RESULTS OF AGRONOMIC AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2009

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

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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 2009 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 12 commercial cultivars and 8 experimental lines, representing both feed and malt type cultivars, were grown at all locations.

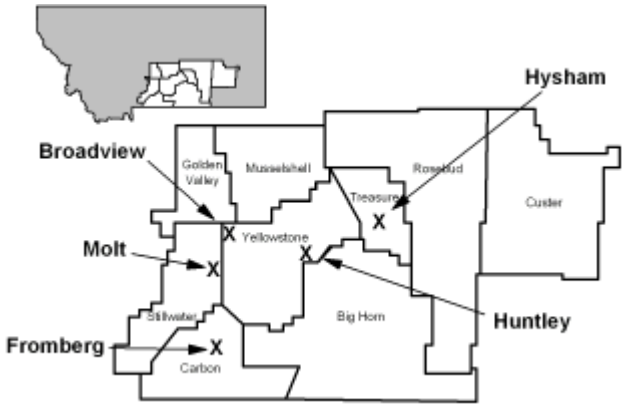

Figure 1. 2009 off-station spring barley trial locations in south central Montana.

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. Actual seeding rates were calculated from the thousand kernel weight determined for the seed lot of each cultivar (Table 1), and varied from 47 to 68 pounds per acre for the dryland sites and from 68 to 100 pounds per acre under irrigation. Seeding rates were not adjusted for germination.

Dryland test plots consisted of a 15-foot, 4-row plot with 14-inch row spacing. 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 2009

Cultivar	Thousand Kernel Weight	Seeds per Pound	1/ Dryland Seeding Rate		2/ Irrigated Seeding Rate	
			per plot	per acre	per plot	per acre
	grams	#	grams	pounds	grams	pounds
Commercial						
AC Metcalfe	39.1	11,625	38.3	52	56.2	77
Baronesse	41.6	10,926	40.7	56	59.8	82
Boulder	42.5	10,684	41.6	57	61.2	84
Champion	45.8	9,906	44.9	62	66.0	90
Conrad	40.7	11,144	39.9	55	58.7	80
Craft	45.8	9,921	44.8	61	65.9	90
Gallatin	35.8	12,694	35.1	48	51.5	71
Goldeneye	38.6	11,750	37.9	52	55.6	76
Harrington	40.1	11,308	39.3	54	57.8	79
Hockett	48.2	9,425	47.2	65	69.4	95
Moravian 37	46.3	9,797	45.4	62	66.7	91
Pinnacle	50.8	8,935	49.8	68	73.2	100
Experimental						
Coors 116	44.2	10,269	43.3	59	63.7	87
Coors 119	43.6	10,424	42.7	59	62.7	86
MT960101	34.7	13,090	34.0	47	49.9	68
MT960155	43.3	10,487	42.4	58	62.3	85
MT010158	45.2	10,049	44.3	61	65.1	89
MT020155	43.2	10,503	42.4	58	62.2	85
MT030042	49.6	9,153	48.6	67	71.4	98
MT061207	47.8	9,489	46.9	64	68.9	94

1/ Equivalent to 0.6 million seeds per acre (14 seeds per foot^2) on a mass basis.
2/ Equivalent to 1.0 million seeds per acre (24 seeds per foot^2) on a mass basis.

RESULTS:

The 2009 spring barley test sites were dry over-winter, with very little rain or snow accumulating during November, January and February. Above average precipitation occurred during March and April, which delayed planting of all

spring barley test locations. Conditions were dry during most of May and the first half of June, but cooler than normal temperatures during June and July delayed crop development helping to avoid drought-related stresses in the crop at the dryland sites. Above normal precipitation also occurred during a period from the last week of June throughout the month of July. The moderate temperatures occurring during late June and throughout July delayed crop maturity. The dryland spring barley trial at Huntley was briefly exposed to pea-size hail on July 26. No stem breakage occurred, but a small amount of head shatter was observed.

The dryland spring barley yield near Huntley averaged 69 bu/a in 2009 (Table 2), 20 bu/a less than the trial harvested in 2008. Yields ranged from 55 bu/a for 'Pinnacle" to 78 bu/a for 'Champion' and 'Baronesse'. The highest yielding experimental entry was 'MT960101', averaging 77 bu/a. The cultivar 'Hockett' was the highest yielding commercial malt-type entry, averaging 75 bu/a at Huntley. Six other commercial spring barley cultivars including 'AC Metcalfe' 'Boulder', 'Conrad', 'Goldeneye', 'Harrington' and 'Moravian 37' produced yields from 67 to 73 bu/a, statistically equal to the yields of Champion or Baronesse at this location. Average test weight was 51.2 lb/bu, with all entries having test weight values heavier than 48 lb/bu. Grain protein levels averaged 12.1 percent and varied from 11.0 percent for 'MT030042' to 13.0 percent for 'Craft'. All spring barley cultivars tested produced more than 90 percent plump kernels in the harvested grain. The measured level of thin kernels was very low among the barley entries tested at this site in 2009.

The 2009 spring barley trial at Molt produced an average yield of 30 bu/a (Table 3), 30 percent more than the site produced the previous year. Grain yields at Molt ranged from 20 bu/a for Harrington to 40 bu/a for Pinnacle. Seven other commercial spring barley cultivars including Baronesse, Boulder, Champion, Conrad, Goldeneye, Hockett and Moravian 37 produced yields from 30 to 36 bu/a, statistically equal to the yields of Pinnacle at this location. Average test weight was 49.6 pounds per bushel, more than 4 lb/bu heavier than test weight values measured at Molt the previous year. Nine of the 20 entries averaged test weight values heavier than 50 lb/bu, including Pinnacle which averaged 53.3 lb/bu. Only Harrington produced a test weight lighter than 48 lb/bu, measuring 44.5 lb/bu. Grain protein content averaged 12.2 percent and ranged from 9.9 percent for Pinnacle to 14.5 percent for AC Metcalfe. Plump and thin kernels averaged 71 and 10 percent, respectively. Only Pinnacle averaged more than 90 percent plump kernels in the harvested grain. Two-year average yield for barley varieties tested during 2008 and 2009 at Molt averaged 27 bu/a. Three-year average yield for barley varieties tested during 2007, 2008 and 2009 in Molt averaged 25 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 29 bu/a, and varied from 18 bu/a for Pinnacle to 49 bu/a for Boulder (Table 4). No other spring barley entry equaled the yield of Boulder at the Broadview test site in 2009. AC Metcalfe was the highest yielding malt-type cultivar, averaging 28 bu/a. Once again, spring barley test weights at the Broadview location were the lightest measured among the three dryland sites harvested in 2009, averaging 46.3 lb/bu. Only Champion and Craft were commercial entries producing test weight values heavier than 48 lb/bu. Grain protein levels were high, averaging 16.2 percent. Grain protein varied from 14.9 percent for Baronesse to 17.3 percent for the experimental entry 'Coors 119'. The percentage of plump kernels in the harvested grain averaged 86 percent, and varied from 97 percent for the experimental line 'MT061207' to 68 percent in Goldeneye. Percentage of thin kernels was low, averaging 4.3 percent. Two-year average yield for barley varieties tested during 2008 and 2009 at Broadview has averaged 28 bu/a, with Boulder spring barley averaging 43 bu/a.

The average spring barley yield at Fromberg in 2009 was 118 bu/a and ranged from 102 bu/a for Craft to 130 bu/a for the experimental entry 'MT960101' and the commercial entry Goldeneye (Table 5). The highest yielding commercial malt-type entry was Moravian 37, averaging 125 bu/a. Average test weight across all entries tested at Fromberg for 2008 was 51.2 lb/bu. Only the experimental line 'Coors 116' produced a test weight lighter than 48 lb/bu. Grain protein averaged 9.8 percent and ranged from 9.0 percent protein for MT030042 to 10.5 percent for Goldeneye. Crop quality was excellent, with mean percent plump and thin kernels averaging 95.2 and 1.3 percent, respectively. Lodging was not evident among most entries tested at the Fromberg in 2009, with only MT061207 showing any obvious sign of lodging. Two-year average yield for spring barley varieties tested during 2008 and 2009 at Fromberg averaged 117 bu/a. Three-year average yield for spring barley varieties tested during 2007 to 2009 averaged 111 bu/a. Boulder, Conrad, Hockett and the experimental line MT960101 have been the highest yielding entries test at Fromberg the past three years.

Average spring barley yields under irrigated condition at Hysham were 109 bu/a (Table 6) in 2009. Substantial lodging was again evident at the Hysham in 2009, but spring barley yields were not as adversely affected. Spring barley yields ranged from 65 bu/a for Goldeneye to 140 bu/a for Coors 119. Moravian 37 and Champion were the highest yielding commercial entries tested at Hysham in 2009, both averaging about 122 bu/a. Average test weight across all entries tested at Hysham for 2009 was 49.4 lb/bu, with only Pinnacle producing less than 48 lb/bu test weight. Grain protein averaged 13.3 percent and ranged from 12.1 for Pinnacle to 14.4 percent for Hockett. Mean percent plump and thin kernels were 95.1 and 2.0 percent, respectively. No statistical difference in yield has been observed for spring barley entries tested at Hysham the past two years.

SUMMARY:

Averaged across all locations for 2009, the experimental entry Coors 119 was the highest yielding spring barley tested averaging 81 bu/a (Table 7 and 8). Although Coors 119 appears to have strong agronomic adaptation for production in south central Montana, the line has been discontinued by MillerCoors due to end use quality issues. Across all locations, Champion was the highest yielding commercial entry averaging 80 bu/a. For the past two years, Baronesse has been the highest yielding entry tested under irrigation (Table 9). For the past three years, Boulder has been the highest yielding commercial barley grown under both dryland and irrigation conditions averaging 79 bu/a (Table 9 and 10). Conrad and Hockett are the only commercial cultivars that have produced yields equal to those of Baroness or Boulder for the past two and three years, respectively, under irrigated conditions (Table 9).

Table 2. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Huntley, Montana during 2009. Cultivars listed alphabetically. (Exp. 093690).

Cultivar	1/ Grain Yield 2009	Grain Yield 2008-2009	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	Heading Date Julian	Heading Date Calendar
	--- bushels/acre ----		- lb/bu -	- % -	- % -	- % -	- % -	- inches -		
Commercial										
AC Metcalfe	**68.4***	76.1	50.6	10.1	12.3	95.1	1.8	33.5	166.3	Jun 14
Baronesse	**78.0***	88.2	51.2	10.2	11.3	96.1	0.9	31.0	172.3	Jun 20
Boulder	**73.7***	88.9	51.9	10.3	11.9	97.3	0.9	31.2	170.3	Jun 18
Champion	**78.1****		51.7	10.3	11.2	95.1	1.5	32.7	170.0	Jun 18
Conrad	**73.5***	83.6	51.3	10.1	12.7	96.9	1.2	29.5	172.3	Jun 20
Craft	63.4	75.3	51.9	10.1	13.0	97.6	0.9	34.6	168.7	Jun 16
Gallatin	65.5		52.2	10.3	12.3	95.8	1.5	33.6	167.7	Jun 15
Goldeneye	**71.0***		49.8	9.9	11.4	95.6	1.3	30.1	163.0	Jun 11
Harrington	**66.8***	73.6	51.1	10.4	12.7	95.7	1.5	32.4	170.0	Jun 18
Hockett	**74.6***	83.1	52.1	10.5	11.9	97.5	0.9	31.8	169.3	Jun 17
Moravian 37	**70.3***		51.3	10.0	12.4	98.2	0.9	28.1	172.7	Jun 20
Pinnacle	55.0		50.9	10.2	11.5	97.6	0.9	31.4	164.0	Jun 12
Experimental										
Coors 116	**73.4***		48.3	10.1	12.7	96.8	1.3	22.0	173.0	Jun 21
Coors 119	**77.0***		49.3	10.1	12.1	96.2	1.3	25.5	173.0	Jun 21
MT960101	**77.4***	77.2	51.2	10.3	11.8	94.4	1.6	29.1	172.7	Jun 20
MT960155	54.8		52.7	10.4	12.2	95.6	1.5	33.6	167.7	Jun 15
MT010158	**67.4***	84.5	51.3	10.2	12.8	96.8	1.2	31.8	170.0	Jun 18
MT020155	**69.6***	77.3	50.9	10.2	12.7	96.5	1.0	33.4	165.3	Jun 13
MT030042	**69.6***		52.7	10.6	11.0	95.5	1.5	30.3	170.0	Jun 18
MT061207	59.2		51.2	10.0	12.7	97.3	0.9	31.8	167.3	Jun 15
Average	69.3	80.8	51.2	10.2	12.1	96.4	1.2	30.9	169.3	Jun 17
PLSD (p=0.05)	13.1	ns	0.7	0.2	1.1	1.4	ns	1.9	1.2	
CV%	11.5	14.5	0.9	1.3	5.6	0.9	35.5	3.7	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 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. 093690)

Planted:	March 20, 2009
Harvested:	August 13, 2009
Fertility:	30-0-0, preplant, February 11, 2009
Herbicide:	Huskie 11 oz/a + Axial XL 16.4 oz/a + R-11 4 oz/a +AMS 1 lb/ac, May 11, 2009
Insecticide:	none applied
Previous Crop:	chemical fallow
Precipitation:	8.96 inches

Table 3. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Molt, Montana during 2009. Cultivars listed alphabetically. (Exp. 093691).

Cultivar	Grain Yield 1/ 2009	Grain Yield 1/ 2008-2009	Grain Yield 1/ 2007-2009	Test Weight	Grain Moisture	Grain Protein 2/	Plump Kernels	Thin Kernels	Plant Height
	bushels/acre			lb/bu	%	%	%	%	inches
Commercial									
AC Metcalfe	25.5	22.6	20.8	48.9	11.8	14.5	55.5	17.6	22.0
Baronesse	**34.4***	28.8		50.0	12.0	11.1	73.9	7.9	19.5
Boulder	**34.4***	32.2	29.4	49.9	11.8	11.0	65.1	10.6	20.1
Champion	**33.3***			50.5	12.0	13.2	44.4	19.5	18.7
Conrad	**36.1***	30.5	29.0	49.8	12.0	11.9	83.0	5.7	22.0
Craft	23.3	22.5	22.6	48.4	11.9	13.3	79.7	6.0	23.6
Gallatin	26.8			49.4	11.8	13.6	60.6	16.6	22.8
Goldeneye	**35.5***			48.0	11.8	11.3	73.4	9.0	22.0
Harrington	19.8	21.6	23.4	44.5	11.9	13.6	58.4	16.0	19.5
Hockett	**30.6***	26.4	23.7	50.8	12.0	12.6	70.0	10.8	21.3
Moravian 37	**35.3***			50.3	11.8	11.8	87.1	4.0	20.8
Pinnacle	**39.6****			53.3	12.2	9.9	91.0	3.0	21.2
Experimental									
Coors 116	27.9			48.4	11.9	11.6	78.6	8.3	19.2
Coors 119	**30.3***			48.7	11.7	13.5	57.4	19.8	20.1
MT960101	25.5	25.7	23.0	49.8	12.3	12.1	68.6	10.7	18.8
MT960155	19.9			50.8	12.0	12.4	66.2	10.4	19.9
MT010158	28.5	27.5		50.4	11.9	11.4	81.2	5.9	23.1
MT020155	28.4	28.0		49.6	11.8	11.9	67.1	11.9	24.1
MT030042	27.7			50.2	12.1	11.3	75.0	8.7	21.6
MT061207	**32.5***			50.8	11.8	12.8	82.9	6.1	21.9
Average	29.8	26.6	24.6	49.6	11.9	12.2	71.0	10.4	21.1
PLSD (p=0.05)	11.0	ns	ns	ns	ns	ns	23.8	ns	2.1
CV%	22.4	23.0	27.8	4.9	1.6	11.9	20.3	62.9	5.9

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. 093691)

Planted:	April 22, 2009
Harvested:	August 20, 2009
Fertility:	11-52-00, 50 lb/a in-furrow at planting, 45-0-0, 67 lb/a, May 6, 2009
Herbicide:	none applied
Insecticide:	none applied
Previous Crop:	spring barley
Precipitation:	n/a

Table 4. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Broadview, Montana during 2009. Cultivars listed alphabetically. (Exp. 093692).

Cultivar	1/ Grain Yield 2009	1/ Grain Yield 2008-2009	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	-------- bushels/acre ------		- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial								
AC Metcalfe	27.7	26.5	47.0	9.2	16.3	88.6	3.1	30.9
Baronesse	34.3	30.5	47.5	9.0	14.9	81.7	5.7	27.5
Boulder	**48.9****	**43.2****	48.1	8.9	16.6	95.2	1.1	28.4
Champion	39.4		50.0	9.6	16.6	85.9	3.5	28.7
Conrad	26.0	25.1	41.5	9.0	15.8	81.4	5.8	25.6
Craft	26.0	26.2	48.1	9.3	15.1	94.7	0.5	32.9
Gallatin	25.8		45.2	9.1	15.6	80.2	6.1	29.8
Goldeneye	23.3		42.8	8.8	16.1	68.2	10.9	26.2
Harrington	24.0	24.2	46.2	9.0	16.5	79.3	7.7	29.5
Hockett	21.8	24.7	47.0	9.6	16.3	95.2	1.1	28.5
Moravian 37	24.2		46.9	8.9	16.9	89.0	2.4	24.1
Pinnacle	17.7		42.9	9.5	16.8	92.6	2.4	26.8
Experimental								
Coors 116	28.8		43.4	8.8	16.6	82.3	5.5	22.6
Coors 119	32.8		46.2	8.8	17.3	79.2	5.8	23.4
MT960101	27.3	25.8	44.6	9.2	16.7	75.5	9.0	25.3
MT960155	24.7		48.4	9.5	15.8	91.9	1.3	26.6
MT010158	31.1	29.1	48.1	9.2	15.7	88.8	3.2	28.6
MT020155	32.1	26.3	45.1	8.3	16.0	89.2	2.2	28.8
MT030042	32.7		49.5	9.6	15.9	77.7	7.8	28.4
MT061207	25.3		47.7	8.9	16.4	97.1	0.3	27.6
Average	28.7	28.1	46.3	9.1	16.2	85.7	4.3	27.5
PLSD (p=0.05)	8.0	8.7	ns	0.4	1.9	11.6	4.6	2.6
CV%	16.8	23.6	8.3	2.6	7.1	8.2	65.1	5.8

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 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. 093692)

Planted:	April 23, 2009
Harvested:	August 27, 2009
Fertility:	11-52-00, 100 lb/a in-furrow at planting
Herbicide:	Roundup RT3, 16 oz/a, May 1, 2009
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 2009. Cultivars listed alphabetically. (Exp. 093794).

Cultivar	Grain Yield 1/ 2009	Grain Yield 1/ 2008-2009	Grain Yield 1/ 2007-2009	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	110.6	108.7	107.8	51.7	11.8	10.0	96.2	0.6	35.0	0.0
Baronesse	123.4	123.7		50.9	11.6	9.2	90.6	3.2	32.4	0.0
Boulder	124.2	126.6	**127.6****	51.4	11.7	9.4	96.5	0.6	31.7	0.0
Champion	127.3			52.3	12.0	9.6	95.8	0.9	34.6	0.0
Conrad	115.6	119.9	**117.5***	51.3	11.9	10.0	94.9	1.3	32.5	0.7
Craft	101.7	105.6	90.0	52.7	12.0	10.1	98.2	0.0	35.5	0.0
Gallatin	110.6			52.1	12.1	9.5	96.6	0.9	34.2	0.7
Goldeneye	129.6			48.7	11.4	10.5	94.7	1.0	34.1	0.0
Harrington	106.4	108.5	107.9	51.0	11.7	9.3	95.9	1.3	33.1	1.0
Hockett	113.4	115.3	**111.2***	52.7	11.8	10.0	96.9	0.6	34.3	0.0
Moravian 37	125.4			51.5	11.7	10.1	97.5	0.6	29.0	0.0
Pinnacle	110.7			50.2	11.8	9.2	99.0	0.0	32.3	0.0
Experimental										
Coors 116	125.2			47.8	11.2	10.1	94.6	1.3	27.1	0.0
Coors 119	125.0			49.0	11.4	9.4	93.4	1.9	26.5	0.0
MT960101	129.9	119.8	**116.4***	51.4	12.0	9.5	87.3	4.4	31.3	0.0
MT960155	119.3			52.3	11.8	9.8	96.3	0.6	34.7	0.3
MT010158	118.7	119.4		52.0	11.8	9.9	96.8	0.6	34.1	0.0
MT020155	110.9	118.1		50.6	11.6	9.8	95.9	0.9	34.7	0.3
MT030042	122.5			52.7	12.0	9.0	90.8	3.5	32.0	1.0
MT061207	110.7			50.7	11.6	10.5	96.7	0.7	33.0	2.7
Average	118.4	116.5	111.2	51.2	11.7	9.8	95.2	1.3	32.6	0.3
PLSD (p=0.05)	ns	ns	19.2	0.7	0.2	0.8	4.7	ns	2.8	1.3
CV%	8.9	9.8	16.8	0.8	1.3	4.8	3.0	116.3	5.1	256.5

1/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 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. 093794)	
Planted:	April 8, 2009
Harvested:	August 20, 2009
Fertility:	40 N – 60 P_2O_5, preplant
Herbicide:	n/a
Previous Crop:	sugar beets
Irrigation:	flood
Precipitation:	n/a

Table 6. Performance of 20 spring barley cultivars and experimental lines tested under irrigated conditions near Hysham, Montana during 2009. Cultivars listed alphabetically. (Exp. 093795).

Cultivar	1/ Grain Yield 2009	2/ Grain Yield 2008-09	Test Weight	Grain Moisture	Grain Protein	Plump Kernels	Thin Kernels	Plant Height	Lodging
	------ bushels/acre ----		- lb/bu -	- % -	- % -	- % -	- % -	- inches -	0-9
Commercial									
AC Metcalfe	103.5	98.5	48.6	11.7	14.2	90.8	3.6	43.8	7.7
Baronesse	116.6	117.9	49.8	12.3	12.7	93.6	2.9	39.7	5.0
Boulder	108.6	106.6	49.6	11.8	13.9	94.6	2.2	42.3	5.3
Champion	**122.0***		51.0	12.1	13.1	97.6	0.9	41.5	4.3
Conrad	111.5	105.3	50.1	11.9	14.0	96.8	1.0	39.1	7.3
Craft	98.4	77.3	51.2	12.0	13.0	99.1	0.3	42.4	4.0
Gallatin	104.0		50.2	12.2	13.8	90.4	4.3	41.3	6.7
Goldeneye	64.9		47.9	12.7	13.3	94.7	2.4	41.6	4.3
Harrington	102.7	98.8	48.1	11.7	13.8	92.6	2.7	41.7	6.7
Hockett	103.0	100.6	49.4	12.0	14.4	91.2	4.2	38.9	8.7
Moravian 37	**121.7***		50.8	12.1	12.8	97.2	0.9	35.7	2.7
Pinnacle	96.7		47.1	11.7	12.1	97.1	1.3	38.6	5.3
Experimental									
Coors 116	**132.4***		48.6	12.1	12.3	98.7	0.0	32.7	1.0
Coors 119	**140.1****		49.3	11.9	12.2	95.3	1.6	32.5	0.0
MT960101	**123.6***	113.0	49.2	12.3	12.9	95.3	1.7	39.8	5.0
MT960155	69.5		48.1	12.5	14.2	89.5	4.9	41.3	6.7
MT010158	113.8	87.1	50.6	12.3	13.3	99.0	0.0	40.0	2.0
MT020155	114.1	103.0	50.0	11.9	13.2	97.5	0.6	41.2	6.0
MT030042	112.4		49.8	12.4	12.2	94.0	2.5	38.1	6.3
MT061207	114.3		49.4	11.6	13.8	96.7	1.0	40.5	7.3
Average	108.7	100.8	49.4	12.1	13.3	95.1	2.0	39.6	5.1
PLSD (p=0.050	19.3	ns	1.0	0.6	1.1	5.4	3.1	1.9	2.8
CV%	10.8	21.7	1.3	3.0	5.0	3.4	92.5	3.0	33.6

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. 093795)

Planted:	March 27, 2009
Harvested:	August 18, 2009
Fertility:	98 lb N/a, fall 2008
Herbicide:	Bronate Advanced, 14 oz/a + Starane Ultra, 5 oz/a +Axial, 8.2 oz/a, POST
Previous Crop:	sugar beets
Irrigation:	flood
Precipitation:	n/a

Table 7. Grain yield[1/] of 20 spring barley cultivars tested at five locations in south central Montana during 2009. Varieties listed by declining five-location average yield.

	Dryland				Irrigated			Five Location
	Huntley	Molt	Broadview	Ave.	Fromberg	Hysham	Ave.	Average
	bushels/acre							
Coors 119	**77.0***	**30.3***	32.8	**46.7***	125.0	**140.1****	132.6	**81.0****
Champion	**78.1****	**33.3***	39.4	**50.3***	127.3	**122.0***	124.6	**80.0***
Boulder	**73.7***	**34.4***	**48.9****	**52.3****	124.2	108.6	116.4	**78.0***
Coors 116	**73.4***	27.9	28.8	**43.4***	125.2	**132.4***	128.8	**77.5***
Baronesse	**78.0***	**34.4***	34.3	**48.9***	123.4	116.6	120.0	**77.3***
MT960101	**77.4***	25.5	27.3	**43.4***	129.9	**123.6***	126.8	**76.7***
Moravian 37	**70.3***	**35.3***	24.2	**43.3***	125.4	**121.7***	123.5	**75.4***
MT030042	**69.6***	27.7	32.7	**43.3***	122.5	112.4	117.5	**73.0***
Conrad	**73.5***	**36.1***	26.0	**45.2***	115.6	111.5	113.5	**72.5***
MT010158	**67.4***	28.5	31.1	42.3	118.7	113.8	116.3	**71.9***
MT020155	**69.6***	28.4	32.1	**43.3***	110.9	114.1	112.5	**71.0***
Hockett	**74.6***	**30.6***	21.8	42.3	113.4	103.0	108.2	68.7
MT061207	59.2	**32.5***	25.3	39.0	110.7	114.3	112.5	68.4
AC Metcalfe	**68.4***	25.5	27.7	40.6	110.6	103.5	107.0	67.2
Gallatin	65.5	26.8	25.8	39.3	110.6	104.0	107.3	66.5
Goldeneye	**71.0***	**35.5***	23.3	**43.3***	129.6	64.9	97.3	64.9
Harrington	**66.8***	19.8	24.0	36.9	106.4	102.7	104.5	63.9
Pinnacle	55.0	**39.6****	17.7	37.4	110.7	96.7	103.7	63.9
Craft	63.4	23.3	26.0	37.6	101.7	98.4	100.0	62.5
MT960155	54.8	19.9	24.7	33.1	119.3	69.5	94.4	57.6
Average	69.3	29.8	28.7	42.6	118.4	108.7	113.4	70.9
PLSD (p=0.05)	13.1	11.0	8.0	9.0	ns	19.3	ns	11.0
CV%	11.5	22.4	16.8	22.2	8.9	10.8	19.4	21.3

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 2009. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield 2009	2008-2009	2007-2009	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	bushels/acre			lb/bu	%	%	%	%	inches
Commercial									
AC Metcalfe	67.2	66.5	65.7	49.4	10.9	13.4	85.2	5.4	33.0
Baronesse	**77.3***	**77.8***		49.9	11.0	11.8	87.2	4.1	30.0
Boulder	**78.0***	**79.5****	**79.1****	50.2	10.9	12.6	89.8	3.1	30.8
Champion	**80.0***			51.1	11.2	12.8	83.7	5.3	31.2
Conrad	**72.5***	**72.9***	72.3	48.8	11.0	12.9	90.6	3.0	29.8
Craft	62.5	61.4	57.9	50.5	11.1	12.9	93.8	1.5	33.8
Gallatin	66.5			49.8	11.1	12.9	84.7	5.9	32.3
Goldeneye	64.9			47.4	10.9	12.5	85.3	4.9	30.8
Harrington	63.9	65.3	65.6	48.2	10.9	13.2	84.4	5.9	31.3
Hockett	68.7	70.0	68.5	50.4	11.2	13.1	90.2	3.5	31.0
Moravian 37	**75.4***			50.2	10.9	12.8	93.8	1.8	27.6
Pinnacle	63.9			48.9	11.1	11.9	95.4	1.5	30.0
Experimental									
Coors 116	**77.5***			47.3	10.8	12.6	90.2	3.3	24.7
Coors 119	**81.0****			48.5	10.8	12.9	84.3	6.1	25.6
MT960101	**76.7***	72.3	70.8	49.2	11.2	12.6	84.2	5.5	28.9
MT960155	57.6			50.5	11.2	12.9	87.9	3.8	31.2
MT010158	**71.9***	69.5		50.5	11.1	12.6	92.5	2.2	31.5
MT020155	**71.0***	70.5		49.2	10.8	12.7	89.2	3.3	32.4
MT030042	**73.0***			51.0	11.4	11.9	86.6	4.8	30.1
MT061207	68.4			50.0	10.8	13.2	94.1	1.8	31.0
Average	70.9	70.6	68.5	49.5	11.0	12.7	88.7	3.8	30.3
PLSD (p=0.05)	11.0	6.6	6.7	1.6	0.3	0.8	7.6	3.2	1.8
CV%	21.3	18.2	20.7	4.5	3.3	9.1	11.8	116.9	8.0
Location Years	5	10	12	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 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 2009. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2009	Grain Yield 1/ 2008-2009	Grain Yield 1/ 2007-2009	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	107.0	103.6	104.1	50.1	11.8	12.1	93.5	2.1	39.4	3.8
Baronesse	120.0	**120.8****		50.4	12.0	10.9	92.1	3.1	36.0	2.5
Boulder	116.4	**116.6***	**119.2****	50.5	11.7	11.7	95.6	1.4	37.0	2.7
Champion	124.6			51.7	12.1	11.4	96.7	0.9	38.0	2.2
Conrad	113.5	**112.6***	**112.6***	50.7	11.9	12.0	95.9	1.1	35.8	4.0
Craft	100.0	91.4	84.9	52.0	12.0	11.6	98.6	0.2	39.0	2.0
Gallatin	107.3			51.2	12.1	11.6	93.5	2.6	37.7	3.7
Goldeneye	97.3			48.3	12.0	11.9	94.7	1.7	37.9	2.2
Harrington	104.5	103.6	104.2	49.6	11.7	11.6	94.2	2.0	37.4	3.8
Hockett	108.2	**108.0***	**107.0***	51.0	11.9	12.2	94.1	2.4	36.6	4.3
Moravian 37	123.5			51.2	11.9	11.4	97.4	0.8	32.4	1.3
Pinnacle	103.7			48.7	11.7	10.7	98.1	0.7	35.4	2.7
Experimental										
Coors 116	128.8			48.2	11.7	11.2	96.6	0.7	29.9	0.5
Coors 119	132.6			49.1	11.6	10.8	94.4	1.8	29.5	0.0
MT960101	126.8	**116.4***	**115.0***	50.3	12.2	11.2	91.3	3.0	35.5	2.5
MT960155	94.4			50.2	12.2	12.0	92.9	2.8	38.0	3.5
MT010158	116.3	103.2		51.3	12.1	11.6	97.9	0.3	37.1	1.0
MT020155	112.5	**110.5***		50.3	11.7	11.5	96.7	0.8	37.9	3.2
MT030042	117.5			51.2	12.2	10.6	92.4	3.0	35.1	3.7
MT061207	112.5			50.1	11.6	12.1	96.7	0.8	36.8	5.0
Average	113.4	108.7	106.7	50.3	11.9	11.5	95.2	1.6	36.1	2.7
PLSD (p=0.05)	ns	14.0	12.3	1.9	ns	ns	ns	ns	2.0	ns
CV%	19.4	15.4	15.3	3.1	3.8	7.3	5.0	138.5	4.5	95.3
Location Years	2	4	5	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 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 2009. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2009	Grain Yield 1/ 2008-2009	Grain Yield 1/ 2007-2009	Test Weight	Grain Moisture	Grain Protein 2/	Plump Kernels	Thin Kernels	Plant Height
	----------	bushels/acre	----------	lb/bu	%	%	%	%	inches
Commercial									
AC Metcalfe	40.6	41.8	38.2	48.9	10.4	14.4	79.7	7.5	28.8
Baronesse	**48.9***	49.1		49.6	10.4	12.4	83.9	4.8	26.0
Boulder	**52.3****	**54.8****	**50.4****	50.0	10.3	13.2	85.9	4.2	26.6
Champion	**50.3***			50.7	10.6	13.7	75.1	8.2	26.7
Conrad	**45.2***	46.4	43.5	47.5	10.4	13.5	87.1	4.2	25.7
Craft	37.6	41.3	38.7	49.5	10.4	13.8	90.7	2.5	30.4
Gallatin	39.3			48.9	10.4	13.8	78.9	8.1	28.7
Goldeneye	**43.3***			46.9	10.2	12.9	79.1	7.0	26.1
Harrington	36.9	39.8	37.9	47.3	10.4	14.3	77.8	8.4	27.2
Hockett	42.3	44.7	41.0	50.0	10.7	13.6	87.6	4.3	27.2
Moravian 37	**43.3***			49.5	10.2	13.7	91.4	2.4	24.3
Pinnacle	37.4			49.0	10.6	12.7	93.7	2.1	26.5
Experimental									
Coors 116	**43.4***			46.7	10.3	13.6	85.9	5.0	21.3
Coors 119	**46.7***			48.1	10.2	14.3	77.6	9.0	23.0
MT960101	**43.4***	42.9	39.3	48.5	10.6	13.5	79.5	7.1	24.4
MT960155	33.1			50.6	10.6	13.5	84.6	4.4	26.7
MT010158	42.3	47.0		49.9	10.4	13.3	88.9	3.4	27.8
MT020155	**43.3***	43.8		48.5	10.1	13.5	84.3	5.0	28.8
MT030042	**43.3***			50.8	10.8	12.7	82.7	6.0	26.8
MT061207	39.0			49.9	10.2	14.0	92.4	2.4	27.1
Average	42.6	45.2	41.3	49.0	10.4	13.5	84.3	5.3	26.5
PLSD (p=0.05)	9.0	5.3	5.2	2.6	0.3	ns	ns	ns	2.6
CV%	22.2	17.6	20.2	5.5	2.9	9.9	15.5	103.8	10.1
Location Years	3	6	7	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).