RESULTS OF CROPPING SYSTEMS RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA – 2013
Southern Agricultural Research Center, Huntley, MT
http:www.sarc.montana.edu

PROJECT TITLE:

Off-Station Spring Barley Variety Performance Trials in South Central Montana. This research is partially supported by the Montana Wheat and Barley 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 barley varieties. This information should help spring barley producers in south central Montana select varieties best suited to their particular area and growing conditions.

METHODS:

The 2013 off-station spring barley trials were conducted under dryland conditions near Huntley, Billings and Broadview, and under irrigation near Fromberg and Hysham Montana (Fig. 1). Twenty spring barley entries comprised of 15 commercial cultivars and 5 experimental lines, representing both feed and malt types, were grown at all locations.

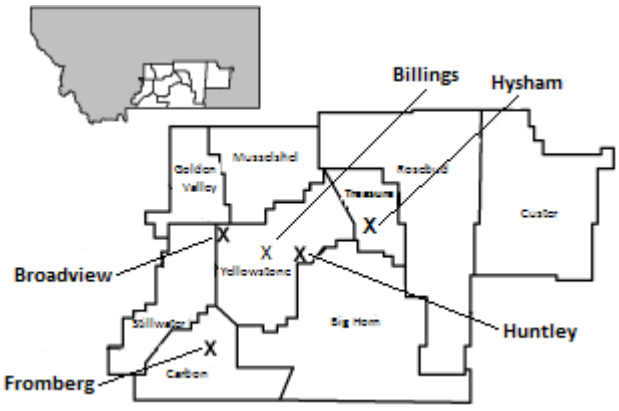

Figure 1. 2013 off-station spring barley trial locations in south central Montana.

All studies were planted using a randomized complete block design with three replications. All entries were seeded at approximately 0.6 million seeds per acre (~14 seed per foot^2) under dryland conditions and 1.0 million seeds per acre (~24 seed per foot^2) under irrigation.

Dryland and irrigated test plots consisted of a 15-foot, 7-row plot 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 based on a 48 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 and is reported on a 12% moisture basis. Plant height was measured in inches from the soil surface to the top of the head, excluding the awns if present. Lodging severity, where observed, was recorded on a 0 to 9 scale representing no lodging (0) to all stems lying flat on the ground (9). Percent plump and thin kernels were determined by measuring the amount of a ~100 gram sub-sample retained above a 6-64" slotted screen and passing through a 5½-64" slotted screen, respectively, following 30 oscillations on a Strand™ sizer shaker.

RESULTS:

Over the last two years (2012 and 2013) spring barley production suffered due to drought stress. The 2013 spring barley test sites were relatively dry throughout the winter months except in October, with below average rain or snow accumulation. Below average precipitation occurred from March through July except in May. Above average precipitation in May (5.16 inches) boosted barley growth and enhanced grain yield. Early season drought coupled with above averaged temperatures resulted in poor spring barley production under all dryland sites. On average, 2013 dryland barley yield was higher compared to barley yield in 2012.

The dryland spring barley yield at the Huntley averaged 68 bu/a in 2013 (Table 1). Yield ranged from 60 bu/a for 'Geraldine', and 'Moravian 69' to 76 bu/a for experimental line 'MT070158'. 'Hockett' was the highest yielding commercial cultivar with 74 bu/a. Eight other commercial spring barley cultivars produced yields from 67 to 71 bu/a, statistically equal to the yield of highest yielding entry at this location. Average test weight was 49.5 lb/bu, with all entries except Moravian 69, and 'Moravian 115' having test weight values higher than 48 lb/bu. Grain protein content averaged 9.2 percent. Protein content ranged from 7.8 percent to 10.3 percent. Most spring barley cultivars produced good proportion of plump kernels, averaging 91 percent of the harvested grain. Proportion of plump kernels ranged from 75.5 percent to 97.5 percent. The measured level of thin kernels averaged 2.3 percent and ranged from 0.4 to 5.1 percent. Two- and three-years (2011- 2013) averaged yield for barley cultivars tested at Huntley was 70 and 68 bu/a respectively. Hockett and 'Craft' were the highest yielding commercial cultivar over the past two- and three-years respectively.

Late planting and poor stand establishment due to drought severely affected spring barley yield in 2013 at Billings. Grain yield averaged only 16 bu/a, lowest among all locations tested in 2013 (Table 2). Yields ranged from 12 bu/a for 'AC Metcalfe' to 20 bu/a for 'Champion'. Seven other commercial spring barley cultivars produced yields from 16 to 19 bu/a, statistically equal to the yield of highest yielding entry. Test weight averaged 48.1 lb/bu and ranged from 45.5 for Moravian 115 to 50.7 for 'Haxby'. Grain protein content averaged 11.9 percent. All barley entries have protein content over 11 percent. Plump and thin kernels averaged 69 and 12 percent, respectively. Proportion of plump kernels ranged from 38 percent for 'Eslick' to 87 percent 'CDC Cowboy '.

Dryland spring barley yield at Broadview was also affected by late planting and drought stress and averaged only 21 bu/a (Table 3). Yield ranged from 18 bu/a to 27 bu/a. Barley entries were not statistically different for grain yield. Test weight

was also low and averaged only 45.6 lb/bu. All entries, except 'Baronesse', and Hockett, produced test weight values lower than 48 lb/bu. Grain protein content averaged 14.0 percent and ranged from 12 to 15 percent. The percentage of plump kernels was only 37 percent in the harvested grain. Baronesse and Hockett were the only entries which produced more than 60 percent plump kernels. Percentage of thin kernels averaged 34.9 percent. Two-years averaged yield for barley cultivars tested during 2012 to 2013 at Broadview was 22 bu/a. Averaged over the past two years Baronesse and Champion were the top yielding commercial entries.

Spring barley lodging was moderate at Fromberg in 2013 for most of the entries, averaging a lodging score of 3.7 out of 9. (Table 4). Lodging score varied from 1 for champion to 6 for MT070158. Spring barley yield was relatively low and averaged only 67 bu/a under irrigated condition. Yield ranged from 57 bu/a for 'Conrad to 78 bu/a for champion (Table 4). Four other commercial spring barley cultivars produced yield from 72 to 74 bu/a, statistically equal to the yield of Champion. The test weight averaged 49.9 lb/bu and ranged from 42.3 lb/bu for Moravian 69 to 54.2 lb/bu for Haxby. Average grain protein content was 13.3 percent and ranged from 11.9 percent for Baronesse to 15.0 percent for Moravian 69. The percentage of plump kernels averaged 82 percent in the harvested grain. Haxby and 'Tradition' produced the highest percentage of plump kernels. Percentage of thin kernels averaged 8.9 percent. Two- and three-years averaged yield for barley cultivars tested during 2011 to 2013 at Fromberg did not differ significantly.

Spring barley yield was excellent under irrigation at Hysham in 2013 averaging 129 bu/a (Table 5). Yield was highest at Hysham among all locations tested in 2013. Lodging was relatively higher for barley cultivars at Hysham in 2013 with an average lodging score of 5.9 out of 9. Moravian 115 had the highest lodging score among the commercial entries. Yield ranged from 103 bu/a for Moravian 115 to 158 bu/a for Tradition. Average test weight was 49 lb/bu. Grain protein averaged 13.1 percent and ranged from 12.0 to 15.0 percent. Barley quality was acceptable at Hysham where mean percent plump and thin kernels were 80.6 and 10.0 percent, respectively. No statistical difference in two- and three-years averaged yield was observed for spring barley entries tested at Hysham.

SUMMARY:

Early season drought stress resulted in delayed planting and poor spring barley stand establishment at some dryland locations in 2013. Rain shower in May (5.16 inches) and June (1.97 inches) boosted barley growth and enhanced grain yield particularly at dryland locations. At dryland test sites test weight and kernel plumpness were adversely affected by drought in 2013. Averaged across all locations experimental line MT070158 was the highest yielding entry, while commercial cultivar Champion was the highest yielding entry in 2013 (Tables 6 and 7). Averaged over the past two- and three-years (2011-2013) Champion and Craft were the highest yielding commercial cultivars respectively, grown under dryland conditions (Table 9). Champion was also the top yielding commercial cultivar under irrigated condition followed by Tradition and Moravian 115 (Table 8) for the past two years.

Table 1. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Huntley, Montana during 2013. Cultivars listed alphabetically. (Exp. 133690).

Cultivar	Grain Yield 1/ 2013	Grain Yield 1/ 2012-2013	Grain Yield 1/ 2011-2013	Test Weight	Grain Moisture	Grain Protein 2/	Plump Kernels	Thin Kernels	Plant Height	Heading date Julian	Heading date Calendar
	- bushels/acre -			- lb/bu -	- % -	- % -	- % -	- % -	- inches		
Commercial											
AC Metcalfe	**68.6***	67.8	66.5	49.1	14.6	10.1	90.2	3.1	29.9	177	Jun-25
Baronesse	**68.6***	**71.2***	**69.4***	50.6	14.6	9.4	93.9	1.7	31.1	177	Jun-25
CDC Cowboy	60.3	61.2		49.5	14.2	9.7	97.5	0.4	37.8	174	Jun-23
Champion	**67.3***	**73.5***		51.2	14.6	8.2	88.5	2.1	28.0	176	Jun-25
Conrad	**68.3***	**70.2***	67.7	48.9	14.5	9.4	93.3	2.7	27.7	178	Jun-26
Craft	**70.9***	**74.7***	**74.5****	49.1	14.8	8.7	84.7	4.6	27.8	177	Jun-26
Eslick	**69.3***	**71.8***		51.7	14.6	7.8	89.1	2.8	25.6	178	Jun-27
Gallatin	61.1	67.0	67.4	50.5	14.3	8.9	92.1	2.0	30.3	176	Jun-25
Geraldine	59.7	62.2	63.3	50.2	14.7	7.9	75.5	5.1	27.3	177	Jun-25
Harrington	**68.8***	**70.0***	67.1	48.8	14.3	9.4	94.9	1.7	29.5	176	Jun-25
Haxby	**71.1***	**75.7***	**73.0***	51.9	14.7	9.6	82.7	3.7	29.4	177	Jun-26
Hockett	**74.2***	**74.3***	**71.7***	50.1	14.2	9.7	94.5	1.3	28.9	176	Jun-25
Moravian 115	64.0	65.2	60.9	44.5	14.4	9.8	93.1	2.0	23.8	177	Jun-26
Moravian 69	59.7	**69.1***	**68.3***	46.7	14.3	9.4	88.2	3.3	24.5	178	Jun-26
Tradition	62.7	67.9	67.7	48.8	13.9	9.7	91.9	1.3	32.5	173	Jun-22
Experimental											
MT010158	63.6	61.6	61.6	50.2	14.5	10.3	95.2	1.3	28.2	177	Jun-25
MT010160	**69.2***	**69.8***	67.3	50.1	14.3	8.9	93.8	1.8	31.2	176	Jun-25
MT070158	**75.9****	**76.6****		49.9	14.4	9.4	96.0	0.8	28.3	178	Jun-27
MT070159	**73.9***	**76.0***		48.9	14.5	9.5	94.2	1.3	27.6	177	Jun-26
MT080279	**72.6***	**75.2***		49.3	14.3	8.5	92.8	2.3	27.0	178	Jun-27
Average	67.5	70.0	67.6	49.5	14.4	9.2	91.1	2.3	28.8	177	Jun-25
PLSD (p=0.05)	10.3	7.9	6.7	1.3	0.3	1.4	6.1	1.8	1.9	1.2	
CV%	9.3	7.8	7.5	1.5	1.4	8.9	4.1	49.2	4.1	0.4	

1/ Yields are based on a 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to a 12% moisture basis.
** 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 Dryland Spring Barley (Exp. 133690)

Planted:	March 27, 2013
Harvested:	July 30, 2013
Fertility:	60-20-0, 220 lb/a, preplant application
Herbicide:	Harmony Extra 0.66/a, Axial XL 16 oz/a, and Hat Trick 32 oz/a
Previous Crop:	chemical fallow
Precipitation:	11.05 inches

Table 2. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Billings, Montana during 2013. Cultivars listed alphabetically. (Exp. 133691).

Cultivar	1/ Grain Yield 2013	2012-2013	2011-2013	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	12.3	41.6	--	48.9	11.1	13.1	75.6	7.6	20.1
Baronesse	**16.1***	43.7	--	49.7	11.0	11.6	78.0	6.7	21.9
CDC Cowboy	**17.8***	30.0	--	49.3	10.9	12.8	86.9	3.8	27.1
Champion	**19.7****	42.7	--	49.4	11.2	11.3	60.7	14.1	20.6
Conrad	14.6	39.4	--	46.8	10.9	12.8	64.1	16.1	19.0
Craft	14.2	43.8	--	47.0	11.1	12.6	67.4	13.2	19.3
Eslick	**17.0***	44.6	--	48.0	10.9	11.2	38.5	27.2	18.4
Gallatin	15.3	40.0	--	48.3	11.0	12.0	68.3	13.1	21.0
Geraldine	15.1	42.9	--	48.0	11.1	11.7	56.3	19.4	18.2
Harrington	14.5	43.2	--	49.0	11.2	12.3	78.7	7.3	21.0
Haxby	**18.8***	41.5	--	50.7	11.1	11.4	58.0	14.1	20.9
Hockett	**16.4***	40.4	--	49.4	11.0	11.3	77.0	8.0	20.9
Moravian 115	**19.5***	41.1	--	45.5	10.6	11.5	78.3	8.9	18.2
Moravian 69	13.5	41.8	--	46.0	10.7	12.9	60.4	16.9	16.4
Tradition	**16.8***	37.0	--	49.3	10.7	11.7	55.0	15.1	21.8
Experimental									
MT010158	**17.9***	33.9	--	48.6	10.8	11.7	65.9	13.4	21.1
MT010160	13.5	40.5	--	49.1	11.3	11.9	72.0	10.3	21.4
MT070158	**18.0***	40.6	--	49.0	10.7	11.2	80.5	7.3	19.3
MT070159	**17.5***	43.0	--	47.4	10.8	11.1	75.9	10.2	18.2
MT080279	**16.0***	41.0	--	47.5	10.9	11.3	73.5	11.3	12.9
Average	16.2	40.6		48.3	10.9	11.9	68.5	12.2	19.9
PLSD (p=0.05)	4.0	ns		1.6	0.3	0.9	10.9	5.4	4.2
CV%	14.7	11.1		2.0	1.7	4.4	9.7	25.9	12.8

1/ Yields are based on a 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12% moisture basis.
** 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).

Billings Dryland Spring Barley (Exp. 133691)

Planted:	April 26, 2013
Harvested:	August 12, 2013
Fertility:	46-0-0, 100 lb/a preplant; 11-52-0, 60 lb/in Furrows at planting
Herbicide:	n/a
Previous Crop:	fallow
Precipitation:	n/a

Table 3. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Broadview, Montana during 2013. Cultivars listed alphabetically. (Exp. 133692).

Cultivar	1/ Grain Yield 2013	2012-	2011-2013	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	18.4	18.5	23.6	45.3	8.2	14.8	39.5	31.1	25.1
Baronesse	24.3	**24.4***	26.8	49.9	8.7	13.4	65.8	14.8	29.7
CDC Cowboy	19.1	19.5		46.8	8.4	15.0	48.8	25.3	33.2
Champion	23.9	**24.3***		46.2	9.0	14.4	15.4	53.4	28.2
Conrad	21.0	19.7	23.3	46.4	8.5	14.1	53.7	23.6	26.8
Craft	21.9	**21.3***	23.8	44.2	8.6	14.5	26.4	44.0	23.5
Eslick	21.3	19.9		46.5	9.4	12.5	25.8	44.6	24.5
Gallatin	22.0	**21.5***	25.7	45.1	8.8	14.3	33.0	37.8	27.3
Geraldine	18.8	19.5	22.9	44.0	8.6	15.0	18.6	53.0	26.0
Harrington	17.8	19.9	21.8	42.3	8.6	14.8	20.4	52.2	24.9
Haxby	21.9	20.8	22.4	46.7	8.4	14.1	14.4	52.0	28.0
Hockett	20.8	**20.9***	22.1	49.0	8.9	12.9	64.7	16.4	25.6
Moravian 115	18.4	19.1	22.2	39.7	8.3	15.3	31.2	40.8	20.7
Moravian 69	23.6	**23.4***	26.3	42.9	9.1	14.6	38.1	34.4	21.4
Tradition	22.0	19.0	25.9	47.4	8.6	13.9	36.4	36.5	29.0
Experimental									
MT010158	26.7	**22.6***	24.2	46.7	7.9	13.6	39.7	29.0	28.0
MT010160	22.8	**23.0***	24.4	44.0	8.6	14.3	36.5	34.9	28.3
MT070158	22.5	**24.0***		47.3	9.0	11.9	51.0	18.5	25.3
MT070159	24.8	**25.1****		45.4	9.2	13.1	39.5	29.8	26.6
MT080279	24.0	**24.2***		46.0	8.5	12.8	43.9	25.6	25.9
Average	21.8	21.5	24.0	45.6	8.7	14.0	37.1	34.9	26.4
PLSD (p=0.05)	ns	4.2	ns	3.2	ns	ns	26.0	22.4	2.7
CV%	17.4	16.1	20.9	4.2	9.3	9.1	42.3	38.9	6.2

1/ Yields are based on a 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12% moisture basis.
** 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 Barley (Exp. 133692)	
Planted:	April 19, 2013
Harvested:	August 20, 2013
Fertility:	n/a
Herbicide:	n/a
Previous Crop:	summer fallow
Precipitation:	n/a

Table 4. Performance of 20 spring barley cultivars and experimental lines tested under irrigated conditions near Fromberg, Montana during 2013. Cultivars listed alphabetically. (Exp. 133794).

Cultivar	1/ Grain Yield 2013	2012-2013	2011-2013	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	3/ Lodging
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -	0-9
Commercial										
AC Metcalfe	63.8	80.5	87.0	50.9	10.0	14.5	77.7	10.5	35.2	5.7
Baronesse	**73.4***	84.0		53.0	10.6	11.9	92.9	3.0	36.0	1.7
CDC Cowboy	58.9	77.1		51.6	10.5	13.4	91.4	4.1	42.5	1.7
Champion	**77.5****	98.2		52.6	10.7	12.9	89.8	4.5	37.1	1.0
Conrad	56.7	81.4	92.7	47.7	10.2	14.4	76.8	13.3	34.4	3.7
Craft	**72.2***	87.0	105.4	49.8	10.3	13.7	80.2	8.8	34.8	4.3
Eslick	**72.0***	87.9		50.8	10.3	12.9	71.5	12.9	34.9	3.3
Gallatin	64.7	84.3	94.4	51.0	10.4	13.3	81.2	8.2	37.4	5.7
Geraldine	67.4	81.8		47.8	9.8	14.4	59.5	24.1	36.9	5.0
Harrington	63.5	73.9		47.7	10.1	12.9	78.6	10.0	36.0	5.0
Haxby	**73.6***	83.6	96.8	54.2	10.6	12.8	94.8	2.7	34.5	3.0
Hockett	63.3	82.2		52.3	10.6	12.6	91.2	4.4	33.5	2.0
Moravian 115	62.1	93.5	102.9	42.5	9.6	13.4	76.7	10.0	32.4	3.0
Moravian 69	60.2	89.8	105.3	42.3	9.6	15.0	46.5	31.1	33.9	4.3
Tradition	64.6	90.7	95.8	50.4	9.8	13.5	94.8	1.5	37.9	2.0
Experimental										
MT010158	**68.1***	96.7	107.5	50.9	10.3	13.4	87.8	5.5	33.5	2.7
MT010160	61.6	87.6	98.1	48.2	10.1	14.1	72.8	12.1	37.5	5.0
MT070158	**72.3***	86.5		53.6	9.8	12.2	93.4	2.8	34.1	6.0
MT070159	**76.9***	95.0		50.4	10.3	12.8	89.9	3.7	33.2	4.3
MT080279	**71.9***	90.0		50.9	10.4	12.0	89.9	3.9	34.5	4.3
Average	67.2	86.6	98.6	49.9	10.2	13.3	81.9	8.9	35.5	3.7
PLSD (p=0.05)	9.8	ns	ns	2.8	0.7	1.6	15.7	10.0	4.3	ns
CV%	8.8	14.9	12.7	3.4	4.0	7.5	11.6	68.2	7.4	69.1

1/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12% moisture basis.
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).
ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

Fromberg Irrigated Spring Barley (Exp. 133794)	
Planted:	April 3,, 2013
Harvested:	August 13, 2013
Fertility:	100 lb N/a preplant; 70 lb/a 11-52-0 at planting
Herbicide:	n/a
Previous Crop:	n/a
Irrigation:	overhead sprinkler

Table 5. Performance of 20 spring barley cultivars and experimental lines tested under irrigated conditions near Hysham, Montana during 2013. Cultivars listed alphabetically. (Exp. 133795).

Cultivar	1/ Grain Yield 2013	2012-2013	2011-2013	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	3/ Lodging
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -	0-9
Commercial										
AC Metcalfe	118.4	103.3	103.2	49.3	13.8	13.3	82.6	9.2	40.3	6.0
Baronesse	**140.3***	116.1	114.1	48.9	12.8	12.8	82.4	8.5	35.8	3.3
CDC Cowboy	114.3	93.4		49.4	15.3	12.0	88.3	6.7	45.4	4.3
Champion	**142.1***	127.2		49.7	13.4	12.3	88.0	4.9	36.2	3.0
Conrad	122.5	118.6	113.8	49.5	14.2	13.1	87.2	5.7	34.9	5.0
Craft	124.9	123.2	115.9	48.3	12.8	13.6	78.7	11.7	35.8	7.0
Eslick	123.0	120.0		48.7	14.1	12.6	71.0	16.0	32.2	7.0
Gallatin	**143.2***	120.6	117.4	50.6	13.6	12.7	80.2	10.2	35.6	6.0
Geraldine	123.6	117.4	111.4	50.6	13.3	13.0	82.2	9.2	34.5	4.0
Harrington	117.0	99.9	100.4	48.1	12.9	13.6	78.1	11.3	35.3	7.3
Haxby	**143.0***	118.0	115.0	50.8	12.6	13.7	83.7	8.6	37.9	7.0
Hockett	127.3	109.9	111.8	49.5	13.9	12.3	82.1	9.8	32.8	5.3
Moravian 115	103.7	129.9	121.9	45.9	11.4	13.5	81.7	8.0	34.3	8.3
Moravian 69	**141.6***	115.0	112.1	49.7	12.3	12.5	83.6	6.9	38.1	7.3
Tradition	**157.6****	133.8	127.0	48.4	11.8	12.5	86.3	5.0	37.9	2.0
Experimental										
MT010158	133.4	118.1	111.6	49.4	11.9	13.3	83.7	7.1	33.7	7.7
MT010160	104.1	104.6	102.2	47.9	11.6	15.0	69.0	18.3	37.1	8.0
MT070158	**143.3***	128.7		49.8	12.6	13.1	79.8	11.3	33.9	5.7
MT070159	133.6	136.0		47.3	12.2	13.5	72.1	16.2	34.5	6.7
MT080279	115.8	125.0		47.5	13.0	13.4	77.1	12.4	38.8	7.0
Average	128.6	117.9	112.7	49.0	13.0	13.1	80.6	10.0	36.3	5.9
PLSD (p=0.05)	21.9	ns	ns	2.4	1.3	1.4	10.4	6.9	4.8	3.6
CV%	10.3	9.5	10.3	3.0	6.3	6.7	7.8	42.1	8.0	36.5

1/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to12 percent moisture basis.
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).
ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

Hysham Irrigated Spring Barley (Exp. 133795)	
Planted:	April 2, 2013
Harvested:	August 5, 2013
Fertility:	60 lb N/a preplant, 70 lb/a 11-52-0 at planting; 100 lb N/a top dress in spring:
Previous Crop:	n/a
Irrigation:	flood
Precipitation:	n/a

Table 6. Grain yield[1/] of 20 spring barley cultivars tested at five locations in south central Montana during 2013. Varieties listed by declining five-location average yield.

Cultivar	Dryland				Irrigated			Five Location Average
	Huntley	Billings	Broadview	Ave.	Fromberg	Hysham	Ave.	
	bushels/acre							
MT070158	**75.9****	**18.0***	22.5	38.8	**72.3***	**143.3***	107.8	**66.4****
Champion	**67.3***	**19.7****	23.9	37.2	**77.5****	**142.1***	109.8	**66.2***
Haxby	**71.1***	**18.8***	21.9	37.3	**73.6***	**143.0***	108.3	**65.7***
MT070159	**73.9***	**17.5***	24.8	38.5	**76.9***	133.6	105.2	**65.2***
Tradition	62.7	**16.8***	22.0	33.8	64.6	**157.6****	111.1	**64.7***
Baronesse	**68.6***	**16.1***	24.3	36.3	**73.4***	**140.3***	106.8	**64.5***
MT010158	63.6	**17.9***	26.7	36.1	**68.1***	133.4	100.8	**62.0***
Gallatin	61.1	15.3	22.0	33.0	64.7	**143.2***	104.0	**61.4***
Craft	**70.9***	14.2	21.9	35.7	**72.2***	124.9	98.5	**60.8***
Eslick	**69.3***	**17.0***	21.3	35.8	**72.0***	123.0	97.5	**60.5***
Hockett	**74.2***	**16.4***	20.8	37.1	63.3	127.3	95.3	**60.4***
MT080279	**72.6***	**16.0***	24.0	37.5	**71.9***	115.8	93.8	**60.1***
Moravian 69	59.7	13.5	23.6	32.5	60.2	**141.6***	100.9	**59.8***
Geraldine	59.7	15.1	18.8	31.2	67.4	123.6	95.5	56.9
Conrad	**68.3***	14.6	21.0	34.6	56.7	122.5	89.6	56.6
AC Metcalfe	**68.6***	12.3	18.4	33.1	63.8	118.4	91.1	56.3
Harrington	**68.8***	14.5	17.8	33.4	63.5	117.0	90.3	56.1
MT010160	**69.2***	13.5	22.8	35.3	61.6	104.1	82.8	54.3
CDC Cowboy	60.3	**17.8***	19.1	32.5	58.9	114.3	86.6	54.2
Moravian 115	64.0	**19.5***	18.4	33.9	62.1	103.7	82.9	53.5
Average	67.5	16.2	21.8	35.2	67.2	128.6	97.9	60.3
PLSD (p=0.05)	10.3	4.0	ns	ns	9.8	21.9	ns	8.7
CV%	9.3	14.7	17.4	12.6	8.8	10.3	10.5	12.2

1/ Yields are based on 48 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).
ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

Table 7. Performance of 20 spring barley cultivars and experimental lines tested under dryland and irrigated conditions at five locations in south central Montana during 2013. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield 2013	1/ Grain Yield 2012-2013	1/ Grain Yield 2011-2013	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	56.3	59.4	63.9	48.7	11.6	13.1	73.1	12.3	30.1
Baronesse	**64.5***	**65.1***		50.4	11.5	11.8	82.6	6.9	30.9
CDC Cowboy	54.2	55.1		49.3	11.9	12.6	82.6	8.1	37.2
Champion	**66.2***	**70.9***		49.8	11.8	11.8	68.5	15.8	30.0
Conrad	56.6	63.4	67.6	47.9	11.7	12.8	75.0	12.3	28.6
Craft	**60.8***	**67.0***	72.6	47.7	11.5	12.6	67.5	16.5	28.2
Eslick	**60.5***	**66.1***		49.1	11.9	11.4	59.2	20.7	27.1
Gallatin	**61.4***	64.2	69.3	49.1	11.6	12.3	71.0	14.3	30.3
Geraldine	56.9	62.0		48.1	11.5	12.4	58.4	22.2	28.6
Harrington	56.1	58.4		47.2	11.4	12.6	70.1	16.5	29.3
Haxby	**65.7***	**65.6***	70.2	50.9	11.5	12.3	66.7	16.2	30.1
Hockett	**60.4***	63.1		50.1	11.7	11.7	81.9	8.0	28.3
Moravian 115	53.5	**67.6***	70.3	43.6	10.9	12.7	72.2	13.9	25.9
Moravian 69	**59.8***	**65.0***	70.8	45.5	11.2	12.9	63.4	18.5	26.9
Tradition	**64.7***	**67.7***	71.6	48.8	11.0	12.3	72.9	11.9	31.8
Experimental									
MT010158	**62.0***	**65.0***	69.0	49.2	11.1	12.5	74.5	11.3	28.9
MT010160	54.3	62.4	66.5	47.8	11.2	12.9	68.8	15.5	31.1
MT070158	**66.4****	**69.0***		49.9	11.3	11.6	80.1	8.1	28.2
MT070159	**65.2***	**72.4****		47.9	11.4	12.0	74.3	12.2	28.0
MT080279	**60.1***	**68.6***		48.2	11.4	11.6	75.4	11.1	27.8
Average	60.3	64.9	69.2	48.5	11.4	12.3	71.9	13.6	29.4
PLSD (p=0.05)	8.7	7.8	ns	1.7	0.6	0.8	11.2	8.0	2.0
CV%	12.2	12.8	12.6	3.0	5.0	7.7	13.1	52.4	7.6
Location Years	5	10	14	5	5	5	5	5	5

1/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12% moisture basis.
** 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).

Table 8. Performance of 20 spring barley cultivars and experimental lines tested under irrigated conditions at two locations in south central Montana during 2012. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2013	Grain Yield 1/ 2012-2013	Grain Yield 1/ 2011-2013	Test Weight	Grain Moisture	Grain Protein 2/	Plump Kernels	Thin Kernels	Plant Height	Lodging 3/
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -	0-9
Commercial										
AC Metcalfe	91.1	91.9	95.1	49.3	11.9	13.9	80.2	9.9	37.7	5.8
Baronesse	106.8	**100.1***		50.9	11.7	12.4	87.6	5.7	35.9	2.5
CDC Cowboy	86.6	85.2		50.5	12.9	12.7	89.9	5.4	44.0	3.0
Champion	109.8	**112.7***		51.2	12.1	12.6	86.4	6.4	36.7	2.0
Conrad	89.6	**100.0***	103.2	48.6	12.2	13.8	82.0	9.5	34.6	4.3
Craft	98.5	**105.1***	110.7	49.1	11.5	13.7	79.4	10.3	35.3	5.7
Eslick	97.5	**104.0***		49.8	12.2	12.7	71.3	14.5	33.5	5.2
Gallatin	104.0	**102.5***	105.9	50.8	12.0	13.0	80.7	9.2	36.5	5.8
Geraldine	95.5	**99.6***		49.2	11.5	13.7	70.9	16.7	35.7	4.5
Harrington	90.3	86.9		47.9	11.5	13.2	78.3	10.6	35.6	6.2
Haxby	108.3	**100.8***	105.9	52.5	11.6	13.3	89.3	5.7	36.2	5.0
Hockett	95.3	96.0		50.9	12.3	12.5	86.7	7.1	33.1	3.7
Moravian 115	82.9	**111.7***	112.4	44.2	10.5	13.4	79.2	9.0	33.3	5.7
Moravian 69	100.9	**102.4***	108.7	46.0	11.0	13.8	65.1	19.0	36.0	5.8
Tradition	111.1	**112.3***	111.4	49.4	10.8	13.0	90.6	3.3	37.9	2.0
Experimental										
MT010158	100.8	**107.4***	109.5	50.2	11.1	13.4	85.7	6.3	33.6	5.2
MT010160	82.8	96.1	100.1	48.0	10.9	14.6	70.9	15.2	37.3	6.5
MT070158	107.8	**107.6***		51.7	11.2	12.6	86.6	7.1	34.0	5.8
MT070159	105.2	**115.5****		48.8	11.3	13.1	81.0	10.0	33.9	5.5
MT080279	93.8	**107.5***		49.2	11.7	12.7	83.5	8.1	36.7	5.7
Average	97.9	102.3	106.3	49.4	11.6	13.2	81.3	9.4	35.9	4.8
PLSD (p=0.05)	ns	**18.5**	ns	ns	ns	ns	ns	ns	3.3	2.5
CV%	10.5	11.8	11.5	3.4	5.6	7.1	10.2	56.0	7.7	49.4
Location Years	2	4	6	2	2	2	2	2	2	2

1/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12% moisture basis.
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).
ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

Table 9. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions at three locations in south central Montana during 2013. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2013	Grain Yield 1/ 2012-	Grain Yield 1/ 2011-2013	Test Weight	Grain Moisture	Grain Protein 2/	Plump Kernels	Thin Kernels	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	33.1	37.7	**40.5***	47.8	11.3	12.6	68.4	13.9	25.0
Baronesse	36.3	**41.8***	**43.6***	50.0	11.4	11.5	79.3	7.7	27.6
CDC Cowboy	32.5	34.9		48.5	11.2	12.5	77.7	9.8	32.7
Champion	37.2	**43.1***		48.9	11.6	11.3	54.9	23.2	25.6
Conrad	34.6	39.0	**40.9***	47.4	11.3	12.1	70.4	14.1	24.5
Craft	35.7	**41.7***	**44.1****	46.8	11.5	11.9	59.5	20.6	23.5
Eslick	35.8	**40.8***		48.7	11.7	10.5	51.1	24.9	22.8
Gallatin	33.0	38.8	**41.9***	48.0	11.4	11.7	64.5	17.6	26.2
Geraldine	31.2	36.9	39.6	47.4	11.5	11.5	50.1	25.8	23.8
Harrington	33.4	39.4	40.4	46.7	11.3	12.2	64.7	20.4	25.1
Haxby	37.3	**42.2***	**43.3***	49.8	11.4	11.7	51.7	23.3	26.1
Hockett	37.1	**41.2***	**42.3***	49.5	11.4	11.3	78.7	8.6	25.1
Moravian 115	33.9	38.2	38.8	43.2	11.1	12.2	67.5	17.2	20.9
Moravian 69	32.5	**40.1***	**42.5***	45.2	11.4	12.3	62.2	18.2	20.8
Tradition	33.8	37.9	**41.8***	48.5	11.1	11.8	61.1	17.6	27.8
Experimental									
MT010158	36.1	36.7	38.7	48.5	11.1	11.9	66.9	14.6	25.8
MT010160	35.3	**40.0***	**41.2***	47.7	11.4	11.7	67.4	15.7	27.0
MT070158	38.8	**43.3***		48.8	11.4	10.9	75.8	8.8	24.3
MT070159	38.5	**43.7****		47.3	11.5	11.3	69.9	13.8	24.1
MT080279	37.5	**42.6***		47.6	11.2	10.8	70.1	13.0	21.9
Average	35.2	40.0	41.4	47.8	11.4	11.7	65.6	16.5	25.0
PLSD (p=0.05)	ns	3.8	3.6	1.4	ns	0.8	10.3	8.5	1.6
CV%	12.6	10.5	11.1	2.8	4.5	8.1	15.7	49.7	7.2
Location Years	3	6	8	3	3	3	3	3	3

1/ Yields are based on a 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 12% moisture basis.
** 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).