The MONTANA STATE UNIVERSITY
MONTANA AGRICULTURAL EXPERIMENT STATION

RESULTS OF AGRONOMIC AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2016

Annual Report of the Investigations at and Administration of the
Southern Agricultural Research Center, Huntley, Montana
http://www.sarc.montana.edu/

PROJECT TITLE:

Off-Station Spring Wheat Variety Performance Trials in South Central Montana. This research is partially supported by the Montana Wheat and Wheat Committee.

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OBJECTIVES:

To provide growers in south central Montana with a reliable, unbiased, up-to-date source of information that will permit valid comparisons among improved spring wheat varieties. This information should help spring wheat producers in south central Montana select varieties best suited to their particular area and growing conditions.

METHODS:

The 2016 off-station spring wheat trials in south central Montana were established under dryland conditions near Broadview and Musselshell, and under irrigated conditions near Fromberg and Hysham, Montana (Figure 1). The spring wheat trials for this region of Montana each possessed 25 entries made up of 17 commercial cultivars and 8 experimental lines.

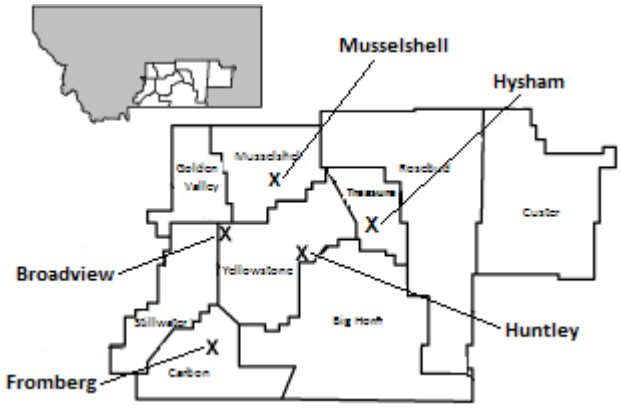

Figure 1. 2016 off-station spring wheat trial locations in south central Montana.

All studies were planted using a partially-balanced lattice design with three replications. All entries were seeded at approximately 0.75 million seeds per acre under dryland conditions (~45 lb/a) and 1.5 million seeds per acre under irrigation (~90 lb/a). Seeding rates were not adjusted for germination. Information pertaining to the traits and characteristics of the commercial spring wheat cultivars are provided in Table 1.

Dryland test plots consisted of a 16-foot, 4-row plot with 12-inch row spacing, while irrigated plots were 16-foot, 7-row with 7-inch row spacing. All rows of each test plot were trimmed 36 inches and harvested using an experimental plot combine. Recorded grain yields were adjusted to 13% grain moisture content, and are reported in bushels per acre (bu/a) based on a 60 pound standard bushel weight. Test weight (lb/bu, pounds per bushel) and grain moisture content (%, percent) were obtained for each plot using a Dickey-John™ GAC 2100 grain analyzer. Grain protein (%, percent) was estimated using near infrared spectroscopy. Reported grain protein values are adjusted to 12% grain moisture content. Plant height was measured in inches from the soil surface to the top of the head, excluding the awns if present. Lodging severity was recorded on a 0 to 9 scale, at Huntley, Fromberg and Hysham, representing no lodging to all stems lying flat on the ground, respectively.

RESULTS:

The 2016 spring wheat test sites had below average rain or snow accumulation during winter months except in October. Precipitation during spring months, March through May, provided adequate soil moisture for spring wheat planting and emergence. Below-average precipitation in June and July resulted in late season drought stress at all test sites. Moreover, temperature was above-average through-out the spring wheat growing season except in May and July. Late season drought stress coupled with above average temperature in 2016 growing season resulted in accelerated wheat growth and caused early maturity.

Dryland spring wheat yield at Broadview averaged only 12 bu/a in 2016 (Table 2) less than half compared to last year. Lower yield at this location this year was mainly attributed to drought at planting and during the grain filling period. 'WB Gunnison' was the highest yielding cultivar with 16 bu/a. Four other entries have the yields statistically equal to that of highest yielding entry. Spring wheat test weight averaged 63.5 lb/bu and ranged from 61.9 to 64.9 lb/bu. Grain protein averaged 9.3 percent. Averaged yield over the past two- and three-year was 20 and 23 bu/a respectively at Broadview.

Musselshell was the new spring wheat test site replacing Billings. Grain yield near Musselshell averaged 18 bu/a in 2016 (Table 3). "Vida" was the highest yielding entry with 23 bu/a. Eleven other entries produced yield from 18 to 22 bu/a, statistically equal to that of highest yielding entry. Test weight averaged 61.8 lb/bu. All entries had a test weight of 60 lb/bu or more except for 'Egan' and 'McNeal'. Grain protein levels averaged 11.1 percent and ranged from 9.9 percent to 12.2 percent.

Irrigated spring wheat yield averaged 97 bu/a at Huntley in 2016 (Table 4). Lodging score was low (1.7 out of 9) at Huntley. Six entries showed relatively higher level of lodging ranging from a score of 3.3 for 'Alum to a score 7.5 for 'Fortuna'. Grain yield varied from 64 bu/a for Fortuna to 115 bu/a for experimental line 'HRS3419'. Ten other entries produced yield statistically equal to that of highest yielding cultivar. 'SY Soren' was the highest yielding commercial cultivar at Huntley. Test weight was good and averaged 61.8 lb/bu. Test weight ranged from 58.8 for 'Oneal' to 63.7 lb/bu for 'Brennan'. Grain protein levels were high and averaged 15.1 percent. 'Solana' was the highest yielding cultivar tested under irrigation at Huntley the past 2 years (2014 and 2016), averaging 101 bu/a.

No lodging was observed for most entries under irrigation at Hysham in 2016. 'Fortuna' was the only cultivar exhibited moderately high lodging (Table 5).

Average yield at Hysham was 104 bu/a, about 24 bu/a more than the last year. Yield ranged from 79 bu/a for Fortuna to 113 bu/a for WB Gunnison. Sixteen other entries produced yield ranged from 103 to 112.5 bu/a, statistically equal to the yield of highest yielding cultivar. Test weight was excellent averaging 63.7 lb/bu, and all entries produced test weight above 62 lb/bu. Grain protein averaged 11.9 percent ranged from 10.4 to 13.3 percent. Average yield, at Hysham, over the past two- and three-year was 93 and 95 bu/a respectively.

Little or no lodging was also observed for most commercial cultivars under irrigation at Fromberg in 2016 (Table 6). Cultivar Fortuna exhibited relatively low lodging (3.1 out of 9) that reduced its yield. The yield at Fromberg in 2016 averaged 105 bu/a marginally higher than last year. This location produced the highest grain yield among all test sites in 2016. Grain yield ranged from 86 bu/a for Fortuna to 120 bu/a for 'WB9879CLP'. Seven other commercial cultivars produced yield ranged from 107 to 116 bu/a, statistically equal to the highest yielding cultivars. Test weight averaged 63.4 lb/bu and ranged from 61.8 to 64.3 lb/bu. Grain protein levels averaged 12.3 percent and ranged from 11.1 for SY Tera to 13.9 percent for Egan. Over the past three years average yield have been fairly stable at Fromberg. Two- and Three-year average yield for spring wheat varieties tested during 2014 - 2016, was 101 and 98 bu/a respectively. The commercial cultivars WB9879CLP and Duclair were the best performing cultivar over the past two- and three-year averaging a grain yield of 112 and 109 bu/a respectively.

SUMMARY:

Higher than normal temperature and below-average precipitation during grain filling period caused late season drought stress that attributed to poor yield at dryland locations and resulted in earliest spring wheat harvest in south eastern Montana. In 2016, WB9879CLP was the highest yielding cultivar across all locations tested in south central Montana averaging 75 bu/a, and closely followed by cultivar Duclair with an average yield of 74 bu/a, (Tables 7 and 8). Commercial cultivars Vida and WB Gunnison exhibited highest average yield of 18 bu/a under dryland conditions (Tables 8 and 10). Duclair was also the top yielding cultivar under irrigated condition over the past two- and three-years respectively (Table 9). Long-term productivity based on last two and three years average yield across all locations were also highest for Duclair (Table 8). Across all locations for the past three years, five other entries produced yields ranged from 70 to 72 bu/a, which was statistically equal to the yield of Duclair. Averaged across locations grain protein content was 12.0 percent. Overall test weight averaged 62.9 lb/bu (Table 8), while averaged 63.0 lb/bu across irrigated locations (Table 9).

Table 1. Selected characteristics and traits of commercial spring wheat cultivars performance tested at three off-station sites in south central Montana during 2016.

Cultivar	Origin 1/	Year of Release	Market Class 2/	PVP 3/	Maturity 4/	Straw Strength 5/	Disease Resistance 6/					Insect Resistance 6/		Quality 7/		Clearfield 8/
							Fusarium Head Blight (Scab)	Leaf Rust	Stem Rust	Stripe Rust	Wheat Stem Sawfly	Russian Wheat Aphid	Hessian Fly (GP)	Milling	Baking	Type
				Yes/No										1-5	1-5	Yes/No
Alum	WSU		HRS		M-L	MS				MR			R			
Brennan	Syngenta	2009	HRS	Y	E	S	MR	R	R	S	S	S	S	-	-	N
Choteau	MSU	2003	HRS	Y	E-M	VS	S	-	R	S	R	S	S	4	4	N
Corbin	WestBred	2006	HRS	Y	E	MS	S	-	-	R	R	S	-	3	3	N
Duclair	MSU	2011	HRS	Y	E-M	S	-	-	MR	MR	-	-	-	-	-	N
Egan	MSU	2014	HRS	Y		-	-	-	-	MR	-	S	-	-	-	N
Fortuna	NDSU	1966	HRS	N	E	MW	S	R	R	VS	R	S	S	5	4	N
McNeal	MSU	1995	HRS	N	M	S	S	MS	MR	VS	S	S	S	3	5	N
Mott	NDSU	2009	HRS	Y	M-L	-	S	MS	MR	-	R	-	-	4	4	N
Oneal	WestBred	2008	HRS	Y	M	S	S	-	-	S	MS	S	-	3	3	N
Reeder	NDSU	1999	HRS	Y	M-L	S	MS	MR	R	MR	S	S	S	3	3	N
Solano	WestBred	2007	HRS	Y	-	-	-	MR	MR	MR	-	-	-	-	-	N
SY Soren	Syngenta	2011	HRS	Y	E-M	S	MR	MR	R	-	-	-	-	-	-	N
SY Tyra	Syngenta	2011	HRS	Y	M	M	S	R	R	MR	MR	-	-	-	-	N
Vida	MSU	2006	HRS	Y	M-L	S	S	-	MS	MR	MS	S	S	4	4	N
WB Gunnison	WestBred	2010	HRS	Y	-	-	-	-	-	.	MR	-	-.	-	-	N
WB9879CLP	WestBred		HRS	Y	E-M	S	MS	S		MR	R			3	3	Y

1/ AAFC=Agriculture & Agri-Food Canada; AgriPro=AgriPro COKER, Berthoud, Colorado; MSU=Montana State University; NDSU=North Dakota State University; SDSU=South Dakota State University; UI=University of Idaho; WestBred=WestBred Group, Monsanto Co., Bozeman, WSU=Montana; Washington State University.

2/ HRS=hard red spring wheat market class; HW=hard white wheat market class.

3/ Indicates a cultivar is protected under the Federal Plant Variety Protection Act of 1970 and amended in 1995.

4/ E=early maturity, M=medium maturity, L=late maturity.

5/ S=strong straw strength, MS=moderately strong straw strength, M=medium straw strength, MW=moderately weak straw strength, W=weak straw strength.

6/ R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible, VS=very susceptible.

7/ Milling and baking quality rated from 1 to 5 where 1=poor and 5=superior quality, respectively.

8/ Signifies a cultivar possessing the Clearfield trait imparting tolerance to Beyond® (imazamox) herbicide.

Table 2. Performance of 25 spring wheat cultivars tested under no-till, dryland conditions near Broadview, Montana during 2016. Cultivars listed alphabetically. (Exp. 169995).

Cultivar	1/ Grain Yield 2016	2015-16	2014-16	Test Weight	Grain Moisture	2/ Grain Protein	Plant Height
	------- bushels/acre -------			lb/bu	%	%	inches
Commercial							
Alum	13.0			64.4	11.1	8.4	17.7
Brennan	9.3	20.2	24.5	64.6	10.4	10.7	18.1
Choteau	10.9	18.9	22.2	63.6	10.6	9.5	18.2
Corbin	13.0	18.9	22.4	64.0	10.7	8.9	18.2
Duclair	13.0	20.8	24.0	63.4	10.7	9.1	19.7
Egan	10.5	19.2	22.4	62.0	10.2	10.2	18.6
Fortuna	10.7	17.4	21.9	62.5	10.7	9.3	23.2
McNeal	11.5	19.0	22.6	62.2	10.4	9.4	20.0
Mott	13.4	21.5	23.7	63.6	10.6	9.5	19.7
Oneal	**13.9***	19.5	23.1	62.9	11.0	8.5	20.2
Reeder	11.2	18.2	22.6	64.4	10.7	9.2	18.1
SY Soren	11.1	18.3		64.5	10.6	10.1	20.2
SY Tyra	13.1	20.3		64.6	10.8	9.0	16.9
Vida	**13.9***	21.3	24.7	63.7	10.8	8.8	19.0
WB Gunnison	**15.9****	21.6	24.7	64.0	10.6	8.5	19.2
WB9879CLP	12.5	21.4		64.2	10.7	9.5	17.8
Experimental							
HRS 3100	12.5			62.2	10.5	9.1	18.2
HRS 3361	10.5	17.9		62.6	10.2	10.2	18.3
HRS 3504	**13.7***			62.4	10.7	8.5	17.9
HRS 3530	9.4	18.1		64.1	10.8	9.5	21.3
HRS 3616	10.2			63.6	10.5	10.2	19.9
MT 1173	**13.9***			62.8	10.9	8.5	19.8
MT 1316	9.8	19.8		61.9	10.5	9.1	17.9
MT 1348	10.7			64.1	10.7	9.6	20.0
MT 1401	12.3			64.9	10.7	8.9	18.6
Average	12.0	19.6	23.2	63.5	10.7	9.3	19.1
PLSD (p=0.05)	2.2	ns	ns	1.1	0.2	0.4	1.8
CV%	10.3	8.6	12.4	1.0	1.3	2.5	5.6

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).
ns Indicates no significant difference between cultivars within a column based on fisher's protected LSD (p=0.05

Broadview Dryland Spring Wheat (Exp. 169995)	
Planted:	April 4, 2016
Harvested:	August 8, 2016
Fertility:	n/a
Herbicide:	na
Insecticide:	none applied
Previous Crop:	fallow
Precipitation:	n/a

Table 3. Performance of 25 spring wheat cultivars tested under conventional dryland conditions near Musselshell, Montana during 2016. Cultivars listed alphabetically. (Exp. 169994).

Cultivar	1/ Grain Yield 2016	2015-16	2014-16	Test Weight	Grain Moisture	2/ Grain Protein	Plant Height
	------- bushels/acre -------			lb/bu	%	%	inches
Commercial							
Alum	**19.9***			62.7	11.0	10.3	24.2
Brennan	16.4			62.8	10.4	12.3	22.6
Choteau	15.8			62.1	10.5	11.1	23.0
Corbin	17.0			62.2	10.6	10.8	24.0
Duclair	**18.2***			61.1	10.5	10.7	25.1
Egan	16.6			59.2	10.1	12.2	23.3
Fortuna	16.4			61.0	10.5	10.8	29.1
McNeal	**18.0***			59.1	10.2	11.4	25.5
Mott	**20.7***			63.1	10.6	11.2	24.3
Oneal	17.3			60.8	11.0	10.8	24.1
Reeder	15.1			62.2	10.4	11.7	22.5
SY Soren	**18.0***			62.7	10.6	11.9	22.8
SY Tyra	**19.5***			63.8	10.9	10.0	23.8
Vida	**22.6****			62.2	10.9	10.1	25.0
WB Gunnison	**20.2***			62.3	10.8	10.7	23.0
WB9879CLP	**19.9***			62.3	10.4	11.1	22.5
Experimental							
HRS 3100	15.0			61.1	10.2	11.2	23.8
HRS 3361	16.2			61.5	10.3	11.8	22.8
HRS 3504	**21.6***			61.6	10.5	9.9	22.5
HRS 3530	15.4			61.7	10.5	11.3	25.2
HRS 3616	17.2			62.2	10.5	11.8	24.8
MT 1173	**22.4***			61.8	10.8	10.1	26.7
MT 1316	**19.2***			61.5	10.4	11.2	23.8
MT 1348	13.1			61.9	10.5	11.5	23.1
MT 1401	15.7			63.1	10.8	11.2	23.6
Average	17.9			61.8	10.6	11.1	24.0
PLSD (p=0.05)	4.9			1.1	0.3	0.6	1.9
CV%	15.4			1.1	1.8	3.2	4.4

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.

Musselshell Dryland Spring Wheat (Exp. 169994)

Planted:	April 12, 2016
Harvested:	August 2, 2016
Fertility:	11-52-0, 70 lb/a in Furrows at planting.
Herbicide:	na
Insecticide:	none applied
Previous Crop:	fallow
Precipitation:	n/a

Table 4. Performance of 25 spring wheat cultivars tested under irrigation near Huntley, Montana during 2016 Cultivars listed alphabetically. (Exp. 139909).

	1/ Grain Yield			Test	Grain	2/ Grain	Plant		Heading Date	
Cultivar	**2016**	**2015-16**	**2014-16**	**2016**	**Moisture**	**protein**	**Height**	**Lodging**	**Julian**	**Calendar**
	------- bushels/acre -------			lb/bu	%	%	inches	0-9		
Commercial										
Alum	91.8			61.5	8.9	15.3	36.5	3.3	161.7	Jun-9
Brennan	**108.2***	**96.4***		63.7	8.6	15.1	32.4	0.4	159.7	Jun-7
Choteau	**106.8***	**90.0***	84.8	61.9	8.7	14.7	39.0	3.5	161.3	Jun-9
Corbin	86.9	78.8	75.1	61.6	8.6	15.0	36.6	4.0	161.0	Jun-9
Duclair	**110.1***	**96.8***	83.8	61.3	8.4	15.0	38.3	0.4	160.3	Jun-8
Egan	**104.4***	**94.0***		62.3	8.4	16.8	39.9	0.1	163.0	Jun-11
Fortuna	64.3	65.5	63.9	61.2	8.4	16.3	43.3	7.5	162.0	Jun-10
McNeal	99.3	**88.1***	78.0	61.6	8.4	15.6	39.2	1.3	162.3	Jun-10
Mott	83.5	78.6	78.2	62.0	8.4	14.7	41.5	0.7	163.7	Jun-11
Oneal	78.9	61.3	66.5	58.8	8.2	15.1	39.0	1.0	162.3	Jun-10
Reeder	94.7	**93.8***	85.2	63.2	8.9	15.6	39.0	1.0	161.0	Jun-9
Solano	**110.9***	**101.4****	88.9	62.9	8.6	15.1	33.3	0.0	160.0	Jun-8
SY Soren	**111.6***			63.3	8.6	14.7	33.2	0.0	161.7	Jun-9
SY Tyra	100.9			61.3	9.0	13.9	34.0	0.4	162.7	Jun-10
Vida	83.2	81.5	80.5	61.3	8.7	15.7	37.8	2.9	162.7	Jun-10
WB Gunnison	**102.4***	**94.3***	85.3	62.7	9.8	14.0	36.9	0.0	161.0	Jun-9
WB9879CLP	**110.5***			62.6	8.8	14.5	36.1	0.9	162.0	Jun-10
Experimental										
HRS 3419	**114.8****			62.0	8.7	13.6	35.7	0.0	162.7	Jun-10
HRS 3504	**103.7***			60.7	8.5	14.8	34.4	0.0	163.0	Jun-11
HRS 3530	99.1			60.9	8.5	14.8	39.8	1.1	163.0	Jun-11
HRS 3616	**105.1***			62.3	8.6	15.6	37.1	0.0	161.0	Jun-9
MT 1173	72.9			59.8	8.8	15.1	39.2	5.3	163.3	Jun-11
MT 1316	99.7			62.3	8.2	15.9	36.2	0.0	158.3	Jun-6
MT 1348	91.9			62.3	8.7	15.3	37.1	1.9	160.7	Jun-8
MT 1401	77.7			62.8	8.7	15.9	39.4	5.5	160.3	Jun-8
Average	96.5	86.2	79.1	61.8	8.7	15.1	37.4	1.7	161.6	Jun-9
PLSD (p=0.05)	12.4	18.0	ns	1.1	0.4	0.5	2.3	2.4	0.8	
CV%	7.8	8.3	12.1	1.1	2.6	2.1	3.7	82.0	0.3	

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
Table 6 Continued.

** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).
ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

Huntley Irrigated Spring Wheat (Exp. 169909)

Planted:	March 18, 2016
Harvested:	August 2, 2016
Fertility:	100-0-0, spread fall 2015
Herbicide:	RT3 22 0z/a in the fall 2015
Insecticide:	none
Previous Crop:	spring barley
Irrigation:	sprinkler
Precipitation:	11.68 inches

Table 5. Performance of 25 spring wheat cultivars tested under irrigation near Hysham during 2016. Cultivars listed alphabetically. (Exp. 169996).

Cultivar	Grain Yield 1/ 2016	Grain Yield 1/ 2015-16	Grain Yield 1/ 2014-16	Test Weight	Grain Moisture	Grain Protein 2/	Plant Height	Lodging
	------- bushels/acre -------			lb/bu	%	%	inches	0-9
Commercial								
Alum	99.6			64.2	10.3	11.8	39.4	0.0
Brennan	**103.6***	**91.3***	**95.5***	64.7	9.6	13.3	34.8	0.0
Choteau	100.8	**92.3***	**100.5***	64.1	10.0	11.6	36.4	0.0
Corbin	**110.0***	**96.4***	**95.7***	64.3	10.0	11.6	37.7	0.0
Duclair	**109.9***	**98.0***	**100.6***	63.3	10.0	11.3	37.9	0.0
Egan	97.0	82.5	86.0	62.6	9.5	13.3	38.8	0.0
Fortuna	79.7	76.5	80.9	63.6	9.8	13.3	41.9	5.3
McNeal	101.1	86.7	**94.4***	62.8	9.6	11.9	38.3	0.0
Mott	**105.5***	**92.7***	91.0	63.9	9.7	12.5	43.7	0.0
Oneal	92.6	84.6	87.6	63.3	10.1	11.2	39.4	0.0
Reeder	**107.8***	**91.4***	**96.0***	64.1	9.9	12.6	40.9	0.0
Solano	**105.2***	**96.1***	**101.9****	63.9	9.9	11.6	36.5	0.0
SY Soren	**111.8***	**95.0***		64.4	9.7	12.4	34.8	0.0
SY Tyra	**107.8***	**100.3****		64.8	10.2	10.4	34.9	0.0
Vida	**107.1***	**98.3***	**99.0***	63.3	10.0	11.3	37.4	0.0
WB Gunnison	**112.8****	**100.1***	**101.4***	64.0	10.5	11.7	35.2	0.0
WB9879CLP	**112***	**93.7***		64.5	10.0	11.7	40.9	0.0
Experimental								
HRS 3419	**110.5***	**93.3***		62.5	9.7	11.0	33.7	0.0
HRS 3504	**109.7***			62.3	9.8	10.9	35.7	0.0
HRS 3530	**108.1***	**92.2***		64.2	9.8	12.1	34.3	0.0
HRS 3616	99.6			63.3	9.8	12.0	36.0	0.0
MT 1173	**105.6***			62.5	10.2	10.7	40.0	0.0
MT 1316	**112.5***	**98.1***		63.7	9.6	11.6	36.0	0.0
MT 1348	**107.2***			63.7	9.8	12.4	38.1	0.0
MT 1401	89.9			64.9	10.1	12.4	36.0	0.0
Average	104.3	92.6	94.7	63.7	9.9	11.9	37.5	0.2
PLSD (p=0.05)	10.0	10.7	10.1	0.6	0.3	0.9	3.6	0.4
CV%	5.5	7.2	6.9	0.5	2.0	4.4	6.0	108.3

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
3/ Lodging severity scores of 0 to 9 represent no lodging to all stems flat on the ground, respectively.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Hysham Irrigated Spring Wheat (Exp. 169996)

Planted:	March 7, 2016
Harvested:	July 26, 2016
Fertility:	60 lb N/a preplant, 70 lb/a 11-52-0 at planting; 140 lb N/a top dress in spring
Herbicide:	none
Previous Crop:	n/a
Irrigation:	flood
Precipitation:	n/a

Table 6. Performance of 25 spring wheat cultivars tested under irrigation near Fromberg, Montana during 2016. Cultivars listed alphabetically. (Exp. 169997).

Cultivar	Grain Yield 1/ 2016	Grain Yield 1/ 2015-16	Grain Yield 1/ 2014-16	Test Weight	Grain Moisture	Grain Protein 2/	Plant Height	Lodging
	------- bushels/acre -------			lb/bu	%	%	inches	0-9
Commercial								
Alum	**110.2***			63.8	9.9	11.9	41.3	0.2
Brennan	105.5	**106.4***	**104.3***	64.2	9.2	13.2	38.2	1.6
Choteau	**107.7***	**103.1***	**103.0***	62.9	9.5	13.1	39.4	0.6
Corbin	**112.8***	**104.4***	**104.2***	63.7	9.8	11.8	40.3	0.1
Duclair	**115.7***	**110.4***	**109.4****	63.1	9.6	11.8	41.6	0.0
Egan	99.4	92.8	93.4	63.2	9.1	13.9	40.7	0.1
Fortuna	85.8	76.2	80.0	63.6	9.5	12.8	48.7	3.1
McNeal	104.0	96.1	99.4	63.4	9.3	11.8	43.2	0.0
Mott	94.5	93.3	93.2	63.3	9.5	12.4	46.5	0.0
Oneal	95.1	92.5	92.2	61.5	9.6	12.4	42.5	0.3
Reeder	102.7	97.5	99.2	64.1	9.6	12.0	44.2	0.0
Solano	**106.5***	**103.6***	**103.5***	64.3	9.4	12.1	31.0	0.0
SY Soren	106.2	**106.8***		64.0	9.3	12.8	37.9	0.1
SY Tyra	**114.0***	**108.6***		63.2	10.3	11.1	35.8	0.8
Vida	104.8	**101.8***	**102.1***	63.3	9.8	12.1	41.9	0.5
WB Gunnison	**107.2***	96.8	97.7	64.1	10.2	12.0	39.9	0.1
WB9879CLP	**119.7****	**111.6****		64.0	9.6	11.7	40.2	0.1
Experimental								
HRS 3419	105.5	**109.1***		62.9	9.4	11.3	37.8	0.0
HRS 3504	**108.2***			62.3	9.3	11.4	37.8	0.0
HRS 3530	**110.8***	**105.6***		63.8	9.9	11.4	43.9	0.0
HRS 3616	98.2			63.3	9.4	12.8	40.4	0.2
MT 1173	99.4			61.8	10.1	12.4	42.7	1.5
MT 1316	**109.4***	**104.9***		63.7	9.0	13.0	39.8	0.4
MT 1348	**107.7***			64.0	9.6	12.6	40.8	0.1
MT 1401	92.5			64.3	9.6	13.1	40.6	1.7
Average	104.9	101.1	98.6	63.4	9.6	12.3	40.7	0.5
PLSD (p=0.05)	13.2	11.0	7.3	1.3	0.4	1.2	2.2	1.7
CV%	7.7	6.3	5.8	1.1	2.3	5.5	3.1	191.5

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
3/ Lodging severity scores of 0 to 9 represent no lodging to all stems flat on the ground, respectively.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Fromberg Irrigated Spring Wheat (Exp. 169997)	
Planted:	March 11, 2016
Harvested:	August 3, 2016
Fertility:	100 lb N/a preplant; 120 lb N/a top dress in May, 2016
Herbicide:	n/a
Previous Crop:	sugarbeet
Irrigation:	overhead sprinkler
Precipitation:	n/a

Table 7. Grain yield[1/] of spring wheat cultivars tested at five-locations in south central Montana during 2016. Varieties listed by declining five-location average yield.

	Dryland			Irrigated				Five Location
Cultivar	Broadview	Musselshell	Ave.	Huntley	Hysham	Fromberg	Ave.	Average
	bushels/acre							
WB9879CLP	12.5	**19.9***	**16.7***	**110.5***	**112.0***	**119.7****	**114.2****	**75.2****
Duclair	13.0	**18.2***	**15.4***	**110.1***	**109.9***	**115.7***	**112.1***	**73.4***
HRS 3504	**13.7***	**21.6***	**18.0****	**103.7***	**109.7***	**108.2***	**107.7***	**71.8***
SY Soren	11.1	**18.0***	14.1	**111.6***	**111.8***	106.2	**109.7***	**71.5***
WB Gunnison	**15.9****	**20.2***	**17.7***	**102.4***	**112.8****	**107.2***	**107.4***	**71.5***
SY Tyra	13.1	**19.5***	**16.6***	100.9	**107.8***	**114.0***	**107.9***	**71.4***
MT 1316	9.8	**19.2***	14.4	99.7	**112.5***	**109.4***	**107.4***	**70.2***
Choteau	10.9	15.8	14.2	**106.8***	100.8	**107.7***	**105.6***	**69.0***
HRS 3530	9.4	15.4	12.4	99.1	**108.1***	**110.8***	**105.8***	**68.5***
Brennan	9.3	16.4	12.7	**108.2***	**103.6***	105.5	**105.5***	**68.4***
Corbin	13.0	17.0	15.2	86.9	**110.0***	**112.8***	103.2	**68.0***
Alum	13.0	**19.9***	**16.5***	91.8	99.6	**110.2***	100.7	**67.0***
HRS 3616	10.2	17.2	13.8	**105.1***	99.6	98.2	101.1	66.2
MT 1348	10.7	13.1	12.2	91.9	**107.2***	**107.7***	102.2	66.2
Reeder	11.2	15.1	13.3	94.7	**107.8***	102.7	101.5	66.2
McNeal	11.5	**18.0***	13.9	99.3	101.1	104.0	100.9	66.1
Vida	**13.9***	**22.6****	**17.8***	83.2	**107.1***	104.8	97.9	65.9
Egan	10.5	16.6	13.2	**104.4***	97.0	99.4	99.9	65.2
Mott	13.4	**20.7***	**17.0***	83.5	**105.5***	94.5	94.3	63.4
MT 1173	**13.9***	**22.4***	**17.8***	72.9	**105.6***	99.4	92.7	62.7
Oneal	**13.9***	17.3	**15.7***	78.9	92.6	95.1	89.3	59.8
MT 1401	12.3	15.7	14.8	77.7	89.9	92.5	87.1	58.2
Fortuna	10.7	16.4	13.5	64.3	79.7	85.8	77.0	51.6
HRS 3100	**12.5**	**15.0**	13.9					
HRS 3361	10.5	**16.2**	12.8					
HRS 3419				**114.8****	**110.5***	**105.5**	**109.7***	
Solano				**110.9***	**105.2***	**106.5***	**107.2***	
Average	12.0	17.9	14.9	96.5	104.3	104.9	101.9	66.8
PLSD (p=0.05)	2.2	4.9	2.7	12.4	10.0	13.2	10.7	8.2
CV%	10.3	15.4	16.2	7.8	5.5	7.7	7.2	8.9

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Table 8. Performance of 23 spring wheat cultivars tested under both dryland and irrigated conditions at three locations in south central Montana during 2016. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield 2016	2015-16	2014-16	Test Weight	Grain Moisture	2/ Grain Protein	Plant Height	Lodging
	------- bushels/acre -------			lb/bu	%	%	inches	
Commercial								
Alum	**67.0***			63.4	10.2	11.5	31.8	0.7
Brennan	**68.4***	**70.0***	**72.4***	63.9	9.6	13.0	29.2	0.4
Choteau	**69.0***	**69.1***	**70.7***	62.9	9.9	11.9	31.2	0.7
Corbin	**68.0***	**67.9***	68.7	63.2	9.9	11.6	31.4	0.8
Duclair	**73.4***	**73.3****	**74.4****	62.5	9.9	11.6	32.5	0.1
Egan	65.2	63.7	66.9	61.9	9.5	13.3	32.4	0.0
Fortuna	51.6	52.6	57.4	62.3	9.8	12.5	37.1	3.3
McNeal	66.1	65.0	68.6	61.8	9.6	12.0	33.2	0.3
Mott	63.4	64.9	64.8	63.2	9.8	12.1	35.1	0.1
Oneal	59.8	61.2	60.5	61.4	10.0	11.8	32.9	0.3
Reeder	66.2	65.5	**69.6***	63.6	9.9	12.2	33.1	0.2
SY Soren	**71.5***	**71.2***		63.9	9.8	12.3	29.7	0.0
SY Tyra	**71.4***	**72.4***		63.5	10.2	11.1	29.1	0.2
Vida	65.9	**68.4***	**70.1***	62.8	10.0	11.5	32.2	0.6
WB Gunnison	**71.5***	**69.9***	**71.4***	63.4	10.4	11.3	30.9	0.0
WB9879CLP	**75.2****	**73.1***		63.5	9.9	11.8	31.5	0.1
Experimental								
HRS 3504	**71.8***			61.8	9.7	11.2	29.8	0.0
HRS 3530	**68.5***	**68.3***		63.0	9.9	11.7	32.9	0.2
HRS 3616	66.2			63.0	9.8	12.4	31.6	0.0
MT 1173	62.7			61.7	10.2	11.4	33.6	1.4
MT 1316	**70.2***	**70.6***		62.6	9.5	12.2	30.7	0.1
MT 1348	66.2			63.2	9.9	12.2	31.9	0.3
MT 1401	58.2			64.0	10.0	12.3	31.8	1.4
Average	66.8	67.5	68.0	62.9	9.9	12.0	32.0	0.5
PLSD (p=0.05)	8.2	6.1	5.1	0.8	0.2	0.6	1.8	1.2
CV%	8.9	8.4	7.9	1.1	2.0	4.9	4.4	171.5
Location Years	5	8	13	5	5	5	5	5

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Table 9. Performance of 25 spring wheat cultivars tested under irrigated conditions only in south central Montana during 2016. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield 2016	2015-16	2014-16	Test Weight	Grain Moisture	2/ Grain Protein	Plant Height	Lodging
	------- bushels/acre -------			lb/bu	%	%	inches	0-9
Commercial								
Alum	100.7			63.3	9.7	12.8	39.1	1.2
Brennan	**105.5***	**100.7***	**99.0***	64.1	9.1	14.1	35.1	0.7
Choteau	**105.6***	**99.5***	**98.8***	63.0	9.4	13.0	38.2	1.2
Corbin	103.2	**97.7***	94.7	63.2	9.5	12.8	38.2	1.3
Duclair	**112.1***	**105.4****	**103.0****	62.6	9.4	12.7	39.3	0.2
Egan	99.9	91.0	90.8	62.7	9.0	14.7	39.8	0.0
Fortuna	77.0	73.9	76.7	62.7	9.2	14.2	44.6	5.4
McNeal	100.9	93.0	94.7	62.6	9.1	13.0	40.2	0.4
Mott	94.3	91.1	88.7	63.1	9.2	13.2	43.9	0.2
Oneal	89.3	86.6	82.8	61.1	9.3	13.2	40.3	0.6
Reeder	101.5	94.5	**96.7***	63.8	9.5	13.4	41.4	0.3
SY Soren	**109.7***	**103.0***		64.0	9.2	13.1	35.3	0.0
SY Tyra	**107.9***	**103.7***		63.0	9.8	12.1	34.9	0.3
Vida	97.9	96.7	95.8	62.7	9.5	12.8	39.0	1.0
WB Gunnison	**107.4***	**99.2***	**98.2***	63.6	10.1	12.5	37.3	0.0
WB9879CLP	**114.2****	**104.2***		63.7	9.4	12.7	39.1	0.2
Experimental								
HRS 3419	**109.7***	**103.9***		62.5	9.3	11.9	35.7	0.0
HRS 3504	**107.7***			61.7	9.2	12.5	36.0	0.0
HRS 3530	**105.8***	**99.0***		63.0	9.4	12.6	39.3	0.3
HRS 3616	101.1			63.0	9.3	13.4	37.8	0.0
MT 1173	92.7			61.3	9.7	12.8	40.6	2.3
MT 1316	**107.4***	**101.2***		63.2	8.9	13.6	37.3	0.2
MT 1348	102.2			63.4	9.4	13.3	38.7	0.6
MT 1401	87.1			64.0	9.4	13.9	38.6	2.3
Solano	**107.2***	**102.1***	**102.4***	63.7	9.3	12.9	33.6	0.0
Average	101.9	97.2	94.0	63.0	9.4	13.1	38.5	0.8
PLSD (p=0.05)	10.7	8.1	6.8	0.9	0.3	0.9	2.6	1.7
CV%	7.2	7.1	6.8	1.0	2.3	5.3	4.5	139.7
Location Years	3	5	8	3	3	3	3	3

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
3/ Lodging severity scores of 0 to 9 represent no lodging to all stems flat on the ground, respectively.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Table 10. Performance of 25 spring wheat cultivars tested under dryland conditions only in south central Montana during 2016. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2016	Grain Yield 1/ 2015-16	Grain Yield 1/ 2014-16	Test Weight	Grain Moisture	Grain Protein 2/	Plant Height
	------- bushels/acre -------			lb/bu	%	%	inches
Commercial							
Alum	**16.5***			63.6	11.0	9.4	20.9
Brennan	12.7	18.8	**29.8****	63.7	10.4	11.5	20.4
Choteau	14.2	18.3	**25.8***	62.8	10.6	10.3	20.5
Corbin	15.2	18.3	**27.2***	63.1	10.6	9.9	21.1
Duclair	**15.4***	**19.9***	**28.8***	62.3	10.6	9.9	22.4
Egan	13.2	18.1	**28.6***	60.6	10.2	11.3	21.2
Fortuna	13.5	17.1	**26.5***	61.8	10.6	10.1	25.8
McNeal	13.9	18.3	**26.8***	60.7	10.3	10.4	22.6
Mott	**17.0***	**21.1***	**26.6***	63.4	10.6	10.4	21.9
Oneal	**15.7***	18.8	24.8	61.8	11.0	9.7	21.9
Reeder	13.3	17.1	**26.3***	63.3	10.5	10.4	20.7
SY Soren	14.1	18.0		63.6	10.6	11.0	21.3
SY Tyra	**16.6***	**20.2***		64.2	10.8	9.6	20.3
Vida	**17.8***	**21.4****	**29.0***	63.0	10.8	9.5	21.9
WB Gunnison	**17.7***	**21.0***	**28.4***	63.2	10.7	9.6	21.2
WB9879CLP	**16.7***	**21.2***		63.3	10.6	10.3	20.2
Experimental							
HRS 3100	13.9			61.7	10.4	10.1	21.0
HRS 3361	12.8	17.1		62.0	10.3	11.0	20.5
HRS 3504	**18.0****			62.0	10.6	9.2	20.5
HRS 3530	12.4	17.2		62.9	10.6	10.4	23.3
HRS 3616	13.8			62.9	10.5	11.0	22.2
MT 1173	**17.8***			62.3	10.9	9.4	23.0
MT 1316	14.4	**19.6***		61.7	10.5	10.1	20.7
MT 1348	12.2			63.0	10.6	10.6	21.7
MT 1401	14.8			64.0	10.8	10.0	21.5
Average	14.9	19.0	27.4	62.7	10.6	10.2	21.6
PLSD (p=0.05)	2.7	2.5	4.3	1.0	0.2	0.5	1.4
CV%	16.2	12.2	10.8	1.1	1.6	3.3	5.6
Location Years	2	3	5	2	2	2	2

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12 percent grain moisture content.
3/ Lodging severity scores of 0 to 9 represent no lodging to all stems flat on the ground, respectively.
** Indicates highest yielding cultivar within a column.
* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).