

Project Title: Off-Station winter wheat variety performance trials in Central Montana - CARC

Project Leader: J.O. Eberly Assistant Professor, CARC, Moccasin

Project Personnel: P.L. Bruckner MAES winter wheat breeder, Bozeman
J.E. Berg MAES Res. Assoc. WW breeder, Bozeman
Eva Magnuson Research Associate, CARC, Moccasin
Jenni Hammontree, Research Lab Manager, CARC, Moccasin

Objectives

Identify top performing winter wheat cultivars in central Montana.

Methods

Standard winter wheat variety performance trials were conducted on chemical fallow or minimal tillage during the fall of 2019 at Moccasin (CARC) and on farms near Denton. Trials consisted of both named varieties of winter wheat and additional experimental lines. Each variety was seeded in three 5-row, 16 foot plots in a randomized experimental design. Seeding dates were September 26, 2019 at Moccasin and October 25, 2019 at Denton. The remaining off-station winter wheat trials could not be planted due to unseasonably wet weather. All plots were trimmed to a harvest length of approximately 12 feet and harvested with a small plot combine. Plots were harvested on August 7 at Moccasin and August 25 at Denton.

Results

The 2020 growing season at CARC started out with good recharge soil moisture and above average precipitation in September, which prevented access to the fields. Total annual precipitation was below the 110-year average (Table 1). This created favorable conditions for winter wheat growth during the mid-spring period. Average annual temperature was 0.1°F higher than the 110-year mean, with individual monthly averages 9.9°F below average in October but 5.4°F warmer in December. August was the hottest month with an average monthly temperature of 68.9°F (3.9°F above normal). Rainfall was 0.71 in above average in June while July and August were 0.68 and 1.23 in below average, respectively.

Average grain yield was 95.5 bu/ac at Denton (Table 2) and 55.0 bu/ac at Moccasin (Table 3). The top-yielding cultivar at Moccasin was Byrd CL Plus (66.2 bu/acre) and differences between the top six cultivars were not significant. The top-yielding cultivar at Denton was Northern 113.8 bu/ac) and differences in yield were not significant among the top six cultivars. Average protein at Moccasin was 10.8% compared Denton's average of 12.2%. Brawl CL Plus had the highest protein content of the named varieties planted at Moccasin this year at 12.6%. At Denton, there was no significant difference in protein among the tested varieties.

Summary

A wetter than average fall prevented the planting of some winter wheat variety trials. As a result, trials were only conducted at Moccasin and Denton. While rainfall in June was above the historic average, below average rainfall in July and August may have negatively impacted yields at Moccasin, where yields were about 9 bu/ac below the 3-year average. This work has been strongly supported by producers at the off-station locations and by the Central Agricultural Research Center Advisory Council. With budget and other resources allowing, plans are in place to continue off-station cereal variety investigation throughout the central Montana region.

Funding Summary:

An expenditure summary will be provided by OSP. No additional grant support was provided for this project.

MWBC FY 2021 Grant Submission Plans:

A request for continuing this project was submitted for funding consideration for the next fiscal year.

Table 1: Monthly precipitation and temperature data during the 2019-20 growing season and the long-term average at the Central Ag. Research Center in Moccasin, MT.

Month	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Year
Year	2019	2019	2019	2019	2020	2020	2020	2020	2020	2020	2020	2020	
Precipitation (inches)													Total
Average (1910-2020)	1.45	0.92	0.57	0.53	0.53	0.46	0.7	1.22	2.64	3.08	1.64	1.58	15.32
Current Year	2.87	0.85	0.78	0.30	0.26	0.56	0.43	0.77	2.68	3.79	0.96	0.35	14.60
Difference	1.42	-0.07	0.21	-0.23	-0.27	0.10	-0.27	-0.45	0.04	0.71	-0.68	-1.23	-0.72
Temperature (°F)													Average
Average (1910-2020)	55.9	34.9	31.0	30.4	26.1	26.6	30.5	36.7	50.8	59.0	64.8	68.9	43.0
Current Year	54.9	44.8	32.9	25.0	21.9	24.5	30.6	40.8	50.1	57.9	65.9	65.0	42.9
Difference	1.0	-9.9	-1.9	5.4	4.2	2.1	-0.1	-4.1	0.7	1.1	-1.1	3.9	0.1

Table 2: 2019-2020 Winter Wheat Trial, Denton, MT

Variety/Pedigree	Year of Release	Source	Height (in)	Test Weight (lb/bu)	Protein (%)	Grain Yield (bu/ac)			
						2018	2019	2020	3 yr avg
AAC Wildfire	2015	Alberta: SECAN	37.4	62.0	12.1		59.4	101.4	
Bobcat			29.6	62.0	11.9			86.9	
Brawl CLP	2011	Colorado Research Foundation	30.9	62.2	12.5	54.7	56.1	78.8	63.2
Byrd CL Plus	2018	Plainsgold/Col. Wheat Res Fdn	33.8	61.8	11.6			93.9	
Flathead			32.3	61.8	12.1			99.5	
FourOsix	2018	Montana (MT1465)	34.1	62.5	12.3	50.6	69.1	109.8	76.5
Judee	2011	Montana	33.3	62.6	12.1	51.6	56.5	98.6	68.9
Keldin	2011	Westbred	32.5	62.3	12.6	30.4	70.1	97.9	66.1
Loma	2016	Montana	32.7	61.2	12.7	56.2	61.6	95.0	70.9
Northern	2015	Montana	34.5	61.2	12.0	53.0	67.2	113.8	78.0
StandClear CLP			33.7	62.7	12.4			106.8	
SY Clearstone 2CL	2012	Montana/Syngenta	36.8	60.9	12.7	61.2	59.7	90.8	70.6
SY Monument	2015	Syngenta	32.1	60.6	12.1	53.3	60.1	95.3	69.6
Warhorse	1013	Montana	33.4	61.2	12.6	54.8	61.8	104.4	73.7
Yellowstone	2005	Montana	34.4	61.2	11.9	51.8	59.4	93.6	68.3
Average			33.3	61.5	12.2	53.7	62.3	95.5	
LSD (0.05)			1.9	1.2	ns	22.5	7.5	15.2	
CV (%)			3.3	1.1	5.7	19.8	6.6	8.8	
P-value			<.0001	<.0001	0.0937	0.5000	0.0062	<.0001	

Bolded and underlined values are the highest mean. Bolded values are not different from the highest value based on the Least Significant Difference (LSD) test

Note: Study averages include experimental lines not listed here.

N.S. = Not Significant

Table 3: 2019-2020 Winter Wheat Trial, Moccasin, MT

Variety/Pedigree	Year of Release	Source	Test Weight (lb/bu)	Protein (%)	Grain Yield (bu/ac)			
					2018	2019	2020	3 yr avg
AAC Wildfire	2015	Alberta: SECAN	63.1	10.5		77.9	59.4	
BobCat			63.5	10.2			55.0	
Brawl CLP	2011	Colorado Research Foundation	65.1	12.6	59.1	63.1	45.8	56.0
Byrd CL Plus	2018	Plainsgold/Col. Wheat Res Fdn	64.8	9.1		76.2	<u>66.2</u>	
Flathead			63.3	11.4			46.9	
FourOsix	2018	Montana (MT1465)	63.6	10.3	70.0	76.3	62.0	69.4
Judce	2011	Montana	64.9	11.0	57.9	69.6	56.1	61.2
Keldin	2011	Westbred	63.9	10.9	66.3	73.0	60.7	66.7
Loma	2016	Montana	63.3	10.5	68.0	71.6	59.4	66.4
Northern	2015	Montana	63.6	11.1	68.0	71.6	59.8	66.5
StandClear CLP			65.1	11.3			54.8	
SY Clearstone 2CL	2012	Montana/Syngenta	63.2	10.5	67.8	80.6	57.6	68.7
SY Monument	2015	Syngenta	63.9	10.4	71.5	77.6	55.1	68.1
Warorse	1013	Montana	63.8	11.1	60.6	66.0	51.2	59.3
Yellowstone	2005	Montana	62.6	10.6	68.7	71.9	57.2	65.9
Average			63.8	10.8	65.5	71.2	55.0	
LSD (0.05)			1.6	0.7	10.4	9.4	7.2	
CV (%)			1.5	3.8	11.1	7.6	8.1	
P-value			<.0001	<.0001	0.0006	<0.0001	<.0001	

Bolded and underlined values are the highest mean. Bolded values are not different from the highest value based on the Least Significant Difference (LSD) test

Note: Study averages include experimental lines not listed here.

N.S. = Not Significant