

RESULTS OF AGRONOMIC AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2010

The Annual Report of the Investigations at and Administration of the
Southern Agricultural Research Center, Huntley, Montana

<http://www.sarc.montana.edu/annualreport/2010/>

- 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 2010 off-station spring barley trials were conducted under dryland conditions near Huntley, Molt and Broadview, and under flood 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.

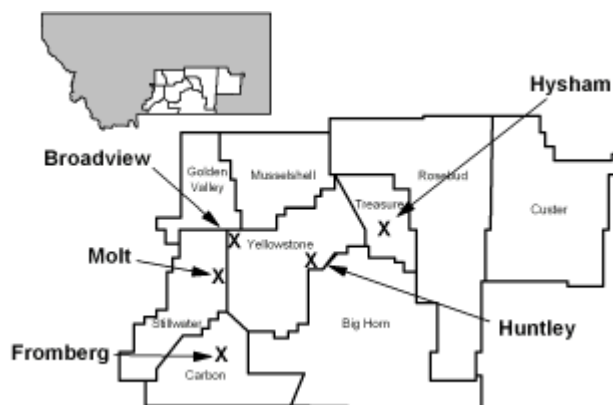


Figure 1. 2010 off-station spring barley trial locations in south central Montana.

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 foot²) under dryland conditions and 1.0 million seeds per acre (~24 seed per foot²) under irrigation. Actual seeding rates were calculated from the thousand kernel weight determined for the seed lot of each cultivar (Table 1), and varied from 57 to 70 pounds per acre for the dryland sites and from 84 to 102 pounds per acre under irrigation. Seeding rates were not adjusted for germination.

Dryland and irrigated test plots consisted of a 15-foot, 7-row plot with 6-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 100% dry matter 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 to all stems lying flat on the ground, respectively. 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.

Table 1. Adjusted seeding rates used to establish 20 spring barley cultivars tested at five off-station sites in south central Montana during 2010.

Cultivar	Thousand Kernel weight gram	Seed per pound #	1/ Dryland Seeding Rate		2/ Irrigated Seeding Rate	
			per plot gram	per acre pound	per plot gram	per acre pound
<u>Commercial</u>						
AC Metcalfe	43.3	10,478	42.5	58	62.4	86
Baronesse	43.6	10,415	42.7	59	62.8	86
Boulder	51.3	8,853	50.3	69	73.8	101
Champion	51.1	8,880	50.1	69	73.6	101
Conrad	46.9	9,688	45.9	63	67.5	92
Craft	48.5	9,352	47.6	65	69.9	96
Gallatin	43.6	10,424	42.7	59	62.7	86
Geraldine	44.8	10,124	43.9	60	64.6	89
Goldeneye	42.6	10,651	41.8	57	61.4	84
Harrington	45.3	10,015	44.4	61	65.3	89
Haxby	43.9	10,342	43.0	59	63.2	87
Hockett	50.4	9,007	49.4	68	72.6	99
Moravian 115	43.3	10,479	42.5	58	63.0	86
Moravian 69	43.2	10,506	42.4	58	62.2	85
Pinnacle	51.9	8,753	50.8	70	74.7	102
<u>Experimental</u>						
MT010158	49.8	9,116	48.8	67	71.7	98
MT010160	46.3	9,797	45.4	62	66.7	91
MT020155	47.1	9,634	46.2	63	67.9	93
MT030042	47.1	9,634	46.2	63	67.9	93
MT050030	51.0	8,898	50.0	69	73.5	101

1/ Equivalent to 0.6 million seeds per acre (14 seeds per foot²) on a mass basis.

2/ Equivalent to 1.0 million seeds per acre (24 seeds per foot²) on a mass basis.

RESULTS:

The 2010 spring barley test sites had above average moisture during winter months, with above average rain or snow accumulating during October, January and February. Below average precipitation occurred during March and April,

while above average precipitation occurred May through August. This higher than normal precipitation coupled with cooler than normal temperatures during May and July delayed crop development and maturity boosting spring barley yield at the dryland sites, while causing increased lodging at irrigated sites. Above normal precipitation during August delayed harvesting at some sites.

The dryland spring barley yield at Huntley location averaged 103 bu/a in 2010 (Table 2), 34 bu/a more than the trial harvested in 2009 and 14 bu/a more than the trial harvested in 2008. Yields ranged from 89 bu/a for 'Haxby' to 116 bu/a for 'MT050030'. The highest yielding commercial cultivar was 'Boulder', averaging 116 bu/a. The cultivar 'Geraldine' was the highest yielding commercial malt-type entry, averaging 110 bu/a at Huntley in 2010. Three other commercial spring barley cultivars 'Baronesse', 'Champion' and 'Goldeneye' and the experimental entry 'MT030042' produced yields from 107 to 111 bu/a, statistically equal to the yields of 'MT050030' at this location. Average test weight was 51.5 lb/bu, with all entries having test weight values heavier than 48 lb/bu. Grain protein levels averaged 10.8 percent and varied from 9.8 percent for 'MT030042' to 11.5 percent for 'Craft'. Most spring barley cultivars tested produced more than 90 percent plump kernels in the harvested grain. Only two entries 'Moravian 69' and 'Goldeneye' have less than 90 percent plump kernels. The measured level of thin kernels was low, ranged from 1.9 to 5.5 percent, among the barley entries tested at this site in 2010.

The 2010 spring barley trial at Molt produced an average yield of 55 bu/a (Table 3), about 90 percent more than the site produced the previous year. Grain yields at Molt ranged from 42 bu/a for Harrington to 65 bu/a for Boulder. Five other commercial spring barley cultivars including Baronesse, 'Conrad', 'Gallatin', Geraldine and 'Haxby' produced yields from 57 to 61 bu/a, statistically equal to the yields of Boulder at this location. Spring barley test weights at the Molt location were the lightest measured among the three dryland sites harvested in 2010, averaging 48.9 lb/bu. Only six of the 20 entries averaged test weight values heavier than 50 lb/bu. Two commercial cultivars Moravian 69 and 'Moravian 115' produced a test weight lighter than 48 lb/bu, measuring 45 and 44 lb/bu respectively. Grain protein content was high averaging 15.0 percent and ranged from 14.0 percent for Goldeneye to 17.6 percent for 'AC Metcalfe'. Plump and thin kernels averaged 58 and 15 percent, respectively. 'Craft' had the highest percent plump kernels in the harvested grain with 78 percent plump kernels. Two-year average yield for barley varieties tested during 2009 and 2010 at Molt averaged 43 bu/a. Three-year average yield for barley varieties tested during 2008, 2009 and 2010 at Molt averaged 36 bu/a. The feed-cultivar Boulder and the malt-cultivar Conrad have been the highest yielding entries at this location for the past three years.

Dryland spring barley yields at Broadview averaged 52 bu/a, and varied from 38 bu/a for MT020155 to 69 bu/a for Boulder (Table 4). Only Conrad, a malt barley, among commercial cultivars produced yields of 62 bu/a, statistically equal to the yields of Boulder at this location. Average test weight was 50.8 lb/bu, about 4.5 lb/bu heavier than the test weight values measured at Broadview location the previous year. All entries, except Moravian 69 and Moravian 115, produced test weight values heavier than 48 lb/bu. Grain protein content averaged 11.1 percent and ranged from 10.4 percent for 'Pinnacle' to 11.9 percent for the experimental entry 'MT010158'. The percentage of plump kernels was low in the harvested grain averaging only 67 percent. No commercial entry produced more than 90 percent plump kernels. Percentage of thin kernels averaged 11.6 percent. Two-year average yield for barley varieties tested during 2009 and 2010 at Broadview averaged 40 bu/a. Three-year average yield for barley varieties tested during 2008, 2009 and 2010 averaged 36 bu/a with Boulder out-yielding all entries averaging 52 bu/a in the past three years.

The average spring barley yield at Fromberg in 2010 was 110 bu/a and ranged from 93 bu/a for Goldeneye to 134 bu/a for the experimental entry 'MT050030'

and the commercial malt barley entry Moravian 115 (Table 5). Average test weight was 52.5 lb/bu. All entries tested at Fromberg site in 2010 produced test weight more than 48 lb/bu. Grain protein averaged 11.4 percent and ranged from 10.4 percent for Baronesse to 12.7 percent for MT020155. Crop quality was excellent, with mean percent plump and thin kernels averaging 96.9 and 1.2 percent, respectively. Lodging was obvious at Fromberg for most of the entries, averaging a lodging score of 4.8 out of 9. Lodging score varied from 0.3 for Pinnacle to 6.7 for Conrad and 'MT030042'. Two-year average yield for spring barley varieties tested during 2009 and 2010 at Fromberg was 112 bu/a. Three-year average yield for spring barley varieties tested from 2008 to 2010 was 115 bu/a. Baronesse, Boulder, Conrad, Geraldine and the experimental line 'MT010158' have been the highest yielding entries tested at Fromberg averaged over the past three years.

Average spring barley yields under irrigated condition at Hysham were 80 bu/a (Table 6) in 2010. Substantial lodging was again evident at Hysham in 2010 which adversely affected spring barley yields. Spring barley yields ranged from 65 bu/a for experimental entry 'MT020155' to 106 bu/a for commercial malt barley cultivar 'Moravian115'. Average test weight was 50.3 lb/bu. All entries tested at Hysham produced 48 lb/bu or more test weight. Grain protein averaged 12.8 percent and ranged from 11.2 for Pinnacle to 14.9 percent for MT010160. Barley quality was relatively poor compared to previous years with mean percent plump and thin kernels were 77.2 and 11.4 percent, respectively. No statistical difference in two-year and three-year averaged yield has been observed for spring barley entries tested at Hysham.

SUMMARY:

Averaged across all locations for 2010, the experimental entry MT050030 was the highest yielding spring barley tested averaging 90.8 bu/a (Tables 7 and 8). Across all locations, Boulder was the highest yielding commercial entry averaging 90.3 bu/a. For the past three years, Boulder and Baronesse have been the highest yielding commercial barley grown under both dryland and irrigation conditions averaging 85 and 82 bu/a respectively (Table 8). Under irrigated condition malt barley cultivar Moravian 115 from Miller-Coors was the top performer in 2010 with an average yield of 120 bu/a (Table 9). Averaged over the past three years, Baronesse under irrigation and Boulder under dryland condition have been the highest yielding entries tested (Tables 9 and 10).

Table 2. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Huntley, Montana during 2010. Cultivars listed alphabetically. (Exp. 103690).

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain		Plump Kernels	Thin Kernels	Plant Height	Heading date	
	2010	2009-10	2008-10			Protein	Moisture				Kernel	Kernel
	- bushels/acre -			- lb/bu -	- % -	- % -	- % -	- % -	- inches			
<u>Commercial</u>												
AC Metcalfe	97.4	82.9	83.2	51.2	11.1	11.4	94.8	2.0	37.9	165.0	13-Jun	
Baronesse	109.1*	93.6*	95.1*	51.7	10.9	10.5	91.7	3.1	34.5	167.0	15-Jun	
Boulder	115.6*	94.6*	97.8**	51.5	10.8	10.9	93.1	2.7	36.2	167.0	15-Jun	
Champion	111.3*	94.7**		52.2	10.8	10.7	94.6	2.2	35.7	166.3	14-Jun	
Conrad	101.8	87.6*	89.6*	52.0	11.1	10.9	95.2	1.9	33.6	168.3	16-Jun	
Craft	92.8	78.1	81.1	52.4	10.5	11.5	96.2	1.5	38.1	165.0	13-Jun	
Gallatin	101.9	83.7		52.1	11.0	10.9	92.9	2.5	34.1	166.0	14-Jun	
Geraldine	110.3*	93.9*	89.1*	51.8	11.1	10.8	90.3	3.5	34.3	170.3	17-Jun	
Goldeneye	107.0*	89.0*		49.4	10.6	10.7	85.3	5.5	33.5	163.0	11-Jun	
Harrington	97.7	82.2	81.6	51.7	10.8	11.3	94.8	2.0	35.0	170.0	17-Jun	
Haxby	88.9			52.1	10.7	11.0	95.1	1.9	35.5	166.7	14-Jun	
Hockett	102.4	88.5*	89.5*	52.9	10.8	11.1	97.2	1.3	33.7	165.0	13-Jun	
Moravian 115	97.3			47.0	10.5	10.5	91.6	3.6	26.5	174.0	21-Jun	
Moravian 69	103.3			49.4	10.9	10.5	88.8	4.9	29.0	172.7	19-Jun	
Pinnacle	99.1	77.0		51.1	10.4	10.4	96.8	1.6	36.7	163.7	11-Jun	
<u>Experimental</u>												
MT010158	91.4	79.4	86.8	52.1	10.8	11.3	96.2	1.5	34.7	168.3	16-Jun	
MT010160	96.9			52.7	10.8	10.5	95.2	1.7	35.8	167.7	15-Jun	
MT020155	104.1	86.9*	86.2	51.4	10.8	11.2	93.0	2.7	38.8	163.7	11-Jun	
MT030042	111.3*	90.4*		53.4	11.0	9.8	94.0	2.5	34.2	165.0	13-Jun	
MT050030	116.2**			51.5	10.8	10.5	93.3	2.7	35.0	167.0	15-Jun	
Average	102.8	86.8	88.0	51.5	10.8	10.8	93.5	2.6	34.6	167.1	15-Jun	
PLSD (p=0.05)	9.8	8.7	10.2	0.9	0.3	0.6	2.6	1.2	2.3	1.9		
CV%	5.8	8.1	11.7	1.0	1.7	3.4	1.7	27.0	4.1	0.7		

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 100 percent dry matter 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. 103690)

Planted: March 29, 2010
Harvested: August 3, 2010
Fertility: 50-0-0, ppi, March 24, 2010
Herbicide: Colt AS, 22 oz/ac; Axial XL, 16 oz/ac; Affinity BS, 0.4 oz/ac; R-11, 4 oz/ac; AMS, 2 lb/ac, May 17, 2010
Insecticide: none applied
Previous Crop: chemical fallow
Precipitation: 8.77 inches

Table 3. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Molt, Montana during 2010. Cultivars listed alphabetically. (Exp. 103691).

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	2010	2009-2010	2008-2010			- % -	- % -	- % -	- inches -
	----- bushels/acre -----			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
<u>Commercial</u>									
AC Metcalfe	48.3	36.9	31.2	48.0	9.1	17.6	50.9	20.8	34.4
Baronesse	60.0*	47.2	39.2*	47.9	8.8	14.9	51.2	17.7	31.5
Boulder	65.0**	49.7	43.2**	49.6	9.1	14.9	65.3	9.3	30.1
Champion	50.8	42.0		50.8	9.4	14.4	57.4	12.6	31.8
Conrad	60.0*	48.1	40.3*	48.2	9.0	15.8	66.6	11.2	31.2
Craft	51.1	37.2	32.0	51.7	9.1	15.4	78.0	5.6	35.3
Gallatin	57.3*	42.1		51.0	9.1	14.8	66.4	9.1	31.2
Geraldine	59.2*	42.4	36.4*	48.2	8.8	14.2	43.6	23.4	28.9
Goldeneye	52.5	44.0		45.5	8.7	14.0	38.7	22.9	30.3
Harrington	42.0	30.9	28.4	47.6	9.0	15.3	50.1	22.1	30.3
Haxby	60.8*			51.8	9.1	14.5	64.2	8.7	34.5
Hockett	43.8	37.2	32.2	49.9	9.0	14.8	67.6	8.7	30.7
Moravian 115	51.1			44.1	8.8	16.1	45.6	29.4	25.7
Moravian 69	55.2			45.2	8.5	16.4	44.9	25.6	25.5
Pinnacle	53.7	46.7		49.1	9.0	14.2	76.1	8.5	31.2
<u>Experimental</u>									
MT010158	59.4*	44.0	38.1*	49.7	9.1	14.8	65.7	11.1	32.2
MT010160	54.5			48.7	9.0	15.0	48.0	20.4	30.8
MT020155	59.2*	43.8	38.4*	50.3	8.8	14.7	59.4	11.5	32.3
MT030042	62.2*	44.9		51.1	9.3	14.4	52.6	13.9	28.3
MT050030	59.2*			49.5	9.0	14.2	65.8	9.5	31.4
Average	55.3	42.5	35.9	48.9	9.0	15.0	57.9	15.1	30.9
PLSD (p=0.05)	8.6	ns	6.9	1.7	0.3	1.2	17.5	9.6	3.5
CV%	9.4	20.3	19.4	2.1	2.0	5.0	18.3	38.5	6.9

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 100 percent dry matter 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).

Molt Dryland Spring Barley (Exp. 103691)

Planted: March 24, 2010
Harvested: August 17, 2010
Fertility: n/a
Herbicide: none applied
Insecticide: none applied
Previous Crop: fallow
Precipitation: n/a

Table 4. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Broadview, Montana during 2010. Cultivars listed alphabetically. (Exp. 103692).

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	2010	2009-2010	2008-2010						
	----- bushels/acre -----			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
<u>Commercial</u>									
AC Metcalfe	45.0	36.4	32.7	49.9	11.3	11.6	72.7	10.7	31.9
Baronesse	58.9	46.6	40.0	49.4	11.3	11.0	50.9	16.0	29.8
Boulder	69.4**	59.1**	52.0**	51.7	11.6	11.1	73.9	8.2	32.4
Champion	54.9	47.1		52.1	11.6	10.7	50.6	14.6	31.4
Conrad	62.2*	44.1	37.4	50.6	11.5	11.5	81.0	6.9	32.4
Craft	43.0	34.5	31.8	52.8	11.5	11.6	78.5	7.3	35.4
Gallatin	48.0	36.9		51.1	11.5	11.0	64.9	11.0	31.0
Geraldine	53.4	40.3	34.7	50.2	11.6	11.7	48.6	18.5	31.4
Goldeneye	50.2	36.8		48.2	11.3	10.9	51.6	18.1	30.8
Harrington	45.0	34.5	31.1	50.8	11.6	11.6	64.8	13.6	31.9
Haxby	40.8			53.4	11.5	10.8	70.5	11.1	34.0
Hockett	40.0	30.9	29.8	52.0	11.6	10.8	76.2	7.6	32.8
Moravian 115	56.3			45.7	11.2	11.3	72.4	11.3	23.9
Moravian 69	58.1			46.0	11.2	11.7	56.8	17.2	25.7
Pinnacle	45.6	31.7		52.8	11.6	10.4	88.0	5.1	31.6
<u>Experimental</u>									
MT010158	56.7	43.9	38.3	52.1	11.6	11.9	77.4	8.4	34.3
MT010160	53.8			51.9	11.7	10.7	66.1	11.5	33.7
MT020155	38.1	35.1	30.2	51.4	11.6	11.4	63.2	15.7	34.4
MT030042	56.1	44.4		52.4	11.8	10.8	64.6	10.5	32.2
MT050030	64.8*			51.1	11.4	10.6	67.2	9.5	30.7
Average	52.0	40.1	35.8	50.8	11.5	11.1	67.0	11.6	31.6
PLSD (p=0.05)	9.7	10.4	8.9	1.5	0.2	0.8	11.2	4.9	4.3
CV%	11.2	21.0	25.2	1.8	1.0	4.2	10.1	25.7	8.2

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 a 100 percent dry matter 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. 103692)

Planted:	March 23, 2010
Harvested:	August 12, 2010
Fertility:	38 N lb/a, preplant
Herbicide:	5 oz Turret LD6, + 3 oz Clarity; Roundup RT3, 16 oz/a, March 23, 2010
Insecticide:	none applied
Previous Crop:	summer fallow
Precipitation:	n/a

Table 5. Performance of 20 spring barley cultivars and experimental lines tested under irrigated conditions near Fromberg, Montana during 2010. Cultivars listed alphabetically. (Exp. 103794).

Cultivar	1/ Grain Yield		Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	3/ Lodging	
	2010	2009-2010			2008-2010					- % -
	----- bushels/acre -----		- lb/bu -	- % -	- % -	- % -	- % -	- inches -	0-9	
<u>Commercial</u>										
AC Metcalfe	118.2	114.4*	111.9	51.9	10.6	12.0	95.3	1.6	43.3	5.3
Baronesse	117.7	120.6*	121.7*	52.5	10.3	10.4	97.4	0.9	36.9	5.7
Boulder	127.3	125.8**	126.8*	53.6	10.6	10.6	98.6	0.5	36.7	5.0
Champion	117.3	122.3*		53.1	10.4	10.8	98.9	0.4	40.7	4.3
Conrad	106.8	111.2*	115.6*	50.7	10.6	11.9	96.9	1.1	38.8	6.7
Craft	97.8	99.7	103.0	53.2	10.5	12.0	98.6	0.5	38.5	5.3
Gallatin	95.3	103.0		53.6	10.5	11.6	97.1	1.0	38.5	2.7
Geraldine	114.7	122.3*	118.0*	52.3	10.5	11.4	93.4	3.2	38.6	3.3
Goldeneye	93.3	111.5*		50.3	10.1	11.6	91.7	3.2	39.9	4.3
Harrington	101.1	103.7	106.0	51.6	10.4	11.7	95.2	1.8	40.8	6.0
Haxby	89.6			54.0	10.4	11.7	98.2	0.6	41.7	4.7
Hockett	98.7	106.1	109.8	53.7	10.5	11.7	98.5	0.5	35.6	4.0
Moravian 115	134.3			49.7	10.4	11.0	95.6	2.1	29.7	6.3
Moravian 69	121.0			51.6	10.3	11.0	95.3	2.3	33.3	4.7
Pinnacle	99.1	104.9		53.1	9.8	10.7	98.7	0.5	41.9	0.3
<u>Experimental</u>										
MT010158	111.9	115.3*	116.9*	53.2	10.5	11.6	98.5	0.5	37.1	4.7
MT010160	104.2			53.3	10.6	11.5	98.2	0.6	38.6	2.3
MT020155	99.3	105.1	111.8	52.9	10.5	12.7	96.4	1.2	41.5	6.3
MT030042	109.5	116.0*		53.8	10.8	10.7	97.5	0.9	36.4	6.7
MT050030	133.7			52.1	10.5	10.7	97.9	0.8	38.8	6.3
Average	109.5	112.1	114.1	52.5	10.4	11.4	96.9	1.2	38.4	4.8
PLSD (p=0.05)	ns	14.9	11.4	1.8	0.5	0.9	2.2	1.0	2.9	2.8
CV%	17.0	10.7	10.1	2.1	2.7	4.9	1.3	49.3	4.5	36.2

1/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.

2/ Grain protein values adjusted to a 100 percent dry matter 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. 103794)

Planted: March 16,, 2010
Harvested: August 10, 2010
Fertility: 110 N, preplant
Herbicide: n/a
Previous Crop: sugarbeets
Irrigation: flood
Precipitation: n/a

Table 6. Performance of 20 spring barley cultivars and experimental lines tested under irrigated conditions near Hysham, Montana during 2010. Cultivars listed alphabetically. (Exp. 103795).

Cultivar	1/ Grain Yield		Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	3/ Lodging	
	2010	2009-2010			2008-2010				- lb/bu -	- % -
<u>Commercial</u>										
AC Metcalfe	68.2	85.8	88.4	50.4	9.0	13.1	79.1	9.1	42.1	4.0
Baronesse	85.9	101.3	107.2	50.1	8.9	13.4	76.3	12.2	38.2	3.7
Boulder	74.0	91.3	95.8	52.1	8.9	12.0	79.6	9.2	43.7	5.3
Champion	94.3	108.2		50.8	9.1	12.6	78.9	10.8	45.3	2.3
Conrad	78.8	95.1	96.5	50.0	9.0	12.9	74.9	12.9	39.0	5.3
Craft	82.5	90.5	79.0	51.7	9.1	13.1	80.8	9.0	37.4	3.7
Gallatin	68.1	86.1		52.4	9.3	13.4	79.4	8.4	41.3	5.7
Geraldine	78.5	101.1	101.0	51.0	9.1	12.4	74.6	12.3	37.4	4.7
Goldeneye	78.3	71.6		50.3	9.1	11.6	81.0	8.4	45.3	4.0
Harrington	89.1	95.9	95.6	49.6	8.9	13.7	76.0	12.3	41.7	6.7
Haxby	77.0			51.6	9.3	12.8	81.9	8.7	41.3	5.3
Hockett	78.5	90.8	93.3	51.9	9.5	12.8	79.5	12.1	41.3	3.7
Moravian 115	105.9			48.0	8.7	12.5	79.5	9.0	41.7	5.3
Moravian 69	98.7			49.1	8.7	11.9	83.2	7.1	42.5	3.0
Pinnacle	68.4	82.6		51.5	9.7	11.2	86.0	6.8	38.2	3.0
<u>Experimental</u>										
MT010158	75.4	94.6	83.2	49.5	8.7	14.1	70.1	17.9	41.7	5.0
MT010160	68.4			48.6	8.8	14.9	68.5	17.9	41.7	3.7
MT020155	64.5	89.3	90.1	48.1	8.7	13.1	69.0	15.1	42.1	2.7
MT030042	89.6	101.0		50.2	9.0	12.9	71.5	15.7	43.3	5.3
MT050030	80.0			49.9	8.9	12.0	74.6	12.4	43.7	5.3
Average	80.2	92.3	93.0	50.3	9.0	12.8	77.2	11.4	41.5	4.4
PLSD (p=0.05)	ns	ns	ns	ns	0.5	ns	ns	ns		ns
CV%	21.0	19.9	22.3	3.6	3.2	8.7	15.2	69.1		41.9

1/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.

2/ Grain protein values adjusted to a 100 percent dry matter 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. 103795)

Planted:	March 17, 2010
Harvested:	August 9, 2010
Fertility:	60 lb N/a preplant, 54 lb N/a as 46-0-0, May 20, 2010
Herbicide:	n/a
Previous Crop:	sugarbeets
Irrigation:	flood
Precipitation:	n/a

Table 7. Grain yield^{1/} of 20 spring barley cultivars tested at five locations in south central Montana during 2010. Varieties listed by declining five-location average yield.

Cultivar	Dryland				Irrigated			Five Location Average
	Huntley	Molt	Broadview	Ave.	Fromberg	Hysham	Ave.	
	----- bushels/acre -----							
MT050030	116.2**	59.2*	64.8*	80.0*	133.7	80.0	106.8*	90.8**
Boulder	115.6*	65.0**	69.4**	83.3**	127.3	74.0	100.7	90.3*
Moravian 115	97.3	51.1	56.3	68.2	134.3	105.9	120.1**	89.0*
Moravian 69	103.3	55.2	58.1	72.2	121.0	98.7	109.8*	87.3*
Baronesse	109.1*	60.0*	58.9	76.0*	117.7	85.9	101.8*	86.3*
Champion	111.3*	50.8	54.9	72.3	117.3	94.3	105.8*	85.7*
MT030042	111.3*	62.2*	56.1	76.5*	109.5	89.6	99.6	85.7*
Geraldine	110.3*	59.2*	53.4	74.3*	114.7	78.5	96.6	83.2*
Conrad	101.8	60.0*	62.2*	74.7*	106.8	78.8	92.8	81.9*
MT010158	91.4	59.4*	56.7	69.2	111.9	75.4	93.7	79.0
Goldeneye	107.0*	52.5	50.2	69.9	93.3	78.3	85.8	76.3
MT010160	96.9	54.5	53.8	68.4	104.2	68.4	86.3	75.6
AC Metcalfe	97.4	48.3	45.0	63.6	118.2	68.2	93.2	75.4
Harrington	97.7	42.0	45.0	61.5	101.1	89.1	95.1	75.0
Gallatin	101.9	57.3*	48.0	69.1	95.3	68.1	81.7	74.1
Craft	92.8	51.1	43.0	62.3	97.8	82.5	90.2	73.5
Pinnacle	99.1	53.7	45.6	66.2	99.1	68.4	83.8	73.2
MT020155	104.1	59.2*	38.1	67.1	99.3	64.5	81.9	73.0
Hockett	102.4	43.8	40.0	62.1	98.7	78.5	88.6	72.7
Haxby	88.9	60.8*	40.8	63.5	89.6	77.0	83.3	71.4
Average	102.8	55.3	52.0	70.0	109.5	80.2	94.9	80.0
PLSD (p=0.05)	9.81	8.6	9.7	9.1	ns	ns	18.7	9.9
CV%	5.8	9.4	11.2	13.6	17.0	21.0	16.3	16.9

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 8. Performance of 20 spring barley cultivars and experimental lines tested under dryland and irrigated conditions at five locations in south central Montana during 2010. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain	Plump Kernels	Thin Kernels	Plant Height
	2010	2009-2010	2008-2010			Protein			
	----- bushels/acre -----			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
<u>Commercial</u>									
AC Metcalfe	75.4	71.3	67.8	50.3	10.2	13.1	78.6	8.8	36.9
Baronesse	86.3*	81.8*	77.9*	50.3	10.0	12.0	73.5	10.0	33.2
Boulder	90.3*	84.1**	81.6**	51.7	10.2	11.9	82.1	6.0	33.9
Champion	85.7*	82.9*		51.8	10.3	11.8	76.1	8.1	34.9
Conrad	81.9*	77.2	74.2	50.3	10.2	12.6	82.9	6.8	34.0
Craft	73.5	68.0	66.0	52.4	10.1	12.7	86.4	4.8	36.8
Gallatin	74.1	70.3		52.0	10.3	12.3	80.1	6.4	33.7
Geraldine	83.2*	80.0*	74.4	50.7	10.2	12.1	70.1	12.2	33.3
Goldeneye	76.3	70.6		48.7	10.0	11.8	69.7	11.6	33.6
Harrington	75.0	69.5	66.7	50.3	10.1	12.7	76.2	10.4	34.5
Haxby	71.4			52.6	10.2	12.1	82.0	6.2	36.4
Hockett	72.7	70.7	69.0	52.1	10.3	12.3	83.8	6.0	33.2
Moravian 115	89.0*			46.9	9.9	12.3	76.9	11.1	26.4
Moravian 69	87.3*			48.3	9.9	12.3	73.8	11.4	28.4
Pinnacle	73.2	68.6		51.5	10.1	11.4	89.1	4.5	35.4
<u>Experimental</u>									
MT010158	79.0	75.4	73.5	51.3	10.1	12.7	81.6	7.9	34.6
MT010160	75.6			51.0	10.2	12.5	75.2	10.4	34.7
MT020155	73.0	72.0	69.9	50.8	10.1	12.6	76.2	9.2	36.7
MT030042	85.7*	79.4*		52.2	10.4	11.7	76.0	8.7	32.8
MT050030	90.8**			50.8	10.1	11.6	79.7	7.0	34.0
Average	80.0	74.8	72.1	50.8	10.1	12.2	78.5	8.4	33.9
PLSD (p=0.05)	9.9	6.2	4.4	1.2	0.2	0.7	7.8	4.4	1.9
CV%	16.9	16.2	14.1	3.2	3.2	7.9	13.6	72.7	6.8
Location Years	5	10	15	5	5	5	5	5	4

1/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.

2/ Grain protein values adjusted to a 100 percent dry matter 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 9. Performance of 20 spring barley cultivars and experimental lines tested under irrigated conditions at two locations in south central Montana during 2010. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain Protein		Plump Kernels	Thin Kernels	Plant Height	3/ Lodging
	2010	2009-2010	2008-2010			- % -	- % -				
	----- bushels/acre -----			- lb/bu -	- % -	- % -	- % -	- % -	- inches -	0-9	
<u>Commercial</u>											
AC Metcalfe	93.2	100.1	101.5	51.2	9.8	12.5	87.2	5.4	43.3	4.7	
Baronesse	101.8*	110.9*	113.5**	51.3	9.6	11.9	86.9	6.6	36.9	4.7	
Boulder	100.7	108.5*	112.6*	52.8	9.8	11.3	89.1	4.8	36.7	5.2	
Champion	105.8*	115.2**		52.0	9.8	11.7	88.9	5.6	40.7	3.3	
Conrad	92.8	103.2*	107.4*	50.4	9.8	12.4	85.9	7.0	38.8	6.0	
Craft	90.2	95.1	98.0	52.5	9.8	12.6	89.7	4.7	38.5	4.5	
Gallatin	81.7	94.5		53.0	9.9	12.5	88.3	4.7	38.5	4.2	
Geraldine	96.6	111.7*	111.2*	51.7	9.8	11.9	84.0	7.8	38.6	4.0	
Goldeneye	85.8	91.5		50.3	9.6	11.6	86.4	5.8	39.9	4.2	
Harrington	95.1	99.8	102.0	50.6	9.7	12.7	85.6	7.1	40.8	6.3	
Haxby	83.3			52.8	9.8	12.2	90.1	4.6	41.7	5.0	
Hockett	88.6	98.4	102.2	52.8	10.0	12.3	89.0	6.3	35.6	3.8	
Moravian 115	120.1**			48.9	9.6	11.7	87.5	5.5	29.7	5.8	
Moravian 69	109.8*			50.3	9.5	11.4	89.3	4.7	33.3	3.8	
Pinnacle	83.8	93.7		52.3	9.7	10.9	92.3	3.7	41.9	1.7	
<u>Experimental</u>											
MT010158	93.7	105.0*	108.0*	51.4	9.6	12.9	84.3	9.2	37.1	4.8	
MT010160	86.3			50.9	9.7	13.2	83.4	9.3	38.6	3.0	
MT020155	81.9	97.2	102.8	50.5	9.6	12.9	82.7	8.1	41.5	4.5	
MT030042	99.6	108.5*		52.0	9.9	11.8	84.5	8.3	36.4	6.0	
MT050030	106.8*			51.0	9.7	11.3	86.2	6.6	38.8	5.8	
Average	94.9	102.2	105.9	51.4	9.7	12.1	87.1	6.3	38.4	4.6	
PLSD (p=0.05)	18.7	12.7	9.4	1.8	ns	1.2	ns	ns	2.9	ns	
CV%	16.3	15.1	12.0	2.9	5.1	8.4	7.4	70.3	4.5	44.3	
Location Years	2	4	6	2	2	2	2	2	1	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 a 100 percent dry matter 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 10. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions at three locations in south central Montana during 2010. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield			Test Weight	Grain Moisture	2/ Grain	Plump Kernels	Thin Kernels	Plant Height
	2010	2009-2010	2008-2010			Protein			
	----- bushels/acre -----			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
<u>Commercial</u>									
AC Metcalfe	63.6	52.1	49.0	49.7	10.5	13.5	72.8	11.2	34.8
Baronesse	76.0*	62.4*	58.1	49.7	10.3	12.1	64.6	12.3	31.9
Boulder	83.3**	67.8**	64.3**	50.9	10.5	12.3	77.4	6.7	32.9
Champion	72.3	61.3		51.7	10.6	11.9	67.5	9.8	33.0
Conrad	74.7*	59.9	55.8	50.3	10.5	12.7	80.9	6.7	32.4
Craft	62.3	49.9	48.3	52.3	10.4	12.8	84.2	4.8	36.3
Gallatin	69.1	54.2		51.4	10.5	12.2	74.7	7.5	32.1
Geraldine	74.3*	58.8	53.4	50.1	10.5	12.2	60.8	15.1	31.5
Goldeneye	69.9	56.6		47.7	10.2	11.9	58.5	15.5	31.6
Harrington	61.5	49.2	47.0	50.0	10.4	12.7	69.9	12.6	32.4
Haxby	63.5			52.4	10.4	12.1	76.6	7.2	34.7
Hockett	62.1	52.2	50.5	51.6	10.5	12.2	80.3	5.8	32.4
Moravian 115	68.2			45.6	10.2	12.7	69.9	14.8	25.4
Moravian 69	72.2			46.9	10.2	12.9	63.5	15.9	26.7
Pinnacle	66.2	51.8		51.0	10.3	11.7	87.0	5.1	33.2
<u>Experimental</u>									
MT010158	69.2	55.7	54.4	51.3	10.5	12.6	79.8	7.0	33.7
MT010160	68.4			51.1	10.5	12.1	69.8	11.2	33.5
MT020155	67.1	55.2	51.6	51.0	10.4	12.4	71.9	10.0	35.1
MT030042	76.5*	59.9		52.3	10.7	11.6	70.4	8.9	31.6
MT050030	80.0*			50.7	10.4	11.8	75.4	7.2	32.4
Average	70.0	56.5	53.2	50.4	10.4	12.3	72.8	9.8	32.4
PLSD (p=0.05)	9.1	6.1	4.7	1.3	0.3	0.8	10.5	6.0	1.9
CV%	13.6	16.1	16.4	2.7	2.6	6.9	15.1	64.3	6.0
Location Years	3	6	9	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 a 100 percent dry matter 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).