

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: 2016 Off-Station Winter Wheat Variety Performance Trials in South Central Montana. This research is partially supported by Montana farmers through the Montana Wheat and Barley Committee.

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

METHODS: The 2016 off-station winter wheat trials were established under irrigation at Huntley and under dryland conditions near Molt under conventional summer fallow conditions; near Fort Smith, Hardin, Hysham, and Rapelje under no-till, chemical fallow conditions (Fig. 1). Each trial contained 25 winter wheat cultivars (17 commercial, 9 experimental), and was planted using a partially-balanced lattice design under dryland and irrigated conditions with three replications. All entries were seeded at approximately 1 million seeds per acre under dryland conditions (~60 lb/a) and 1.5 million seeds per acre under irrigation (~90 lb/a). Dryland test plots consisted of a 16-foot, 4-row plot with 15-inch row spacing. Irrigated test plots consisted of a 16-foot, 7-row plot with 7-inch row spacing. All rows of each harvested test plot were trimmed 36 inches and harvested using a plot combine. Information pertaining to the traits and characteristics of the winter wheat entries are provided in Table 1.

Recorded grain yields were adjusted to 13% grain moisture content, and are reported in bushels per acre based on a 60 pound standard bushel weight. Two year (2015-16) and three year (2014-16) yield averages are provided for cultivars tested during previous years. Test weight (pounds per bushel) and grain

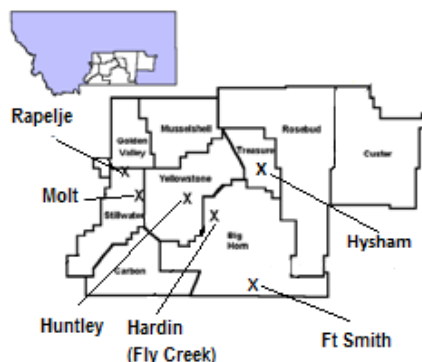


Figure 1. 2016 off-station winter wheat trial locations in south central Montana.

moisture content (percent) were obtained for each plot using a Dickey-john™ GAC 2100 grain analyzer. Grain protein content (percent) was determined by near-infrared reflectance for each harvested sample, and 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. Corresponding calendar dates also are presented. Information pertaining to the specific cultural management of each study site is listed at the bottom of their respective data table (Tables 2 through 7).

RESULTS:

The 2016 winter wheat test sites had below average rain or snow accumulation during winter months except in October that provided some soil moisture for winter wheat planting and stand establishment. Rain shower from March through May facilitated early winter wheat development. Below-average precipitation throughout the winter and in summer months resulted in late season drought stress at dryland sites that accelerated wheat growth and caused early maturity. Mean monthly temperature was above-average through-out the growing season. Late season drought coupled with above-average temperature resulted in earliest winter wheat harvest in south eastern Montana

Irrigated winter wheat trial was established at Huntley in 2016. Winter wheat stand was excellent that resulted in above average yield at this location. This location has the highest grain yield among all location in 2016, averaging 102 bu/ac (Table 2). Yields ranged from 125 bu/a for 'Colter' to 66 bu/a for 'Rampart'. Nine other entries produced yield that was statistically equal to the yield of highest yielding cultivar. Test weight values were good under irrigated conditions, averaging 61.2 lb/bu. All entries possessed test weight values of 60 lb/bu or more. Grain protein content averaged 11.8 percent and ranged from 10.7 to 12.8 percent. Two-year (2014 and 2016) average yield for winter wheat varieties tested at Huntley was 88 bu/a. Three-year (2013, 2014 and 2016) average yield was 94 bu/a. Montana line 'MT1138' was the highest yielding entry over the last two years, while Colter was the highest yielding commercial cultivar at Huntley over the past two and three years.

Average yield under dryland conditions at Rapelje in 2016 was 54 bu/a (Table 3), about 23 bushels per acre lower than winter wheat yield observed at this site in 2015. Grain yield ranged from 43 bu/a for cultivar 'CDC Falcon' to 63 bu/a for 'Cowboy'. Thirteen other entries produced yield that was statistically equal to the yield of highest yielding cultivar. Test weight was good and averaged 61.7 lb/bu. All entries produced test weight over 60 bu/ac at this site. Grain protein was low and averaged 10.3 percent and ranged from 9.1 percent for Cowboy to 11.0 percent for Rampart. Two-year average yield for winter wheat varieties tested at Rapelje during 2015 and 2016 was 65 bu/a. Three-year average yield from 2014 through 2016 was 70 bu/a. 'Yellowstone' was the highest yielding cultivar over the past two and three years at Rapelje.

Winter wheat yield under dryland condition at Hardin during 2016 was relatively low and averaged only 42 bu/a (Table 4), over 20 bu/a lower than the last year yield. A windstorm near harvesting and sawfly damaged mainly attributed to lower winter wheat yield at this site. Yield ranged from 27 bu/a for Rampart to 52 bu/a for 'Keldin'. Test weight was low and averaged only 55.5 lb/bu. All entries at Hardin produced test weight below 60 lb/bu in 2016. Grain protein content averaged 13.7 percent. Protein content ranged from 12.7 percent for Cowboy to 15.4 percent CDC Falcon. Two-year average yield for winter wheat varieties tested during 2015 and 2016 was 52 bu/a. Three-year average yield for winter wheat varieties tested during 2014 to 2016 was 54 bu/a. Averaged over the past three years experimental line MT1138 was the highest yielding entry at Hardin, While 'SY Clearstone' and Yellowstone were among the highest yielding commercial cultivars.

Average yield under dryland conditions at Molt was 53 bu/a (Table 5) about 22 bu/a lower than last year. Yield ranged from 43 bu/a for Rampart to 63 bu/a for MT1138. Six other entries produced yield that was statistically equal to the yield of experimental line MT1138. Keldin was the highest yielding commercial cultivars at Molt in 2016. Test weight averaged 60 lb/bu and ranged from 58.9 to 62.3 lb/bu. Grain protein content was the lowest at Molt in 2016 and averaged only 9.7 percent. Two- and Three-year average yields for winter wheat varieties tested at Molt were 64 and 58 bu/a respectively.

Average yield under dryland conditions at Hysham was 36 bu/a (Table 6). Drought during grain filling period drastically reduced yield at this location. Yield ranged from 22.8 bu/a for 'Judee' to 47 bu/a for Cowboy. Nine other entries produced yield that was statistically equal to the yield of highest yielding cultivar. Test weight was the lowest at Hysham in 2016 averaging only 54 lb/bu. All entries had test weight below 60 bu/a. Grain protein content averaged 14.2 percent with all entries having protein content of 13 percent or higher except cowboy. Three-year average yield for winter wheat varieties was 50 bu/a. MT1138 was the highest yielding entry over the past tree-years at Hysham.

Average yield under dryland conditions at Fort Smith was 43 bu/a (Table 7). Drought during grain filling period reduced yield at this location. Yield ranged from 31 bu/a for 'Jerry' and Rampart to 65 bu/a for Keldin. Test weight was low and averaged only 54.9 lb/bu. All entries had test weight below 60 bu/a. Grain protein content averaged 13.1 percent with all entries having protein content of 12 percent or higher. Yellowstone was the highest yielding cultivar at Fort Smith over the past tree-years. Three-year average yield for winter wheat varieties tested at this site was 62 bu/a.

SUMMARY:

In 2016 winter wheat suffered drought stress at planting time as well as during grain filling period that resulted in yield loss at all dryland locations. Drought stress coupled with above-average temperature accelerated wheat growth and resulted in early maturity and harvest. Grain production at dryland test sites ranging from 36 bu/a at Hysham to 54 bu/a at Repelje (Table 8). Keldin was the highest yielding cultivar not only under dryland conditions, producing 54 bu/a, but also was the top yielding entry with an average yield of 65 bu/a across all six of the test locations in 2016. While Colter was the highest yielding cultivar producing 125 bu/a under irrigated conditions at Huntley.

Since 2014, experiments representing 14 location-years of testing have uniformly tested cultivars at several dryland locations in south central Montana (Table 10). Experimental line MT1138 was the highest yielding entry averaged over the past two- and three-years across all dryland locations. While Yellowstone produced two and three-year average yield that was statistically equal to the yield of MT1138.

Table 1. Selected characteristics and traits of 25 commercial and experimental winter wheat cultivars performance tested at six off-station sites in south central Montana during 2016.

Cultivar	1/ Origin	Year of Release	2/ Market Class	3/ PVP Yes/No	4/ Maturity	5/ Coleoptile Length	Chaff Color	6/ Winter Survival 1-5	7/ Straw Strength	Solid Stem Type Yes/No	8/ Disease Resistance				9/ Quality		10/ Clearfield Type Yes/No
											Leaf Rust	Stem Rust	Stripe Rust	Dwarf Bunt	Milling	Baking	
											1-5	1-5	1-5	1-5	1-5	1-5	
<u>Commercial</u>																	
Bearpaw	MSU	2011	HRW	Y	M	M	White	2	M	Y	S	R	S	S	4	3	N
Broadview	Meridian	2009	HRW	N	M	S	White	5	S	N	R	R	S	S	3	3	N
CDC Falcon	CDC	1999	HRW	Y	M	S	White	4	S	N	R	R	S	S	3	3	N
Colter	MSU	2014	HRW	Y	M	S	White	3	S	N	-	R	R	S	3	4	N
Cowboy																	
Decade	MSU	2010	HRW	Y	M	M	White	4	S	N	MS	R	S	S	3	4	N
Jerry	NDSU	2001	HRW	N	M-L	M	White	5	M	N	R	R	S	S	3	3	N
Judee	MSU	2011	HRW	Y	M	M	White	2	S	Y	S	S	R	S	3	4	N
Keldin																	
Rampart	MSU	1996	HRW	N	M	L	Brown	2	W	Y	S	MR	MR	S	4	4	N
SY Clearstone§	Syngenta	2012	HRW	Y	M	S	White	2	S	N	-	MR	R	S	3	3	Y
SY Wolf	Syngenta	2010	HRW	Y	M	M	White	2	S	N	-	R	R	S	3	2	N
Warhorse	MSU	2014	HRW	Y	M	M	White	3	S	Y	MR	R	R	S	3	3	N
WB Quake	WestBred	2011	HRW	Y	M	S	White	3	S	Y	R	MR	R	S	4	3	N
WB3768 §	WestBred	2014	HWW	Y	L	M	White	3	M	N	-	R	R	S	3	3	N
Yellowstone	MSU	2005	HRW	Y	M	S	White	4	MS	N	MS	S	R	S	3	4	N
<u>Experimental</u>																	
MT0978	MSU		HRW		M-L	S	White	3	MS	N	-	R	R	S	3	3	N
MT1078	MSU		HRW		M	M	White	2	S	N	-	MR	R	S	3	3	N
MT1090	MSU		HRW		M	S	White	3	S	N	-	MR	R	S	3	3	N
MT 1117	MSU		HRW		M-L	M	White	2	S	N	-	R	R	S	3	3	N
MT1148	MSU		HRW		M	S	White	3	S	N	-	R	R	S	3	3	N
MT1265	MSU		HRW		M-L	-	White	3	MS	N	-	MR	R	S	3	4	N
MT1286	MSU		HRW		M	-	White	3	M	N	-	S	MR	S	2	3	N
MTCS1204	MSU		HRW		M	-	White	3	S	Y	-	R	R	S	4	3	Y
MTS0826-63	MSU		HRW		M-L	M	White	3	MW	Y	-	R	R	S	4	4	N
MTS1024	MSU		HRW		M	M	White	2	S	Y	-	MS	MR	S	3	3	N

1/Meridian Seeds, Alberta, Ca; CDC=Crop Development Centre, University of Saskatchewan; MSU=Montana State University; NDSU=North Dakota State University; UNL=University of Nebraska-Lincoln; USU=Utah State University; WestBred=WestBred LLC, Bozeman, Montana.

2/ HRW=hard red winter 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/ L=long coleoptile length, M=medium coleoptile length, S=short coleoptile length.

6/ Winter survival rated from 1 to 5 where 1=poor and 5=best winter survival, respectively, based on years of observations at Sidney, Moccasin and Williston.

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

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

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

10/ Signifies a cultivar possessing the Clearfield trait imparting tolerance to products containing imazamox herbicide.

§ 'SY Clearstone', and 'WB3768' licensed for sale on an exclusive basis by Syngenta and WestBred LLC, respectively.

Table 2. Performance of 25 commercial and experimental winter wheat cultivars tested under no-till, irrigated conditions near Huntley, Montana during 2016. Cultivars listed alphabetically. (Exp. 163880).

Cultivar	1/ Grain Yield			Test Weight	Grain Moistur e	2/ Grain		Plant Height	Lodging Index	Heading Date	
	2016	2014-16	2013-16			Protein	Grain			Julian	Calendar
	----- bushels/acre -----			lb/bu	%	%	inches	0-9			
<u>Commercial</u>											
Bearpaw	79.4	75.5	82.5	60.0	10.4	12.3	41.6	8.7	154.0	2-Jun	
Broadview	94.7			61.3	10.9	11.6	49.6	6.3	155.3	3-Jun	
CDC Falcon	103.2	95.9*	105.7*	61.4	10.9	11.7	48.6	8.7	153.3	1-Jun	
Colter	124.6**	108.0*	112.0*	61.7	10.8	12.1	50.1	1.0	155.3	3-Jun	
Cowboy	83.5	80.2		62.4	10.9	10.7	44.5	7.7	150.3	29-May	
Decade	101.7	85.3	92.0	60.8	11.0	11.5	47.1	3.3	153.7	1-Jun	
Jerry	79.5	69.1	81.0	60.2	10.7	12.0	51.8	7.7	152.7	31-May	
Judee	80.8	73.8	86.6	61.7	10.8	11.6	43.4	9.0	153.0	1-Jun	
Keldin	120.6*			62.4	11.1	10.7	46.4	3.7	151.3	30-May	
Northern	111.2*	101.1*	108.7*	60.7	10.8	11.9	47.7	4.0	155.7	3-Jun	
Rampart	65.5	69.4	78.6	62.7	11.0	12.9	49.9	7.0	155.3	3-Jun	
SY Clearstone	100.4	97.7*		59.9	10.2	11.8	49.9	7.0	155.0	3-Jun	
SY Wolf	97.8			61.6	10.9	12.1	43.1	8.3	151.7	30-May	
Warhorse	94.1	86.8	96.0	61.9	10.6	12.8	47.3	5.0	155.7	3-Jun	
WB-Quake	81.7	77.1	88.9	60.7	10.3	11.7	46.5	8.0	155.7	3-Jun	
Yellowstone	112.6*	103.6*	102.8*	61.1	10.8	12.0	48.9	5.3	154.0	2-Jun	
<u>Experimental</u>											
MT1138	114.8	110.1**		61.0	10.7	12.0	48.8	7.3	155.0	3-Jun	
MT1257	108.5*			61.2	10.7	11.9	48.0	5.0	153.3	1-Jun	
MT1265	111.2*			60.9	10.6	11.7	51.7	7.0	155.3	3-Jun	
MT1332	123.0*			61.0	10.7	11.5	50.9	5.0	154.0	2-Jun	
MT1348	91.3			60.2	10.6	12.0	46.3	8.3	152.7	31-May	
MT1354	123.8*			62.1	10.9	11.8	49.8	1.7	155.3	3-Jun	
MT1356	111.7*			60.4	10.6	12.4	51.9	8.0	154.7	2-Jun	
MTS1224	106.1			61.1	10.8	12.0	48.3	7.3	155.7	3-Jun	
WB3768	116.3*			62.2	10.8	11.0	51.0	5.7	157.0	5-Jun	
Average	101.5	88.1	94.1	61.2	10.8	11.8	48.1	6.2	154.2	2-Jun	
PLSD (p=0.05)	16.5	16.5	12.2	1.3	0.4	0.8	4.4	3.3	2.1		
CV%	9.9	12.1	13.7	1.3	2.2	4.0	5.0	32.3	0.8		

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13 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.

Table 2 continued.

ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD ($p=0.05$).

** Indicates highest yielding cultivar within a column. * Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD ($p=0.05$).

Huntley Irrigated Winter Wheat (Exp. 163880)

Planted: September 16, 2015

Harvested: July 29, 2016

Fertility: 100 N lbs/acre in fall 2015 as 46-0-0

Herbicide: Huskie@12 oz/ac + osprey 4.7 Oz/a on May 12, 2016

Previous crop: spring barley

Irrigation: sprinkler

Precipitation: 17.88 inches.

Table 3. Performance of 25 commercial and experimental winter wheat cultivars tested under no-till, dryland conditions near Rapelje, Montana during 2016. Cultivars listed alphabetically. (Exp. 163881).

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain Protein	Plant Height
	2016	2015-16	2014-16				
	----- bushels/acre -----			lb/bu	%	%	inches
<u>Commercial</u>							
Bearpaw	50.6	60.3	68.1	61.4	8.9	10.3	28.7
Broadview	49.5	63.9*		61.0	9.0	10.6	29.0
CDC Falcon	42.8	60.6	73.4*	60.7	9.0	10.6	26.8
Colter	55.9*	67.8*	73.5*	61.9	9.1	10.7	31.9
Cowboy	63.1**			61.2	9.3	9.1	30.6
Decade	51.8	59.2	68.2	62.2	9.1	10.3	30.9
Jerry	53.7	67.1*	76.2*	60.9	9.1	10.5	33.5
Judee	52.1	58.2	67.7	62.3	9.2	10.9	29.7
Keldin	57.2*			62.6	9.2	9.3	30.7
Northern	56.0*	64.3*	68.5	62.1	9.3	10.8	31.5
Rampart	45.5	52.2	62.2	61.7	9.0	11.0	32.2
SY Clearstone	60.3*	67.5*	72.7*	61.3	9.2	10.1	32.5
SY Wolf	59.2*	68.6*		63.6	9.4	10.0	29.1
Warhorse	54.2*	62.7	68.1	61.6	8.9	10.7	29.9
WB-Quake	45.2	56.8	62.9	62.0	9.0	10.7	29.5
Yellowstone	60.3*	72.8**	79.7**	61.3	9.1	10.2	32.2
<u>Experimental</u>							
MT1138	51.7	68.2*	72.9*	60.7	9.1	9.9	30.5
MT1257	55.2*	71.3*		61.2	9.1	10.2	31.3
MT1265	52.1	70.9*		60.9	9.1	10.3	31.6
MT1332	55.2*			62.1	9.3	10.2	30.8
MT1348	55.8*			62.5	9.3	9.6	30.1
MT1354	55.1*			62.0	9.3	10.0	31.4
MT1356	52.3			61.1	9.0	10.2	29.6
MTS1224	57.7*	69.3*		62.2	9.5	10.2	29.8
WB3768	57.5*	71.5*		62.4	9.6	10.3	34.1
Average	54.0	64.9	70.3	61.7	9.2	10.3	30.7
PLSD (p=0.05)	9.1	9.9	10.1	1.1	0.2	0.7	2.0
CV%	8.5	12.1	14.9	1.0	1.6	4.0	3.6

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13 percent moisture content.

2/ Grain protein values adjusted to 12 percent grain moisture content.

ns Indicates no significant difference between cultivars within a column of data based on Fisher's protected LSD (p=0.05).

** 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).

Rapelje Dryland Winter Wheat (Exp. 163881)

Planted:	October 14, 2015
Harvested:	July 25, 2016
Fertility:	11-52-00, 75 lb/a in-furrow at planting
Herbicide:	n/a
Previous crop:	chemical fallow

Table 4. Performance of 25 commercial and experimental winter wheat cultivars tested under no-till, dryland conditions near Hardin, Montana during 2016. Cultivars listed alphabetically. (Exp. 163884).

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain		Plant Height
	2016	2015-16	2014-16			Protein	Grain	
	----- bushels/acre -----			lb/bu	%	%	inches	
<u>Commercial</u>								
Bearpaw	34.0	50.4	51.6	54.9	13.5	13.0	34.1	
Broadview	38.1	51.3		55.4	10.0	13.7	33.7	
CDC Falcon	45.0*	54.4	52.7	54.7	11.3	14.7	33.1	
Colter	38.3	51.3	53.1	54.1	9.6	13.8	35.0	
Cowboy	46.2*			54.3	11.6	12.7	32.3	
Decade	43.3	50.3	56.2*	55.7	12.4	13.6	34.3	
Jerry	40.4	49.9	51.9	55.5	11.4	13.7	35.0	
Judee	33.2	47.2	52.4	54.7	10.7	13.9	32.2	
Keldin	52.2**			57.3	12.2	13.3	33.3	
Northern	38.5	52.7	56.1*	56.3	10.6	14.1	32.8	
Rampart	27.3	42.6	46.4	56.3	11.0	13.7	39.0	
SY Clearstone	49.6*	56.6	57.1*	55.5	11.3	13.4	35.3	
SY Wolf	43.5	52.9		57.7	10.8	13.2	32.0	
Warhorse	32.5	47.2	50.3	53.8	10.2	14.4	33.6	
WB-Quake	34.7	48.1	50.5	55.4	11.2	13.6	31.4	
Yellowstone	48.6*	54.8	57.3*	55.8	11.3	13.6	34.6	
<u>Experimental</u>								
MT1138	49.0*	58.8	62.0**	55.0	9.6	13.5	35.2	
MT1257	41.0	52.3		55.7	10.5	13.3	33.9	
MT1265	50.6*	59.1		56.1	9.8	13.9	34.4	
MT1332	43.3			54.9	11.2	13.7	33.7	
MT1348	49.9*			55.8	12.3	13.3	33.7	
MT1354	40.8			55.9	12.4	13.8	34.3	
MT1356	47.1*			55.4	9.9	14.0	32.0	
MTS1224	47.6*	55.1		55.3	10.7	14.0	30.2	
WB3768	37.4	51.8		56.3	11.3	13.6	34.3	
Average	42.1	51.9	53.6	55.5	11.1	13.7	33.7	
PLSD (p=0.05)	7.7	ns	8.3	1.4	2.1	0.7	3.2	
CV%	10.6	10.5	10.6	1.4	11.9	2.7	5.9	

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13 percent moisture content.

2 Grain protein values adjusted to 12 percent grain moisture content.

ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

** 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).

Hardin Dryland Winter Wheat (Exp. 163884)

Planted: October 7, 2015
Harvested: July 21, 2016
Fertility: 100 lb N/a as 46-0-0 in fall 2015;
Pesticide: n/a
Previous crop: chemical fallow

Table 5. Performance of 25 commercial and experimental winter wheat cultivars tested under conventional, dryland conditions near Molt, Montana during 2016. Cultivars listed alphabetically. (Exp. 163885).

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain Protein	Plant Height
	2016	2015-16	2014-16				
	----- bushels/acre -----			lb/bu	%	%	inches
<u>Commercial</u>							
Bearpaw	51.8	65.5	59.3	61.3	10.2	9.3	32.1
Broadview	49.3	65.4		59.3	10.3	9.9	32.0
CDC Falcon	47.6	62.2	61.3	58.9	10.1	10.1	28.7
Colter	51.5	62.8	56.0	59.1	9.8	10.0	33.9
Cowboy	56.2*			60.0	10.4	8.6	31.2
Decade	52.0	62.1	60.6	60.9	10.3	9.3	30.2
Jerry	54.0	60.4	55.0	59.3	10.1	10.5	38.0
Judee	47.5	63.3	58.2	59.8	10.2	10.2	33.7
Keldin	59.0*			61.1	10.3	8.6	31.6
Northern	51.2	66.2	60.1	61.4	10.0	9.7	31.3
Rampart	42.5	55.6	50.6	60.6	10.4	9.3	30.6
SY Clearstone	54.3	60.7	55.6	59.5	9.8	10.0	34.1
SY Wolf	53.4	64.6		62.3	10.3	9.4	30.0
Warhorse	48.6	60.9	57.1	60.2	9.9	10.4	32.8
WB-Quake	45.9	59.9	54.3	59.8	10.0	9.6	31.5
Yellowstone	58.0*	65.5	58.7	58.9	9.7	10.1	34.4
<u>Experimental</u>							
MT1138	62.3**	70.6	61.8	59.7	10.0	9.5	34.1
MT1257	58.1*	65.7		59.1	9.7	10.2	32.1
MT1265	54.7	67.0		58.8	9.9	9.4	34.9
MT1332	54.1			59.4	9.9	10.2	33.4
MT1348	54.1			59.4	10.1	9.2	33.0
MT1354	52.7			59.9	10.0	9.6	31.1
MT1356	50.7			59.8	10.0	9.3	31.5
MTS1224	58.5*	66.8		60.2	10.0	10.0	32.8
WB3768	55.4*	67.7		61.0	10.1	9.8	32.4
Average	52.9	63.8	57.6	60.0	10.1	9.7	32.5
PLSD (p=0.05)	7.5	ns	ns	1.3	0.2	ns	3.1
CV%	7.9	9.0	10.8	1.3	1.4	6.1	5.4

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13 percent moisture content.

2 Grain protein values adjusted to 12 percent grain moisture content.

ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

** 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).

Molt Dryland Winter Wheat (Exp. 16885)

Planted: October 9, 2015
Harvested: July 27, 2016
Fertility: 100 lb/a as 46-0-0 in spring.
Herbicide: n/a
Previous crop: summer fallow

Table 6. Performance of 25 commercial and experimental winter wheat cultivars tested under conventional, dryland conditions near Hysham, Montana during 2016. Cultivars listed alphabetically. (Exp. 163882).

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain Protein	Plant Height
	2016	2015-16	2014-16				
	----- bushels/acre -----			lb/bu	%	%	inches
<u>Commercial</u>							
Bearpaw	30.5	41.5	48.9*	54.4	10.0	13.9	29.9
Broadview	23.5	38.1		52.7	9.7	14.9	31.1
CDC Falcon	33.8	40.0	45.2	53.3	10.3	14.5	29.7
Colter	37.7*	44.6	57.4*	53.1	9.8	14.6	31.4
Cowboy	46.7**			55.8	10.8	12.2	31.6
Decade	43.3*	46.4	53.0*	56.1	10.8	12.7	32.3
Jerry	30.0	39.9	48.4*	51.5	9.9	15.0	35.2
Judee	22.8	34.9	39.9	52.8	10.2	14.9	29.3
Keldin	40.5*			53.9	10.2	13.2	31.5
Northern	32.6	43.9	51.3*	53.1	11.0	14.5	29.0
Rampart	26.2	37.2	41.7	55.6	10.2	14.8	32.0
SY Clearstone	43.1*	46.1	57.2*	53.6	10.7	13.8	33.2
SY Wolf	29.2	39.9		54.8	10.4	13.1	31.9
Warhorse	35.1	43.0	49.0*	54.5	10.5	14.4	29.7
WB-Quake	25.1	36.7	47.3	54.5	10.1	14.9	26.2
Yellowstone	44.1*	49.4	54.1*	54.5	9.6	13.8	32.3
<u>Experimental</u>							
MT1138	43.1*	49.0	57.8**	54.6	10.2	13.6	32.8
MT1257	35.3	42.0		53.9	10.5	15.1	32.8
MT1265	42.4*	46.5		54.9	10.6	13.5	31.6
MT1332	45.2*			55.0	10.6	14.0	33.2
MT1348	35.7			51.4	10.1	14.5	32.7
MT1354	36.8			52.9	9.5	14.9	32.4
MT1356	46.1*			53.8	10.6	13.6	33.1
MTS1224	33.8	40.6		53.1	10.6	15.0	26.6
WB3768	38.3*	45.2		55.5	11.1	15.0	30.8
Average	36.0	42.4	50.1	54.0	10.3	14.2	31.3
PLSD (p=0.05)	9.2	ns	9.5	2.5	ns	1.4	2.2
CV%	15.7	10.9	12.3	2.8	6.8	6.0	4.3

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13 percent moisture content.

2 Grain protein values adjusted to 12 percent grain moisture content.

ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

** 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 Dryland Winter Wheat (Exp. 163882)

Planted:	September 29, 2015
Harvested:	July 8, 2016
Fertility:	100 lb/a as 46-0-0 in spring.
Herbicide:	n/a
Previous crop:	Chemical fallow

Table 7. Performance of 25 commercial and experimental winter wheat cultivars tested under conventional, dryland conditions near Fort Smith, Montana during 2016. Cultivars listed alphabetically. (Exp. 163886).

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain Protein	Plant Height
	2016	2015-16	2014-16				
	----- bushels/acre -----			lb/bu	%	%	inches
<u>Commercial</u>							
Bearpaw	36.8	60.6	64.8*	54.9	12.0	13.0	37.4
Broadview	37.9			53.3	11.5	13.7	39.9
CDC Falcon	42.7	56.5	60.2*	55.1	12.6	12.9	36.4
Colter	31.6	61.3	65.6*	53.5	12.0	13.4	38.5
Cowboy	46.8	78.1		54.5	12.0	12.4	39.9
Decade	50.8	59.5	64.2*	56.0	12.4	13.0	37.9
Jerry	31.2	54.8	57.1	55.4	12.2	13.6	42.5
Judee	44.7	66.0	65.6*	57.9	11.9	12.2	38.1
Keldin	65.3**			58.6	11.6	11.9	41.1
Northern	39.8	64.4		52.5	11.6	14.2	37.9
Rampart	31.1	45.7	50.4	54.5	12.1	14.2	43.4
SY Clearstone	44.8	60.9		55.3	12.6	12.5	40.9
SY Wolf	46.0			57.1	12.7	12.9	37.7
Warhorse	47.2	62.0	63.8*	56.5	11.6	12.8	38.6
WB-Quake	39.3	60.8	61.2*	56.1	12.4	12.3	38.3
Yellowstone	47.3	67.4	69.7**	55.8	12.4	12.3	38.8
<u>Experimental</u>							
MT1138	47.8	68.9		55.1	12.4	12.6	40.8
MT1257	43.3			52.8	11.5	13.6	26.2
MT1265	51.2			54.3	12.7	13.3	40.4
MT1332	41.3			53.4	12.4	13.5	38.8
MT1348	53.2*			55.9	11.9	12.2	41.9
MT1354	42.0			53.0	12.8	13.6	39.9
MT1356	45.5			54.2	12.1	13.2	40.4
MTS1224	41.5			54.0	13.0	13.5	37.1
WB3768	33.8			53.5	12.3	13.4	39.1
Average	43.3	61.9	62.2	54.9	12.2	13.1	38.9
PLSD (p=0.05)	12.7	ns	11.4	2.6	0.6	1.3	ns
CV%	16.2	11.9	11.8	2.7	2.6	5.5	10.8

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13 percent moisture content.

2 Grain protein values adjusted to 12 percent grain moisture content.

ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

** 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).

Fort Smith Dryland Winter Wheat (Exp. 163886)

Planted: October 7, 2015
Harvested: July 12, 2016
Fertility: 100 lb/a as 46-0-0 in the fall
Herbicide: n/a
Previous crop: Chemical fallow

Table 8. Grain yield^{1/} of 25 commercial and experimental winter wheat cultivars tested at six locations in south central Montana during 2016. Varieties listed by declining average yield across all locations.

Cultivar	Rapelje	Hysham	Hardin	Molt	Fort Smith	Dryland	Huntley	All
	No-Till Dryland	No-Till Dryland	No-Till Dryland	No-Till Dryland	No-Till Dryland	Locations Average	Min.Till Irrigated	Locations Average
-----bushels/acre -----								
Keldin	57.2*	40.5*	52.2**	59.0*	65.3**	53.7**	120.6*	64.8**
Yellowstone	60.3*	44.1*	48.6*	58.0*	47.3	52.2*	112.6*	62.3*
MT1138	51.7	43.1*	49.0*	62.3**	47.8	51.8*	114.8	62.3*
MT1265	52.1	42.4*	50.6*	54.7	51.2	50.9*	111.2*	60.9*
MT1332	55.2*	45.2*	43.3	54.1	41.3	46.9	123*	59.5*
MT1356	52.3	46.1*	47.1*	50.7	45.5	49.0*	111.7*	59.5*
SY Clearstone	60.3*	43.1*	49.6*	54.3	44.8	50.9*	100.4	59.2*
MT1354	55.1*	36.8	40.8	52.7	42.0	45.6	123.8*	58.6*
MTS1224	57.7*	33.8	47.6*	58.5*	41.5	48.1*	106.1	57.8*
Decade	51.8	43.3*	43.3	52.0	50.8	48.8*	101.7	57.6*
Colter	55.9*	37.7*	38.3	51.5	31.6	44.2	124.6**	57.6*
Cowboy	63.1**	46.7**	46.2*	56.2*	46.8	52.3*	83.5	57.5*
MT1348	55.8*	35.7	49.9*	54.1	53.2*	50.5*	91.3	57.3*
MT1257	55.2*	35.3	41.0	58.1*	43.3	46.8	108.5*	57.1*
WB3768	57.5*	38.3*	37.4	55.4*	33.8	43.4	116.3*	55.6
Northern	56.0*	32.6	38.5	51.2	39.8	43.3	111.2*	54.6
SY Wolf	59.2*	29.2	43.5	53.4	46.0	45.6	97.8	54.3
Warhorse	54.2*	35.1	32.5	48.6	47.2	43.9	94.1	52.3
CDC Falcon	42.8	33.8	45.0*	47.6	42.7	41.4	103.2	51.7
Jerry	53.7	30.0	40.4	54.0	31.2	42.4	79.5	48.6
Broadview	49.5	23.5	38.1	49.3	37.9	38.8	94.7	48.1
Bearpaw	50.6	30.5	34.0	51.8	36.8	41.6	79.4	47.9
Judee	52.1	22.8	33.2	47.5	44.7	39.3	80.8	46.2
WB-Quake	45.2	25.1	34.7	45.9	39.3	37.2	81.7	44.6
Rampart	45.5	26.2	27.3	42.5	31.1	33.4	65.5	38.7
Average	54.0	36.0	42.1	52.9	43.3	45.7	101.5	55.0
PLSD (p=0.05)	9.1	9.2	7.7	7.5	12.7	6.0	16.5	8.2
CV%	8.5	15.7	10.6	7.9	16.2	14.4	9.9	13.2

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13 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 9. Performance of 25 commercial and experimental winter wheat cultivars tested under dryland and irrigated conditions at six locations in south central Montana during 2016. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain Protein	Plant Height
	2016	2015-16	2014-16				
	----- lb/bu -----			lb/bu	%	%	inches
<u>Commercial</u>							
Bearpaw	47.9	55.5	59.6	57.8	10.8	11.9	34.0
Broadview	48.1	56.5		57.0	10.2	12.5	36.0
CDC Falcon	51.7	57.6	61.1	57.4	10.6	12.4	33.8
Colter	57.6*	61.6*	67.6*	57.3	10.3	12.4	36.7
Cowboy	57.5*			58.0	10.8	11.0	35.0
Decade	57.6*	59.1	65.4	58.7	11.0	11.7	35.5
Jerry	48.6	54.8	59.5	57.3	10.6	12.5	39.3
Judee	46.2	53.1	60.0	58.1	10.5	12.3	34.5
Keldin	64.8**			59.2	10.8	11.2	35.8
Northern	54.6	60.4	66.4*	57.7	10.5	12.5	35.1
Rampart	38.7	46.5	52.2	58.5	10.6	12.7	37.9
SY Clearstone	59.2*	61.0*	65.5	57.6	10.6	11.9	37.6
SY Wolf	54.3	59.3		59.5	10.7	11.8	34.0
Warhorse	52.3	57.1	61.2	58.2	10.3	12.5	35.3
WB-Quake	44.6	52.0	58.1	57.9	10.5	12.2	33.9
Yellowstone	62.3*	64.9*	68.9*	58.0	10.5	11.9	36.8
<u>Experimental</u>							
MT1138	62.3*	66.3**	71.0**	57.9	10.4	11.7	37.1
MT1257	57.1*	61.5*		57.2	10.4	12.4	34.0
MT1265	60.9*	65.2*		57.8	10.5	12.0	37.2
MT1332	59.5*			57.5	10.7	12.2	36.9
MT1348	57.3*			57.7	10.7	11.8	36.2
MT1354	58.6*			57.7	10.7	12.3	36.5
MT1356	59.5*			57.4	10.5	12.2	36.3
MTS1224	57.8*	61.2*		57.7	10.8	12.5	34.2
WB3768	55.6	61.6*		58.3	10.8	12.3	36.9
Average	55.0	58.7	62.8	57.9	10.6	12.1	35.9
PLSD (p=0.05)	8.2	5.4	5.0	1.1	ns	0.5	2.1
CV%	13.2	11.8	12.7	2.0	6.7	5.6	6.8
Location x	6	10	16	6	6	6	6

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13 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 10. Performance of 25 commercial and experimental winter wheat cultivars tested under dryland conditions at five locations in south central Montana during 2016. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain Protein	Plant Height
	2016	2015-16	2014-16				
	----- lb/bu -----			lb/bu	%	%	inches
<u>Commercial</u>							
Bearpaw	41.6	52.8	54.0	57.4	10.9	11.9	32.5
Broadview	38.8	52.2		56.2	10.1	12.7	33.2
CDC Falcon	41.4	52.6	54.7	56.5	10.6	12.5	30.9
Colter	44.2	54.6	57.0	56.4	10.1	12.5	34.0
Cowboy	52.3*			57.1	10.8	11.0	33.1
Decade	48.8*	54.4	58.1	58.3	11.0	11.8	33.2
Jerry	42.4	52.0	54.3	56.7	10.5	12.7	36.9
Judee	39.3	50.0	53.6	57.4	10.4	12.4	32.6
Keldin	53.7**			58.5	10.7	11.3	33.8
Northern	43.3	54.8	56.8	57.1	10.5	12.6	32.5
Rampart	33.4	44.4	47.2	57.6	10.5	12.7	35.4
SY Clearstone	50.9*	56.6*	58.6	57.1	10.7	11.9	35.2
SY Wolf	45.6	55.0		59.1	10.6	11.8	32.0
Warhorse	43.9	53.0	54.5	57.4	10.2	12.5	32.9
WB-Quake	37.2	48.7	50.9	57.4	10.5	12.3	31.3
Yellowstone	52.2*	59.6*	62.2*	57.4	10.5	11.9	34.5
<u>Experimental</u>							
MT1138	51.8*	60.9**	62.9**	57.3	10.3	11.7	34.7
MT1257	46.8	56.2		56.5	10.3	12.6	31.3
MT1265	50.9*	60.1*		57.1	10.5	12.0	34.5
MT1332	46.9			56.8	10.6	12.3	34.0
MT1348	50.5*			57.1	10.8	11.8	34.2
MT1354	45.6			56.8	10.7	12.3	33.8
MT1356	49.0*			56.8	10.4	12.1	33.3
MTS1224	48.1*	56.3		57.0	10.8	12.5	31.3
WB3768	43.4	55.5		57.6	10.8	12.5	34.2
Average	45.7	54.2	55.8	57.2	10.6	12.2	33.4
PLSD (p=0.05)	6.0	4.6	4.0	1.3	ns	0.6	2.3
CV%	14.4	11.6	13.0	2.1	7.3	5.8	7.2
Location x	5	9	14	5	5	5	5

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13 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).