	12.80	9.15	1288.65	62.45
MT 21384	45.01	11.23	<b>10.23</b>	1300.77	62.00
MT 1939	44.56	12.97	9.33	1274.40	60.43
MT 21037	44.09	11.03	9.07	1257.57	62.00
MT 21174	44.01	<b>14.35</b>	9.10	1256.00	60.25
MT 21173	43.66	12.03	9.17	1246.30	61.37
SYN 212	43.12	11.77	9.40	1235.77	62.77
BZ 92413R	42.53	10.43	9.27	1215.93	61.90
WB 173	42.49	12.17	9.53	1218.40	62.63
WB 211	41.95	12.67	9.17	1198.27	61.13
MT 21074	41.45	11.47	9.17	1183.57	59.97
MT 21186	41.21	10.65	9.20	1177.35	62.00
ND 695	41.00	13.47	9.13	1170.17	60.53
MT 21247	40.41	12.45	9.30	1155.80	60.95
W-2	40.15	12.57	9.70	1153.50	59.57
SYN 211	40.01	12.80	9.40	1144.40	60.45
MT 21224	39.76	11.47	9.27	1136.73	61.90
PI 679964	39.73	11.23	9.33	1136.90	59.17
MT 21314	39.63	11.90	9.13	1131.60	61.33
SYN 183	39.37	12.13	9.73	1132.33	63.07
MT 21485	39.34	12.47	9.27	1124.70	61.87
PI 642366	39.30	10.40	9.40	1125.30	62.40
MT 21484	39.24	12.10	9.80	1128.97	62.17
MT 1716	39.01	12.37	9.30	1115.60	62.53
MT 21230	38.99	10.47	9.57	1116.37	62.70
MT 21313	38.48	11.63	9.17	1099.10	61.03
MT 2030	38.00	12.73	9.37	1086.43	61.27
MT 21105	37.84	11.50	9.23	1081.47	62.07
BZ 917-277	37.65	10.55	9.85	1085.80	62.05
MT 21214	37.64	11.90	10.20	1087.23	62.07
PI 690450	37.47	10.40	9.60	1075.70	62.97
MT 21211	37.00	13.07	9.33	1060.33	65.37
PI 660981	36.92	14.00	9.07	1052.67	57.63

Table 1. Continued

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
MS 201	36.87	11.07	9.30	1054.60	58.93
AGRIPR 161	36.44	11.93	9.60	1045.73	60.73
MT 1809	36.38	12.05	9.15	1038.45	61.70
CI 10003	36.20	13.95	9.25	1034.80	58.55
PI 574642	35.64	10.00	9.70	1022.10	60.63
SYN 182	35.57	13.20	9.20	1016.10	63.30
MT 21487	35.53	11.27	9.27	1015.67	63.50
PI 633974	35.48	12.73	9.77	1019.40	60.93
MS 211	35.41	11.70	9.13	1010.27	59.63
MT 21473	35.40	11.37	9.70	1017.50	60.80
NDHRS14-0134-C03	35.24	12.05	9.15	1006.30	61.35
MT 2063	35.21	11.20	9.65	1011.45	62.95
MT 21352	35.14	11.77	9.57	1007.50	61.83
BZ 996434	35.04	11.70	9.40	1003.35	62.90
MT 2049	34.48	12.03	9.47	989.40	62.47
MT 21220	34.18	10.20	9.37	978.57	62.63
MT 21148	33.38	11.80	9.47	957.20	62.23
AGRIPR 141	33.14	12.20	9.30	947.90	62.40
PI 676978	32.48	12.40	9.07	926.50	60.33
MT 2050	31.35	10.80	9.17	895.30	61.23
MT 21016	30.52	13.43	9.47	875.00	60.50
MT 21104	29.83	11.20	9.37	853.27	62.00
LIMAGR 222	29.72	11.07	9.17	848.63	63.27
LIMAGR 211	28.31	11.23	9.30	809.23	<b>63.87</b>
LIMAGR 231	26.67	12.40	9.50	764.50	63.33
WB 222	25.54	13.30	9.20	729.95	62.20
MS 212	24.56	11.47	9.17	701.63	62.87
Mean	37.90	11.96	9.39	1085.13	61.59
StDev	5.44	0.99	0.26	156.05	1.39
C.V. (%)	14.35	8.28	2.77	14.38	2.26

Planting date: 4/28/2023

Harvest date: 8/14/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 2. Off-station spring wheat variety trial located in Ethridge, MT. Toole County. Western Triangle Ag. Research Center. 2023.

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
MT 2050	<b>70.65</b>	14.30	9.23	<b>2019.33</b>	<b>59.57</b>
WB9879CLP	68.66	13.93	9.10	1959.67	59.07
BZ 996434	67.62	14.27	9.10	1929.40	58.73
MT 2054	67.22	14.47	8.93	1915.03	58.73
MT 1716	66.97	14.67	9.00	1909.93	58.00
ND 695	65.02	14.67	9.03	1854.30	57.57
PI 679964	64.80	15.37	8.93	1845.50	57.90
PI 660981	64.79	14.67	9.10	1848.97	58.20
AGRIPR141	64.55	14.10	9.07	1841.57	58.47
MT 2013	63.75	15.25	9.07	1818.50	57.30
MT 2007	63.49	14.80	9.17	1813.10	57.80
MT 1939	63.19	15.33	9.00	1801.27	56.77
MT 2030	62.55	15.60	9.00	1783.27	57.33
PI 690450	62.16	15.23	9.07	1773.07	56.70
BZ 92413R	59.18	15.37	9.17	1690.10	56.83
MT 2022	58.93	14.97	9.10	1681.83	58.23
MT 1809	58.74	15.43	9.03	1674.47	57.77
MT 2038	58.62	15.83	9.20	1674.77	56.03
PI 642366	58.56	15.40	9.07	1671.17	55.77
MT 2049	58.18	14.67	9.07	1659.80	56.80
AGRIPR 10	57.88	15.30	<b>9.33</b>	1656.20	57.13
PI 633974	57.76	15.53	9.07	1647.70	57.13
AGRIPR 14	56.54	15.13	8.97	1610.97	57.33
PI 676978	56.33	<b>16.07</b>	9.07	1607.10	56.53
MT 2063	55.37	16.03	9.20	1581.77	56.80
Mean	62.06	15.06	9.08	1770.75	57.54
StDev	4.23	0.57	0.09	120.52	0.92
C.V. (%)	6.82	3.78	0.99	6.81	1.6

Planting date: 5/9/2023

Harvest date: 9/1/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 3. Off-station spring wheat variety trail located in Valier, MT. Pondera County. Western Triangle Ag. Research Center. 2023

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
PI 679964	<b>78.18</b>	14.73	9.63	<b>2244.17</b>	58.70
MT 2054	77.62	14.47	<b>9.97</b>	2236.60	60.27
MT 2007	77.13	14.53	9.57	2212.80	58.77
MT 1939	76.40	15.07	9.70	2194.50	59.27
MT 2050	75.68	14.70	9.77	2175.73	60.07
PI 660981	73.40	15.10	9.80	2111.20	59.53
MT 1716	72.96	<b>15.13</b>	9.57	2093.00	59.43
MT 1809	72.85	15.10	9.73	2092.97	59.23
WB9879CLP	72.35	14.80	9.53	2074.40	60.37
BZ 996434	71.51	15.00	9.73	2055.13	58.20
AGRIPR 10	70.69	14.97	9.87	2034.27	58.97
ND 695	70.60	14.63	9.70	2028.13	58.00
PI 676978	70.26	14.90	9.70	2018.87	59.13
MT 2022	70.13	15.07	9.77	2016.33	<b>60.43</b>
PI 642366	70.09	14.50	9.73	2014.20	58.43
AGRIPR 14	69.22	14.40	9.87	1992.00	58.40
MT 2049	68.82	14.90	9.63	1975.73	58.97
AGRIPR141	68.69	14.80	9.77	1975.23	57.93
MT 2013	67.28	15.40	9.50	1928.43	58.07
PI 690450	65.85	14.97	9.60	1889.80	59.20
MT 2038	63.51	14.67	9.53	1820.77	60.17
MT 2030	62.80	14.93	9.63	1803.47	59.57
BZ 92413R	61.58	14.53	9.67	1769.10	59.40
MT 2063	55.78	14.93	9.53	1600.10	60.07
PI 633974	53.00	14.90	9.70	1522.97	59.07
Mean	69.46	14.85	9.69	1995.20	59.19
StDev	6.21	0.24	0.12	178.9	0.75
C.V. (%)	8.94	1.62	1.24	8.97	1.27

Planting date: 5/17/2023

Harvest date: 9/4/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 4. Off-station spring wheat variety trail located near the Knees. Chouteau County. Western Triangle Ag. Research Center. 2023

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
MT 2050	<b>61.15</b>	14.03	9.43	<b>1751.80</b>	60.43
WB9879CLP	59.73	13.67	<b>9.47</b>	1711.10	59.63
PI 679964	58.97	<b>14.43</b>	9.10	1682.80	60.17
ND 695	57.73	14.13	9.23	1649.87	60.17
AGRIPR141	57.38	13.93	9.23	1640.00	59.27
MT 2049	56.35	13.67	9.23	1610.63	60.47
BZ 92413R	56.05	14.03	9.30	1602.57	60.20
BZ 996434	55.10	14.13	9.20	1573.97	59.50
PI 660981	54.85	14.03	9.37	1569.77	60.10
MT 2007	54.81	14.23	9.43	1569.87	59.50
MT 2054	54.72	13.97	9.00	1560.10	60.43
MT 2022	54.38	<b>14.43</b>	9.37	1556.50	59.23
MT 1939	53.93	14.37	9.33	1542.90	59.07
MT 2013	52.79	13.93	9.33	1510.27	58.87
MT 2038	52.52	13.37	9.27	1502.10	<b>61.17</b>
MT 1716	52.11	13.57	9.27	1489.83	60.37
MT 1809	51.79	14.23	9.37	1482.30	60.47
AGRIPR 10	51.53	14.20	9.27	1473.33	59.33
PI 642366	51.18	13.70	9.30	1464.23	59.73
MT 2063	50.63	13.83	9.40	1449.63	61.17
PI 690450	49.27	13.60	9.27	1408.47	47.20
PI 633974	48.66	13.70	9.30	1391.23	60.50
PI 676978	45.83	13.43	9.33	1311.67	61.17
MT 2030	45.23	13.97	9.23	1292.47	61.03
AGRIPR 14	45.14	13.37	9.17	1289.37	60.73
Mean	53.27	13.92	9.29	1523.47	59.60
StDev	4.22	0.31	0.1	120.74	2.62
C.V. (%)	7.92	2.23	1.08	7.93	4.4

Planting date: 5/16/2023

Harvest date: 8/28/2023

Fertilizer: 40lb/ac 11-52-0 at planting

# Barley



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

**Principal Investigator:** Justin Vetch, Superintendent/Assistant Professor of Agronomy, Western Triangle Ag. Research Center

**Personnel:** Wyatt Medina, Research Associate, WTARC, Conrad, MT  
Herb Flores, Assistant Farm Ops Manager, WTARC, Conrad, MT

**Cooperators:** Mark Suta, Ethridge, MT  
Aaron Killian, Knees area, 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 barley varieties under the local conditions with respect to yield, test weight, seed moisture, and seed protein. The environmental conditions at the off-station nurseries can vary greatly from those at the WTARC. The research center strives to provide growers of the western triangle area unbiased information of various spring barley varieties.

**Methods:** Off-station barley nurseries consist of 25 entries replicated three times, seeded with a four-row plot seeder on four foot spacing. All plots were planted on no-till chemical fallow. Plots were trimmed, measured for length, and then harvested with a Wintersteiger Classic plot combine. Spring barley seed was cleaned prior to collecting yield data.

**Results:** Results are tabulated in tables 1 through 4. For the on-station replication of off-station barley trials, the yield was notably high at 95.37 bu/ac, with a protein content of 12.18 and moisture level at 10.24%. The on-station Intrastate Barley variety trial exhibited a yield of 79.98 bu/ac, with a higher protein content of 13.86 and moisture at 9.35%. In the off-station spring barley variety trials, Ethridge reported a yield of 48.25 bu/ac, protein at 13.40, and moisture at 8.14%, while Knees showed a yield of 63.40 bu/ac, lower protein content of 11.12, and moisture similarly low at 8.10%. The on-station replication of off-station barley trials had top yielding varieties consisting of MT Boy Howdy at 130.16 bu/ac, 2IM14-8212 at 123.24 bu/ac, 2IM16-0154 at 114.37, MT18M06008 with 107.43 bu/ac, and BC Lexy with 106.76 bu/ac. For the intrastate barley trials, the top yielding varieties were: MT20\_M053\_02 with 118.78 bu/ac, MT20\_M033\_14 at 111.79 bu/ac, MT18M06008 at 109.22 bu/ac, MT18M10207 with 106.07 bu/ac, and MT20\_M054\_05 with 105.31 bu/ac. The Ethridge nursery had some overlapping top performing entries, with the top 5 being Voyager at 63.90 bu/ac, Buzz at 59.59 bu/ac, MT17M01908 with 56.61 bu/ac, MT19\_M067\_02 with 56.34 bu/ac, and MT18M06008 at 56.24 bu/ac. The Knees nursery had its own set of top performers, with one overlapping variety: first, BC Leandra with 83.22 bu/ac, then LCS Opera with 78.30 bu/ac, BC Ellinor with 75.15 bu/ac, LG Diablo at 74.31 bu/ac, and MT19\_M067\_02 at 70.76 bu/ac.

At the research center, this year's overall crop year temperatures were slightly below the 30-year average, being 0.4 degrees colder than usual. February, April, June, July, and August temps were close to the long-term average. November and December were each 9 and 10.7 degrees colder than the average, along with March, which also trailed the average by 10.8 degrees. The remaining months were 3-4 degrees warmer than the 30-year average.

Precipitation at the research center was a surprising 7.24 inches more than the long-term average. September and October were slightly above the average, while March and April were 5.97 and 3.72 inches above the average, respectively. The remaining months exhibited slightly less than average



precipitation. October was closest to the 30-year average, with a 0.04-inch increase from the mean.

**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 error. The Coefficient of Variability (CV) values are useful in comparing treatment or variety differences. The CV value measures the variability of the experiment or variety trial, and a CV of 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

Table 1. On-station replication of off-station barley trials, WTARC, Conrad 2023.

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
MT Boy Howdy	<b>130.16</b>	8.90	10.40	<b>2980.00</b>	51.85
2IM14-8212	123.24	9.80	<b>10.70</b>	2831.00	48.20
2IM16-0154	114.37	13.63	10.13	2610.83	49.43
MT18M06008	107.43	11.85	10.15	2452.60	<b>52.15</b>
BC Lexy	106.76	13.00	10.20	2438.60	46.50
MT19_M095_04	106.05	12.90	9.95	2415.75	50.95
MT Endurance	105.47	12.50	10.30	2412.00	47.20
MT19_M061_19	105.37	11.90	9.95	2400.25	50.30
MT17M01908	102.92	10.87	10.13	2349.17	50.67
MT18M06011	100.26	12.67	10.23	2291.37	52.13
LCS Odyssey	98.91	12.10	10.33	2263.33	48.50
ABI Eagle	95.15	9.60	10.40	2178.40	50.10
MT19_M067_02	93.09	12.40	10.10	2124.10	49.70
LG Diablo	91.12	12.80	10.10	2079.20	47.55
BC Leandra	89.36	13.10	10.10	2037.95	46.40
MT17M05808	88.28	11.95	10.45	2022.20	50.65
Buzz	87.66	11.95	10.10	2000.15	50.75
BC Ellinor	85.28	12.43	10.30	1950.23	46.27
MT19_M064_04	84.54	11.80	10.40	1935.50	50.80
LCS Opera	82.38	11.90	10.05	1878.25	48.55
CDC Copeland	81.33	12.60	10.10	1855.57	49.00
Merit 57	80.84	12.80	10.40	1850.60	47.75
Hockett	78.11	11.00	10.40	1788.30	49.40
AC Metcalfe	76.01	<b>15.10</b>	10.23	1736.77	47.33
Voyager	70.08	14.85	10.35	1603.70	49.65
Mean	95.37	12.18	10.24	2179.43	49.27
StDev	14.57	1.38	0.17	333.86	1.76
C.V. (%)	15.28	11.33	1.66	15.32	3.57

Planting date: 4/26/2023

Harvest date: 8/2/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 2. Intrastate Barley variety trial, WTARC, Conrad 2023.

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
MT20_M053_02	<b>118.78</b>	11.77	9.50	<b>2692.07</b>	51.83
MT20_M033_14	111.79	12.27	9.17	2524.50	52.50
MT18M06008	109.22	12.10	9.53	2479.97	50.63
MT18M10207	106.07	13.33	9.53	2409.63	52.50
MT20_M054_05	105.31	13.80	9.47	2385.87	51.90
MT18M11004	101.46	12.43	9.13	2291.20	49.50
MT18M11002	99.90	13.03	9.30	2260.70	54.43
MT17M05808	99.71	12.57	9.43	2261.07	51.63
MT19_M045_11	97.24	14.90	9.47	2205.97	52.63
MT20_M047_16	95.09	13.47	9.37	2151.93	54.33
MT19_M061_19	93.88	13.90	9.33	2125.00	51.47
MT21_094_08	92.17	13.70	9.57	2094.40	52.03
MT19_M095_04	91.80	13.00	9.50	2081.53	54.53
MT19_M055_03	91.49	13.17	9.30	2069.67	51.27
MT20_M008_04	91.15	13.10	9.37	2064.30	51.57
MT19_H11_05	90.01	12.97	9.43	2038.80	51.57
MT18M11106	89.66	13.17	9.37	2029.43	49.73
MT20_H092_13	88.54	14.00	9.33	2003.40	52.83
MT19_M067_02	88.36	12.80	9.43	2000.30	53.43
Hockett	88.29	15.03	9.40	2003.10	52.60
MT Endurance	87.53	12.57	9.53	1985.40	50.70
MT21_094_04	86.97	12.93	9.47	1971.10	50.27
MT19_M098_17	86.13	13.33	9.43	1950.00	51.77
MT19_M060_06	83.98	13.27	9.47	1903.80	51.83
MT20_M062_04	83.49	14.00	9.33	1887.97	51.70
MT20_H092_03	81.99	14.27	9.40	1858.87	53.37
MT20_M120_05	79.96	14.20	9.10	1804.37	49.03
MT Boy Howdy	79.79	13.60	9.47	1811.63	50.23
Merit 57	79.71	13.87	9.23	1802.60	49.23
MT19_M034_16	79.41	13.60	9.37	1796.63	50.17
MT18M10106	79.04	15.60	9.20	1785.70	52.60
AC Metcalfe	78.99	12.70	9.27	1786.40	50.20
MT20_M044_06	78.80	14.23	9.60	1789.77	51.37
MT20_M063_01	76.39	14.17	9.33	1727.97	51.50
MT19_M022_10	76.03	14.80	9.40	1722.77	52.50
MT20_M073_12	75.82	13.23	9.47	1717.90	54.43
MT20_M074_02	75.56	14.17	9.30	1708.37	53.63
MT18M06009	75.46	13.13	9.20	1705.03	51.13

Table 2. Continued

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
MT20_M118_15	74.94	15.23	9.20	1692.97	52.07
Havener	73.31	15.20	9.27	1657.73	55.20
MT19_H14_11	72.32	14.13	9.40	1636.63	52.03
MT18H02702	71.92	15.17	9.50	1631.60	51.80
Buzz	71.22	13.57	9.17	1607.40	50.40
MT19_M080_13	70.86	12.80	9.17	1600.30	49.53
Haxby	70.48	13.87	9.10	1590.73	51.20
MT19_H09_09	69.93	13.33	9.60	1586.90	52.87
MT20_M050_03	69.76	15.60	9.30	1577.77	52.83
MT19_H12_12	69.48	14.33	9.13	1568.67	52.57
MT20_M124_07	68.75	15.13	9.30	1556.43	52.60
MT19_M064_04	68.71	14.77	9.20	1552.67	48.50
FHB-2017-59-2	67.92	14.80	9.37	1537.63	52.50
MT19_H11_04	67.86	13.43	<b>9.63</b>	1539.73	58.53
MT20_M117_10	66.49	13.13	9.07	1499.90	49.00
MT21_094_06	66.14	13.97	9.20	1494.07	48.53
MT18M06011	64.78	<b>15.77</b>	9.30	1464.90	52.93
MT19_H11_17	63.86	15.37	9.23	1444.27	49.00
MT20_M102_03	63.71	14.77	9.17	1440.03	48.33
MT20_M052_13	62.98	15.33	9.27	1425.53	49.93
MT20_M033_01	62.64	15.43	9.50	1419.27	52.17
MT17M01908	59.72	14.03	9.60	1355.43	<b>57.70</b>
MT17M04801	58.92	13.93	9.33	1333.07	50.97
MT19_M071_21	58.47	14.10	9.40	1323.63	54.67
MT20_M006_08	57.96	13.83	9.30	1310.50	50.37
MT20_M118_02	50.48	13.53	9.40	1142.63	48.80
Mean	79.98	13.86	9.35	1810.62	51.78
StDev	14.56	0.95	0.14	330.73	2
C.V. (%)	18.2	6.85	1.5	18.27	3.86

Planting date: 4/26/2023

Harvest date: 8/1/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 3. Off-station spring barley variety trial located in Ethridge, MT. Toole County. Western Triangle Ag. Research Center, 2023.

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
Voyager	<b>63.90</b>	13.67	8.07	<b>1426.07</b>	43.53
Buzz	59.59	<b>15.17</b>	8.00	1328.60	45.07
MT17M01908	56.61	13.47	8.07	1263.50	45.17
MT19_M067_02	56.34	14.90	8.23	1259.37	44.53
MT18M06008	56.24	13.70	8.17	1256.23	45.90
ABI Eagle	55.46	13.03	8.30	1240.60	45.07
LCS Opera	54.38	14.20	8.13	1214.47	45.63
BC Leandra	54.09	13.07	8.03	1206.63	46.30
2IM16-0154	53.44	13.13	8.27	1194.97	44.10
MT Endurance	53.21	13.73	8.13	1188.50	45.23
LCS Odyssey	52.58	12.60	8.13	1173.93	45.13
BC Ellinor	52.19	13.27	8.07	1164.53	44.67
BC Lexy	51.74	14.50	8.10	1155.07	45.23
2IM14-8212	47.15	12.93	<b>8.33</b>	1055.13	46.33
Hockett	45.81	13.00	8.10	1022.67	45.80
MT18M06011	44.99	13.73	8.13	1004.50	46.33
AC Metcalfe	42.35	13.03	8.07	944.87	46.43
LG Diablo	41.84	13.17	8.07	933.57	45.73
MT17M05808	41.01	14.00	8.20	916.60	<b>46.45</b>
MT Boy Howdy	40.45	12.63	8.03	902.17	44.53
MT19_M095_04	38.81	13.10	8.20	867.60	48.23
MT19_M064_04	36.95	12.53	8.17	825.27	46.33
MT19_M061_19	36.78	12.47	8.20	821.87	43.07
Merit 57	35.84	12.80	8.00	799.03	45.67
CDC Copeland	34.64	13.20	8.25	774.15	45.85
Mean	48.25	13.40	8.14	1077.60	45.45
StDev	8.22	0.7	0.09	183.48	1.05
C.V. (%)	17.04	5.22	1.11	17.03	2.31

Planting date: 5/9/2023

Harvest date: 9/1/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 4. Off-station spring barley variety trial located near the Knees. Chouteau County. Western Triangle Ag. Research Center, 2023.

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
BC Leandra	<b>83.22</b>	10.73	8.20	<b>1859.57</b>	48.47
LCS Opera	78.30	10.63	8.13	1748.37	49.77
BC Ellinor	75.15	11.07	8.20	1679.50	48.00
LG Diablo	74.31	10.63	8.13	1659.13	48.17
MT19_M067_02	70.76	11.00	8.00	1577.83	50.10
Hockett	68.51	11.83	8.10	1529.13	51.20
MT19_M061_19	68.21	11.00	8.07	1522.00	48.93
LCS Odyssey	68.21	10.97	8.10	1522.47	49.90
2IM14-8212	67.91	11.27	<b>8.23</b>	1518.17	49.53
MT19_M095_04	65.74	10.73	8.10	1467.23	50.47
CDC Copeland	65.73	12.07	8.03	1466.17	49.63
ABI Eagle	65.06	10.93	8.10	1451.77	49.67
Buzz	63.68	10.83	8.10	1421.10	50.50
2IM16-0154	62.86	11.17	8.03	1401.80	50.10
MT Boy Howdy	62.36	10.27	8.13	1392.60	50.40
MT17M01908	59.33	10.90	8.03	1323.20	51.67
BC Lexy	58.49	10.55	8.10	1305.50	49.95
MT17M05808	58.34	<b>12.30</b>	8.07	1301.80	49.53
AC Metcalfe	57.59	12.03	8.10	1285.37	50.63
Merit 57	56.95	11.40	8.23	1272.80	49.70
MT Endurance	56.73	11.23	8.00	1264.70	50.60
MT19_M064_04	52.96	10.77	7.97	1180.80	45.90
Voyager	52.73	11.60	8.13	1177.30	49.47
MT18M06008	47.50	10.83	8.13	1060.63	50.60
MT18M06011	44.50	11.17	8.07	992.97	<b>51.83</b>
Mean	63.40	11.12	8.10	1415.28	49.79
StDev	9.06	0.5	0.07	202.66	1.22
C.V. (%)	14.29	4.5	0.86	14.32	2.45

Planting date: 5/16/2023

Harvest date: 8/28/2023

Fertilizer: 40lb/ac 11-52-0 at planting

# Canola



**Project Title:** Canola variety evaluations at Western Triangle Ag. Research Center

**Principal Investigator:** Justin Vetch, Superintendent/Assistant Professor of Agronomy, Western Triangle Ag. Research Center

**Personnel:** Wyatt Medina, Research Associate, WTARC, Conrad, MT  
Herb Flores, Assistant Farm Ops Manager, WTARC, Conrad, MT

**Objectives:** To evaluate canola varieties grown at the Western Triangle Ag. Research Center.

**Methods:** All plots were planted into no-till chemical fallow using a six-row planter with spacing set to four feet. Plots were trimmed, measured for length, and then harvested with a Wintersteiger Classic plot combine. Canola seed was cleaned prior to collecting data.

**Results:** Results tabulated in table 1. The canola nursery averaged 886.4 lbs./ac (Table 1). Test weight averaged 52.01 lbs./bu with mean seed oil content of 41.59%. There was no lodging or shatter to report in the canola nurseries. Highest yields in lbs./ac were InVigor L345PC at 1367, CP9978TF at 1124, InVigor L233P at 1119, InVigor L343PC with 1108, and CP7130LL at 1076.

At the research center, this year's overall crop year temperatures were slightly below the 30-year average, being 0.4 degrees colder than usual. February, April, June, July, and August temps were close to the long-term average. November and December were each 9 and 10.7 degrees colder than the average, along with March, which also trailed the average by 10.8 degrees. The remaining months were 3-4 degrees warmer than the 30-year average.

Precipitation at the research center was a surprising 7.24 inches more than the long-term average. September and October were slightly above the average, while March and April were 5.97 and 3.72 inches above the average, respectively. The remaining months exhibited slightly less than average precipitation. October was closest to the 30-year average, with a 0.04-inch increase from the mean.



Table 1. Statewide Canola variety trial, WTARC, Conrad 2023.

Variety or ID	Yield (lb/ac)	Oil Content (%)	Test Weight (lb/bu)
InVigor L345PC	<b>1367</b>	41.3	52.5
CP9978TF	1124	40.9	51.8
InVigor L233P	1119	41.7	52.2
InVigor L343PC	1108	42	51.3
CP7130LL	1076	40.6	52.3
NCC1825/8-S	1035	39.7	<b>53.3</b>
NC527CR TF	941	41.6	51.1
InVigor L340PC	922	41.7	52.2
CP7250LL	882	41.8	51.7
CP9221TF	834	42.1	51.7
InVigor LR354PC	830	40.1	52.7
NC155 TF	731	41.6	52.2
NCC101S	724	38.6	52.4
7361RC	634	44.3	50.9
NC471 TF	623	<b>45.2</b>	51.8
StarFlex	598	43.2	51.7
InVigor L350PC	491	40.6	52.4
Mean	884.65	41.59	52.01
StDev	227.77	1.55	0.58
C.V. (%)	25.75	3.73	1.12

Planting date: 5/3/2023

Harvest date: 8/22/23

Fertilizer: 40lb/ac 11-52-0 at planting

# Pulses



**Project Title:** Spring pea, Lentil, Chickpea Variety Evaluation

**Principal Investigator:** Justin Vetch, Superintendent/Assistant Professor of Agronomy, Western Triangle Ag. Research Center.

**Personnel:** Wyatt Medina, Research Associate, WTARC, Conrad, MT  
Herb Flores, Assistant Farm Ops Manager, WTARC, Conrad, 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 pulse varieties under the local conditions with respect to yield, test weight, plant height, seed moisture, and seed protein. The environmental conditions at the off-station nurseries can vary greatly from those at the WTARC. The research center strives to provide growers of the western triangle unbiased information on various spring pulse varieties.

**Methods:** On-station field pea nursery consisted of 48 entries, replicated three times. The statewide lentil nursery consisted of 14 entries, replicated four times. Statewide chickpea nursery consisted of 17 entries, replicated four times. All pulse nurseries were seeded with a six-row plot seeder on four 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.

**Results:** Pulse variety data are summarized in tables 1 through 3. In the Statewide Pea Variety Evaluation, the yield was recorded at 28.05 bu/ac with a high protein content of 24.7% and a moisture level of 9%. The Statewide Chickpea Variety Evaluation showed a yield of 16.46 bu/ac with a moisture content of 8.79%, though protein data was not available. For the Statewide Lentil Variety Evaluation, the yield was significantly higher at 177.95 lbs./ac, but there was no data available for moisture or protein content. The highest yielding pea varieties were Salamanca at 34.77 bu/ac, Aragorn with 32.89 bu/ac, Hyline with 32.78 bu/ac, PG Cash at 32.06 bu/ac, and Pro 1436230 at 31.84 bu/ac. For the chickpea trial, the top entries (in terms of yield) were NDC160236 at 23.76 bu/ac, CDC Frontier at 22.61 bu/ac, CDC Orion with 18.73 bu/ac, CDC Palmer with 18.63 bu/ac, and ND Crown with 18.50 bu/ac. Lastly, the Lentil trials yield was measured in **pounds per acre (lbs./ac)**, and the top performers were Avondale at 244.72 lbs./ac, Sage at 230.25 lbs./ac, CDC Maxim CL with 213.31 lbs./ac, CDC Kermit with 199.76 lbs./ac, and NDL090204R with 186 lbs./ac.

**Summary:** 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.

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 change or error. The Coefficient of Variability (CV) values are useful in comparing treatment or variety differences. 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

Table 1. Statewide Pea Variety Evaluation. Field pea. Western Triangle Ag. Research Center. 2023

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
Salamanca	<b>34.77</b>	23.13	8.90	<b>1659.75</b>	65.30
Aragorn	32.89	21.60	8.78	1568.58	64.80
Hyline	32.78	25.58	8.75	1561.78	65.78
PG Cash	32.06	24.38	8.78	1527.48	66.08
Pro 143-6230	31.84	26.28	9.08	1523.40	65.28
Boost	31.11	26.18	8.95	1486.28	64.85
B202318	30.86	23.60	8.55	1467.33	65.48
MS-22G1	30.71	23.88	8.72	1462.75	66.15
Passion	30.66	24.13	9.05	1465.48	65.30
CP5222Y	30.64	23.85	8.90	1462.28	65.48
PS17100008	30.46	23.08	9.05	1456.58	64.73
Pizzazz	30.45	25.73	9.83	1468.08	65.95
CDC	30.01	25.13	8.95	1433.15	64.58
Spectrum	29.80	25.13	9.15	1425.85	65.93
Orchestra	29.80	25.13	9.15	1425.85	65.93
Hampton	29.44	25.35	8.48	1398.73	64.60
Pro 181-7124	29.27	24.55	9.30	1402.85	64.28
LGPN4184	29.27	25.45	9.40	1404.35	65.18
NDP140510Y	29.11	25.03	8.60	1385.03	65.65
PS17100022	28.95	25.48	8.90	1381.98	66.23
AAC Beyond	28.24	<b>27.05</b>	8.63	1344.38	65.15
AAC Profit	27.82	24.93	9.00	1329.03	64.60
Ginny 2	27.74	24.48	8.88	1323.75	64.80
AAC Julius	27.69	25.80	9.10	1324.75	64.80
DS-Admiral	27.52	24.63	9.83	1329.83	63.75
NDP150412G	27.35	25.95	8.50	1299.63	66.55
6124-7	27.31	25.73	8.90	1304.08	65.08
Banner	27.20	24.95	8.40	1291.20	65.73
CP5244Y	27.12	25.05	8.80	1293.35	66.08
Pro 173-7406	26.96	23.78	9.33	1292.65	64.53
AAC Chrome	26.69	23.23	9.03	1275.38	65.45
MS ProStar	26.67	25.15	9.05	1275.33	65.00
5206	26.51	26.53	9.50	1273.75	64.13
LGPN4185	26.46	24.60	8.73	1260.77	64.67
AAC Carver	26.27	23.30	8.95	1254.53	65.40

Table 1. Continued

Variety or ID	Yield (bu/ac)	Protein (%)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
6087-11	26.20	26.45	9.63	1261.05	64.78
LG Sunrise	25.87	23.60	9.13	1237.98	65.28
Pro 171-7665	25.77	23.73	8.83	1228.88	65.05
Fairway	25.41	24.05	8.65	1209.38	64.40
Shamrock	25.40	23.15	8.78	1210.85	<b>67.20</b>
PG 8927	24.97	24.98	<b>9.85</b>	1204.28	64.18
NDP150231Y	24.93	25.45	8.80	1188.70	66.08
ND Dawn	24.62	23.13	9.33	1180.53	64.48
6138-1	22.85	25.80	9.08	1092.93	65.23
6232-4	22.23	24.05	8.90	1061.10	66.10
CDC Inca	21.51	24.58	9.15	1029.73	65.63
Mean	28.05	24.7	9	1340.43	65.24
StDev	2.84	1.13	0.34	134.87	0.71
C.V. (%)	10.12	4.57	3.78	10.06	1.09

Planting date: 5/2/2023

Harvest date: 8/16/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 2. Statewide Chickpea Variety Evaluation. Western Triangle Ag. Research Center. 2023

Variety or ID	Yield (bu/ac)	Moisture (%)	Plot Weight (g)	Test Weight (lb/bu)
NDC160236	<b>23.76</b>	8.93	<b>1134.28</b>	59.7
CDC Frontier	22.61	<b>9.03</b>	1080.73	60.55
CDC Orion	18.73	8.65	891.53	58.33
CDC Palmer	18.63	8.73	887.35	59.4
ND Crown	18.50	8.73	881.43	59.86
CDC Consul	18.33	8.85	874.50	<b>61.93</b>
Myles	17.12	8.63	814.40	57.23
CDC Anna	16.82	8.98	803.25	61.1
CDC Leader	16.14	8.98	770.95	59.53
Kasin	15.85	8.80	755.63	61.43
CDC Cory	15.53	8.85	740.85	59.6
2510-2	14.62	8.80	696.98	60.9
New Hope	14.38	8.73	685.20	59.35
Sawyer	14.02	8.68	667.73	59.43
Royal	12.36	8.73	588.90	58.7
Sierra	11.44	8.50	543.50	58.03
Nash	10.94	8.83	521.75	57.4
Mean	16.46	8.79	784.64	59.56
StDev	3.4	0.14	162.76	1.31
C.V. (%)	20.66	1.59	20.74	2.2

Planting date: 5/2/2023

Harvest date: 8/17/2023

Fertilizer: 40lb/ac 11-52-0 at planting

Table 3. Statewide Lentil Variety Evaluation. Western Triangle Ag. Research Center. 2023

Variety or ID	Yield (lb/ac)	Plot Weight (g)
Avondale	<b>244.72</b>	<b>234.33</b>
Sage	230.25	220.48
CDC Maxim CL	213.31	204.25
CDC Kermit	199.76	191.28
NDL090204R	186.00	178.10
LC14600088R	182.41	174.67
NDL090170L	177.12	169.60
CDC Richlea	173.36	166.00
CDC Viceroy	169.60	162.40
CDC Invincible CL	153.31	146.80
CDC Greenstar	151.93	145.48
NDL090185R	144.85	138.70
CDC Impala CL	139.60	133.68
CDC Impress CL	125.09	119.78
Mean	177.95	170.39
StDev	33.53	32.11
C.V. (%)	18.84	18.85

Planting date: 5/2/2023

Harvest date: 8/23/2023

Fertilizer: 40lb/ac 11-52-0 at planting



# Agronomy and Soil Nutrient Management Program





**Project Title:** WTARC On-Station 2023 Experiment Catalogue

**Principal Investigator:** Justin Vetch Superintendent/Assistant Professor of Agronomy, Western Triangle Ag. Research Center

**Personnel:** Wyatt Medina, Research Associate, WTARC, Conrad, MT

**Background:** The WTARC conducts a plethora of on-station experiments, in addition to the required yearly varietal testing trials. These experiments are a part of Dr. Justin Vetch's agronomy research program. This year's projects consisted of:

1) *USDA barley forage breeding program varietal trials*

- Montana State University is a land grant university, and as such, it has long been active in barley varietal testing and plant breeding. Current barley breeding efforts have focused on the development of malt barley varieties, but the importance of the livestock industry in the northern great plains region has shifted interest to forage variety development. Unfortunately, in Montana, most forage lines were released long ago, unprotected, and do not generate revenue to use for future improvement. The Montana Experiment Station and the Montana Wheat and Barley Committee (MWBC) have subsidized our breeding program, which has created spring and winter forage barley lines with improved forage yield and quality, foreshadowing a significant benefit to growers. The purpose of these ongoing barley forage varietal trials is to assess the currently developed forage barley lines, assisting in the development and release of barley forage varieties with improved biomass, quality, and grain yield.

2) *Collaborative sulfur source and rate effects on wheat, pea, and canola study*

- Sulfur is removed in grain and plant stubble, without replacement on many farms. It serves an essential purpose in many crops, such as oilseeds, or legumes. MSU is not able to provide strong recommendations for sulfur applications due to lack of fertility research. This problem extends to the nation at large, as there have been very little recent sulfur fertility studies at all. In addition to this, experiments regarding the effects of different sulfur sources on fertility have suffered a similar lack of coverage. The purpose of this study is to determine the effects of sulfur source and application rate on wheat, pea, and canola yield and quality.

3) *Collaborative study to examine effects of nitrogen treatment and planting density in 5 wheat varieties*

- This experiment was designed to rigorously test the effects of varying nitrogen fertilizer rates and planting densities in five different wheat varieties. The aim of this study is to understand how these agronomic factors interact and influence wheat development, yield, and quality, contributing valuable data to optimize wheat cultivation practices.

4) *Winter canola planting date and fertilizer application timing study*

- Focusing on the canola industry in the Northern Great Plains region, this study investigates the effects of varied planting dates and fertilizer application timings on winter canola. The objective is to determine the optimal conditions for maximizing canola yield and quality.

5) *MiniCore barley preharvest sprout testing*

- The National Small Grains Collection maintains the germplasm of 1,860 barley varieties of diverse origin, growth habit, and row type. These entries are known as the informative core, or iCore lines. Of these lines, a subset was chosen based on susceptibility to preharvest sprout, among other traits. This collection is referred to as the “miniCore” lines. The goal of this study is to examine how preharvest sprout manifests across a genetically diverse barley population.

6) Hyperspectral imaging for the discrimination of herbicide resistant wild oats

- Proper weed management is essential to ensuring crop welfare. Over the years, a variety of different herbicides have been created to quell the emergence of harmful, competitive weeds. These solutions, however, are only temporary. Throughout the course of mankind’s use of herbicides for weed control, some plants have developed robust resistances to certain widely used herbicides. Standard practices for detection of herbicide resistance and identification of multiple herbicide resistant (MHR) flora involve laborious seed collection followed by herbicide application in controlled settings. This process is time consuming, and expensive. The focus of this study involves leveraging emergent hyperspectral imaging technology to noninvasively detect MHR and herbicide susceptible wild oat.

**Overview:** The 2023 research initiatives at the WTARC have been focused on delivering scientifically rigorous and agriculturally relevant results. This year’s experiments have been strategically designed to address critical issues in crop production and management. Our studies range from evaluating varietal performance in barley forage to the precise application of hyperspectral imaging in weed control. Each project is grounded in empirical research methodologies, aiming to generate data that can directly inform farming practices and agricultural product development. The findings from these studies are intended to provide valuable insights for farmers, agronomists, and industry stakeholders, contributing to enhanced crop yields, sustainable farming practices, and overall agricultural efficiency. Through these experiments, the WTARC reaffirms its commitment to scientific excellence and its role in advancing the field of agronomy.



# Entomology/Insect Ecology Program



## Welcoming Our Newest WTARC Faculty Member

We are delighted to introduce Dr. Tiziana Oppedisano, who has recently joined our team as an Assistant Professor of Entomology/Insect Ecology. Dr. Oppedisano comes to us with a rich background in biology and entomology, having completed her studies at the University of Milan, Italy, and further specializing with a Ph.D. in Sustainable Plant Production and Protection from the Fondazione Edmund Mach/University of Molise, Italy.

Her doctoral research, focused on the biology and ecology of insect vectors of apple proliferation, laid a solid foundation for her subsequent work in the field. In 2019, Dr. Oppedisano moved to the USA and took up a postdoctoral researcher position at the Hermiston Agricultural Research and Extension Center (Oregon State University). Here, she made significant contributions to understanding the role of leafhoppers as vectors of phytoplasma and virus diseases in various crops, with particular emphasis on integrated pest management approaches.



*Dr. Tiziana Oppedisano*

An active member of the Entomological Society of America, Dr. Oppedisano is not just a scholar but also an avid participant in local outreach events, reflecting her commitment to community engagement and knowledge dissemination.

At the Western Triangle Agricultural Research Center, Dr. Oppedisano's research will primarily focus on the integrated management of agricultural arthropod pests, particularly in small-grain, pulse, and oilseed crops within the Golden Triangle. Her work aims to deepen our understanding of pest biology and ecology in these crop systems and to translate this knowledge into practical, cost-effective, and environmentally sensitive pest management tactics. Key pests under her study include the wheat stem sawfly and wireworms in wheat, pea leaf weevils in pulses, and flea beetles in canola.

Dr. Oppedisano is enthusiastic about her role and is keen to collaborate with colleagues and stakeholders. She invites anyone with arthropod pest concerns to reach out to her for assistance and guidance.



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