Project Title: Evaluation of spring wheat cultivar performance under continuous crop and crop-fallow systems in central Montana

Project Leader: D.M. Wichman (pre-July 8) and P.M. Carr (post-July 8)

Project Personnel:

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Objectives:
Identify top performing spring wheat cultivars in central Montana.

Results:
The 2015-16 growing season at CARC was drier (13.1 inches) than the long-term average (15.3 inches; Table 1). Less-than-average amounts of precipitation occurred each month from September through March, but timely precipitation in April along with greater than average amounts of precipitation in May (4.5 vs. 2.6 inches) created favorable conditions for plant growth during the mid-spring period. Dry conditions developed again in June (1 inch vs. a long-term average of 3.1 inches) while average amounts of precipitation (1.7 inches) were received during July. August was slightly drier than normal, with 87% of the long-time average (1.6 inches) received. Mean air temperature was warmer than the long-term average (46^{o}F vs. 43^{o}F). More favorable growing conditions occurred at Geraldine than at Moccasin, but mean grain yield was similar at both locations. Grain yield of spring wheat cultivars averaged 35 bu/ac at Geraldine compared with 34 bu/ac at Moccasin (Tables 2 and 3). Alum, Egan, Reeder, and Duclair were among the top-performing performers for grain yield at those two locations along with Highwood. These same cultivars were planted at Denton but a hailstorm forced abandonment of the study. It was expected that Alum would perform well at Highwood relative to other cultivars because of acidic soil conditions (pH < 5; Table 4), but this cultivar also produced the highest mean grain yield at both Moccasin and Geraldine.

Mean protein concentration of grain ranged from less than 12% across cultivars at Geraldine to over 14% at Moccasin. Gross returns integrated protein concentrations (premiums and discounts) and grain yield into a single ranking criterion. Egan and Alum were among the top-ranked cultivars using this ranking criterion at each of three locations (Moccasin, Geraldine, and Highwood). Readers should compare gross returns of contrasting cultivars only with caution since statistical analyses were not used to separate treatment means.

Summary:

Less than average precipitation was received during the 2016 growing season at Moccasin, acidic soils were encountered at Highwood, hail destroyed the study at Delton, and good growing conditions generally occurred at Geraldine but spring wheat performance was similar to that at Moccasin. Results indicate that Egan along with Alum were among the top performing cultivars included in spring wheat variety testing across central Montana in 2016.

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

MWBC FY 2017 Grant Submission Plans:
A request for continuing this project was submitted for funding consideration for the next fiscal year. Funding was awarded. Thank you!

Table 1. Monthly precipitation and temperature data during the 2015-16 growing season and the long-term average at the Central Ag. Research Center in Moccasin, MT.

Month	Year	Precipitation, in		Air Temperature, °F	
		Current Year	*1909-2016*	*Current Year*	*1911-2016*
Sep	*2015*	0.8	1.4	57.8	54.9
Oct	"	0.6	0.9	48.7	44.9
Nov	"	0.5	0.6	33.4	32.8
Dec	"	0.4	0.5	27.2	25.0
Jan	*2016*	0.3	0.5	27.9	21.8
Feb	"	0.3	0.4	35.8	24.7
Mar	"	0.6	0.7	38.4	30.6
Apr	"	1.2	1.2	45.3	40.8
May	"	4.5	2.6	50.4	50.1
Jun	"	1.0	3.1	61.7	57.9
Jul	"	1.7	1.7	66.0	65.9
Aug	"	1.4	1.6	64.3	64.9
Total\Average		13.3	15.3	46.4	42.9

Table 2. Off Station Spring Wheat Test (Moccasin, CARC), Montana.

ID	Variety	Grain Yield (bu/ac)			Test Weight (lbs/bu)	Protein (%)	Gross returns $/ac*
		2016	2015-16	2014-16			
CI 13596	FORTUNA	35.1	32.8	32.2	59.6	14.0	165.0
PI574642	MCNEAL	31.0	29.1	28.7	60.2	14.0	145.6
ND 695	REEDER	36.3	31.7	31.0	60.1	14.5	174.1
PI633974	CHOTEAU	35.9	31.8	30.9	59.9	14.3	170.9
PI642366	VIDA	33.5	32.2	34.0	60.2	14.0	157.5
PI660981	DUCLAIR	35.4	33.1	33.8	59.1	13.3	161.1
NDSW0449	MOTT	27.9	26.3	27.2	60.9	15.1	137.1
BZ996434	CORBIN	30.3	29.1	31.0	59.8	14.5	145.3
BZ999592	ONEAL	33.1	33.3	32.0	60.8	13.8	154.3
WB9879CLP	WB9879CLP	33.8	30.8	47.1	61.3	14.5	162.2
BZ92413R	WB GUNNISON	33.2	32.0	32.2	60.3	13.4	152.1
AGRIPR10	BRENNAN	31.1	29.6	29.8	62.0	14.7	150.2
AGRIPR12	SY TYRA	36.2	30.9	29.0	61.1	12.9	161.9
AGRIPR14	SY SOREN	32.4	28.5	…	60.5	15.8	164.0
EGAN	EGAN	37.4	33.7	33.8	59.3	14.5	179.4
WSCIA	ALUM	37.5	…	…	61.1	13.6	173.2
Pulse USA	PRESTIGE	31.4	30.0	31.4	60.4	14.7	151.8
Pulse USA	REDSTONE	29.0	26.6	28.1	57.0	14.2	137.5
Croplan	HRS 3100	35.3	…	…	60.5	14.0	165.6
Croplan	HRS3361	29.3	…	…	60.4	15.0	143.3
Croplan	HRS 3504	35.2	…	…	60.0	13.9	164.6
Croplan	HRS 3530	32.2	…	…	59.4	14.7	155.9
	Average	33.9	30.7	32.0	60.2	14.2	160.5
	LSD (0.05)	8.10	…	…	1.61	…	…
	C.V. (%)	14.50	…	…	1.30	…	…

*: Prices are calculated based on protein premiums and discounts as of September 2016, United Grains Elevator.

Table 3. Off Station Spring Wheat Test (Geraldine, CARC), Montana.

ID	Variety	Grain Yield (bu/ac)			Test Weight (lbs/bu)	Protein (%)	Gross returns $/ac
		2016	2015-16	2014-16	2016		
CI 13596	FORTUNA	34.4	35.1	33.9	60.8	12.4	150.4
PI574642	MCNEAL	36.5	37.7	35.2	58.6	11.7	154.7
ND 695	REEDER	38.6	38.7	37.1	61.6	11.4	160.4
PI633974	CHOTEAU	39.9	36.7	36.2	60.5	11.9	170.4
PI642366	VIDA	37.4	39.8	38.1	60.2	11.2	152.3
PI660981	DUCLAIR	41.2	38.2	37.7	59.7	10.9	162.8
NDSW0449	MOTT	32.8	36.9	34.5	59.2	12.5	144.2
BZ996434	CORBIN	36.9	35.8	35.3	61.2	11.2	150.4
BZ999592	ONEAL	36.0	37.6	35.0	58.7	11.2	146.7
WB9879CLP	WB9879CLP	37.2	39.5	39.6	60.7	11.7	159.2
BZ92413R	WB GUNNISON	34.9	36.3	35.0	61.4	11.0	139.4
AGRIPR10	BRENNAN	35.6	40.1	37.6	61.7	13.0	160.2
AGRIPR12	SY TYRA	29.2	36.0	34.2	56.7	12.1	126.2
AGRIPR14	SY SOREN	36.0	…	…	59.8	12.3	156.9
EGAN	EGAN	40.8	39.8	38.0	59.8	12.7	181.1
WSCIA	ALUM	42.0	…	…	62.2	11.4	174.4
Pulse USA	PRESTIGE	32.0	37.2	35.0	59.5	11.6	134.9
Pulse USA	REDSTONE	38.2	33.0	33.2	59.4	11.8	162.6
Croplan	HRS 3100	29.5	…	…	57.0	11.6	124.4
Croplan	HRS3361	26.7	…	…	58.6	12.0	114.8
Croplan	HRS 3504	34.8	…	…	58.6	10.4	130.8
Croplan	HRS 3530	30.0	…	…	59.3	11.6	127.2
	Average	35.2	37.4	36.0	59.9	11.5	146.3
	LSD (0.05)	5.74			1.58		
	C.V. (%)	9.94			1.28		

*: Prices are calculated based on protein premiums and discounts as of September 2016, United Grains Elevator.

Table 4: Off Station Spring Wheat Test (Highwood, CARC), Montana.

ID	Variety	Grain Yield (bu/a)	Test Weight (lbs/bu)	Protein (%)	Gross returns $/ ac
CI 13596	FORTUNA	28.7	60.3	13.0	129.0
PI574642	MCNEAL	29.9	58.1	12.2	129.8
ND 695	REEDER	37.8	59.9	13.6	174.5
PI633974	CHOTEAU	35.1	58.8	13.0	157.8
PI642366	VIDA	33.9	59.4	11.5	142.2
PI660981	DUCLAIR	37.2	59.7	12.5	163.4
NDSW0449	MOTT	30.9	58.5	14.5	148.0
BZ996434	CORBIN	35.0	60.6	13.1	157.9
BZ999592	ONEAL	30.4	58.1	12.1	131.0
WB9879CLP	WB9879CLP	35.9	59.8	13.3	163.4
BZ92413R	WB GUNNISON	29.5	61.3	11.5	123.6
AGRIPR10	BRENNAN	27.6	59.8	15.4	137.2
AGRIPR12	SY TYRA	23.0	57.6	13.3	104.9
AGRIPR14	SY SOREN	29.3	60.4	14.8	142.1
EGAN	EGAN	42.2	60.3	14.5	202.2
WSCIA	ALUM	46.4	62.7	13.2	210.3
Pulse USA	PRESTIGE	22.1	57.4	12.2	95.8
Pulse USA	REDSTONE	39.1	59.3	12.3	170.3
Croplan	HRS 3100	31.7	58.7	11.1	127.8
Croplan	HRS3361	23.8	58.4	12.4	104.1
Croplan	HRS 3504	33.9	59.5	12.1	146.3
Croplan	HRS 3530	30.7	57.0	12.8	136.9
Average		32.4	59.4	12.9	145.2
LSD (0.05)		4.94	2.53	…	…
C.V. (%)		9.31	2.07	…	…

*: Prices are calculated based on protein premiums and discounts as of September 2016, United Grains Elevator.