The MONTANA STATE UNIVERSITY
MONTANA AGRICULTURAL EXPERIMENT STATION

RESULTS OF AGRONOMIC AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2017

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

http://www.sarc.montana.edu/

PROJECT TITLE:

Off-Station Spring 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 2017 off-station spring barley trials were conducted under dryland conditions at Huntley, Broadview and Musselshell, and under irrigation near Fromberg and Hysham Montana (Fig. 1). Twenty-five spring barley entries comprised of 20 commercial cultivars and 5 experimental lines, representing both feed and malt types, were grown at all locations.

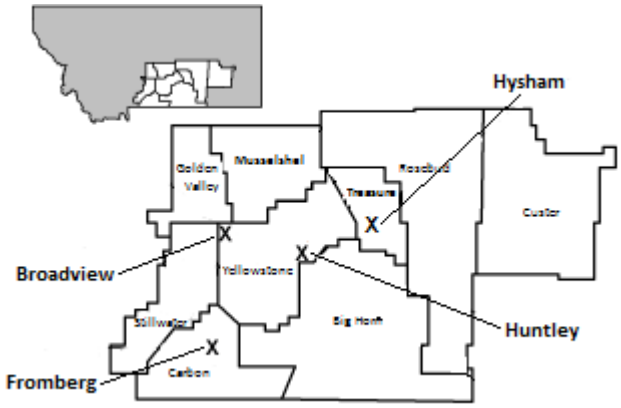

Figure 1. 2017 off-station spring barley trial locations in south central Montana.

All studies were planted using a partially-balanced lattice design with three replications. All entries were seeded at approximately 0.6 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 test plots consisted of a 16-foot, 4-row plot with 12-inch row spacing, while irrigated plots were 16-foot, 7-row with 7-inch row spacing. All rows of each test plot were trimmed 36 inches and harvested using an experimental-plot combine. Recorded grain yields were adjusted to 13% grain moisture content, and are reported in bushels per acre 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:

The 2017 spring barley test sites had below average rain or snow accumulation during winter months except in November and January. Precipitation during spring months, March and April, provided adequate soil moisture for spring barley planting and emergence. Below-average precipitation from May through July resulted in late season drought stress at all test sites. Moreover, temperature was 1 – 6 ^{0}F above-average throughout the spring barley growing season. Late season drought stress coupled with above-average temperature in 2017 growing season resulted in accelerated barley growth and caused early maturity.

The dryland spring barley yield at Huntley averaged 112 bu/a in 2017 (Table 1). High yield at this location this year was mainly attributed to high soil moisture due to 3-yrs of fallow period at the experiment site. Yield ranged from 71 bu/a for 'Haybet' to 122 bu/a for 'Claymore'. Fourteen other entries also produced yield that was statistically equal to the highest yielding cultivar. Test weight averaged 52.5 lb/bu and ranged from 49.1 for Haybet to 59.2 for '09WA-265-12'. Grain protein content averaged 12.9 percent and ranged from 11.3 percent to 14.2 percent. Two- and three-years (2015- 2017) average yield for barley cultivars tested at Huntley was 100 and 95 bu/a respectively.

Dryland spring barley yield at Broadview averaged only 28 bu/a (Table 2), but was 12 bu/a higher than last year at this site. The lower yield was mainly attributed to drought stress during grain filling period. Cultivars 'Champion' produced the highest yield of 34 bu/a at Broadview in 2017. Nine other entries also produced yield that was statistically equal to the highest yielding cultivar. Test weight was poor and averaged only 46.3 lb/bu. Most entries produced test weight below 48 lb/bu. Grain protein content averaged 12.3 percent. The percentage of plump kernels was 55 percent in the harvested grain. Percentage of thin kernels averaged 5.7 percent. Champion was the top yielding cultivar over the past 3-yrs. Two- and three-year average yield for barley cultivars tested during 2015 to 2017 at Broadview was 23 and 32 bu/a respectively.

Spring barley lodging was moderately high at Fromberg in 2017 for most of the entries, averaging a lodging score of 4.5 out of 9. (Table 3). Lodging score varied from 1.0 for 'Odyssey' to 6.7 for Claymore, 'Merit 57' and 09WA-265-12. Spring barley yield was good and averaged 142 bu/a under irrigation. Yield ranged from 106 bu/a for Haybet to 179 bu/a for Odyssey. Two other commercial spring barley cultivars produced yield statistically equal to the highest yielding entry. The test weight averaged 50.9 lb/bu and ranged from 46.6 lb/bu to 55.3 lb/bu. Average grain protein content was 13.5 percent and ranged from 11.1 percent to 15.4 percent. The percentage of plump kernels averaged 83 percent in the harvested grain. Percentage of thin kernels averaged only 2.7 percent. Two- and three-years yield for barley cultivars, tested during 2015 to 2017, averaged 130 and 126 bu/a

respectively. Champion was the top yielding cultivar over the past 3-yrs with an average yield of 140 bu/a.

Limited or no Lodging was observed for barley cultivars at Hysham in 2017 with an average lodging score of 0.3 out of 9. Spring barley yield under irrigation at Hysham in 2017 averaged 169 bu/a (Table 4). Yield was highest at Hysham among all locations tested in 2017. Yield ranged from 136 bu/a for 'Haxby' to 189 bu/a for Odyssey. Average test weight was 54.8 lb/bu. All entries produced test weight heavier than 48 lb/bu. Grain protein content averaged 11.0 percent and ranged from 10.2 to 11.8 percent. Barley quality was also good at Hysham where mean percent plump and thin kernels were 96 and 0.7 percent, respectively. Two- and three-years average yield for barley cultivars tested during 2015 to 2017 at Hysham was 137 and 129 bu/a respectively. Champion was the top yielding cultivar over the past 2- and 3-yrs with an average yield of 147 and 140 bu/a respectively.

SUMMARY:

Below-average precipitation caused late season drought stress that resulted in earliest spring barley harvest in south eastern Montana. Odyssey was the top yielding commercial cultivar under irrigated condition in 2017 (Table 7). Averaged across all locations cultivar Odyssey also had the highest grain yield in 2017 (Table 5 and 6). Averaged across all locations over the past two- and three-years (2015-2017) grain yield was 99 and 98 bu/a respectively (Table 6). Champion was the top yielding commercial cultivar under irrigated condition over the past two- and three-years (Table 6). Averaged across locations grain protein content was 12.4 percent. Overall test weight averaged 51.2 lb/bu. Averaged over locations the percentage of plump kernels averaged 79 percent in the harvest grain (Table 6), and was higher, 90 percent, under irrigation (Table 7).

Table 1. Performance of 25 spring barley cultivars and experimental lines tested under dryland conditions near Huntley, Montana during 2017. Cultivars listed alphabetically. (Exp. 173690).

Cultivar	Grain Yield 1/ 2017	Grain Yield 1/ 2016-17	Grain Yield 1/ 2015-17	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	**114.9***	107.0	98.5	52.9	8.8	13.3	0.0	0.0	42.5	169.3	Jun-18
Balster	**118.1***	109.2		51.9	8.7	12.6	0.0	0.0	40.3	177.7	Jun-26
Bill coors 100	106.2	79.1		50.2	8.3	13.6	0.0	0.0	35.5	179.7	Jun-28
CDC Copeland	111.5	111.4		51.8	8.6	13.3	0.0	0.0	41.8	183.0	Jul-2
Champion	**118.7***	107.7	103.7	54.2	9.0	12.3	0.0	0.0	40.9	168.7	Jun-17
Claymore	**121.8****	113.2		52.4	9.0	13.0	0.0	0.0	39.7	177.7	Jun-26
Conrad	**113.0***	95.7	92.3	52.2	8.9	13.5	0.0	0.0	39.0	182.3	Jul-1
Eslick	**117.2***	91.1	88.2	53.5	8.8	12.8	0.0	0.0	36.5	183.7	Jul-2
Genie	**114.2***	100.9		51.4	8.7	12.6	0.0	0.0	37.1	178.7	Jun-27
Growler	112.4	93.9		50.7	8.1	14.2	0.0	0.0	40.6	170.3	Jun-19
Haxby	**119.3***	120.4	109.1	55.4	8.8	12.5	0.0	0.0	41.5	167.7	Jun-16
Haybet	70.6	89.9		49.1	8.6	14.2	0.0	0.0	40.4	167.0	Jun-16
Hays	112.5	94.2		50.7	8.7	13.1	0.0	0.0	36.9	179.0	Jun-28
Hockett	107.9	90.9	89.6	54.0	9.0	12.5	0.0	0.0	42.3	164.0	Jun-13
Lavina	111.5	117.5		49.4	8.8	12.8	0.0	0.0	39.0	167.3	Jun-16
Merit 57	**116.7***	101.9		51.0	8.4	13.4	0.0	0.0	41.1	162.7	Jun-11
Moravian 165	**113.4***	98.8	94.4	52.5	8.6	13.3	0.0	0.0	45.3	166.0	Jun-15
Odyssey	**114.5***	94.8		49.8	8.5	12.4	0.0	0.0	36.0	185.0	Jul-4
Oreana	**119.1***	84.8		52.1	8.7	12.8	0.0	0.0	34.8	179.7	Jun-28
Synergy	**113.4***	95.1		52.9	8.8	12.4	0.0	0.0	40.9	175.7	Jun-24
Experimental											
09WA-265-12	109.3	102.8		59.2	8.5	13.6	0.0	0.0	43.6	169.7	Jun-18
MT090190	109.0	101.1	94.2	53.6	8.9	11.6	0.0	0.0	39.6	168.0	Jun-17
MT124027	**120.3***	106.0		52.6	8.9	12.3	0.0	0.0	40.0	171.3	Jun-20
MT124073	**121.3***	105.3		52.9	8.9	12.5	0.0	0.0	42.3	178.7	Jun-27
MT124128	100.9	99.1		54.8	9.1	11.3	0.0	0.0	41.9	160.7	Jun-9
Average	112.3	100.5	96.2	52.5	8.7	12.9	0.0	0.0	40.0	173.3	Jun-22
PLSD (p=0.05)	8.8	ns	ns	0.7	0.3	0.4			1.4	12.8	
CV%	4.5	5.3	4.5	0.7	1.9	1.6			2.0	4.5	

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. 173690)	
Planted:	March 27, 2017
Harvested:	Aug. 1, 2017
Fertility:	None applied, soil had 256 lb/a residual NO3-N due to 3-yrs fallow
Herbicide:	Bromac adv. 16 oz./a + affinity Broadspec 0.5 oz./a on 4/18/17.
Previous Crop:	chemical fallow
Precipitation:	March-July: 6.72 inches

Table 2. Performance of 21 spring barley cultivars and experimental lines tested under dryland conditions near Broadview, Montana during 2017. Cultivars listed alphabetically. (Exp. 173692).

1/ Cultivar	2/ Grain Yield 2017	2016-17	2015-17	Test Weight	Grain Moisture	3/ Grain Protein	Plump Kernels	Thin Kernel	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	**31.7***	24.5	31.3	45.6	10.4	13.9	52.0	4.4	24.0
Balster	**30.3***			43.7	10.0	12.7	57.8	4.5	20.5
Bill coors 100	27.4			43.1	10.0	13.0	64.0	5.0	19.3
CDC Copeland	**32.8***	26.1		44.6	9.7	14.2	50.9	5.0	24.4
Champion	**34.3****	27.1	**36.2****	47.8	10.6	12.6	34.3	5.3	22.2
Claymore	25.9			44.5	10.6	13.3	26.6	7.2	20.6
Conrad	26.7	20.2	27.5	47.1	10.4	12.3	67.6	3.8	21.9
Eslick	26.2	21.7		45.9	10.0	12.5	8.8	19.1	18.0
Genie	25.8			47.6	10.1	12.7	69.6	2.8	14.3
Growler	24.9			42.3	9.5	13.3	63.4	4.5	20.9
Haxby									
Haybet									
Hays									
Hockett	**29.1***	22.5	31.0	48.0	10.5	12.3	74.1	1.6	22.2
Lavina									
Merit 57	22.6			41.7	10.0	12.5	47.4	9.8	21.4
Moravian 165	**28.6***			45.0	10.3	13.1	52.7	5.6	24.1
Odyssey	**30.0***			44.0	10.0	12.6	65.2	4.1	20.7
Oreana	27.8			47.8	10.3	11.5	59.5	3.2	17.5
Synergy	**30.6***			44.6	10.1	12.5	60.7	3.2	23.4
Experimental									
09WA-265-12	22.5			56.2	11.7	11.7	16.4	19.7	20.9
MT090190	20.3	18.6		48.3	10.5	11.6	65.6	2.3	22.4
MT124027	22.9			46.9	10.2	11.1	61.4	2.9	21.7
MT124073	**30.0***			47.2	10.6	13.1	66.2	3.8	25.6
MT124128	**33.8***			50.4	10.6	11.6	91.4	0.9	21.5
Average	27.8	23.0	31.5	46.3	10.3	12.6	55.0	5.7	21.3
PLSD (p=0.05)	6.2	ns	3.7	2.4	0.6	ns	12.0	5.5	4.3
CV%	13.4	14.8	14.0	3.2	3.3	8.6	13.2	59.2	12.3

1/ Cultivars Haxby, Haybet, Hays and Lavina were grazed/damaged by deer and were excluded from data analysis
2/ Yields are based on a 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
3/ 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. 173692)

Planted:	April 24, 2017
Harvested:	August 8, 2017
Fertility:	10 gallons/a of 28.1-0-0-5 NPKS 5/12/2017
Herbicide:	Starane Flex 13.5 oz/a post emergence
Previous Crop:	Safflower
Precipitation:	n/a

Table 3. Performance of 25 spring barley cultivars and experimental lines tested under irrigated conditions near Fromberg, Montana during 2017. Cultivars listed alphabetically. (Exp. 173794).

Cultivar	1/ Grain Yield 2017	2016-	2015-17	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	3/ Lodging
	-------- bushels/acre --------			- lb/bu	- % -	- % -	- % -	- % -	-	0-9
Commercial										
AC Metcalfe	127.4	121.3	123.1	50.9	11.6	14.2	81.2	2.2	37.8	5.7
Balster	142.2			49.1	11.9	13.7	84.1	1.9	36.4	5.0
Bill coors 100	**164.0***			52.1	12.0	12.1	93.6	0.7	32.5	2.0
CDC Copeland	129.6	125.8		49.9	11.5	14.5	81.0	3.0	40.4	6.0
Champion	159.1	145.0	**139.7****	54.1	12.2	13.5	94.4	0.5	40.8	2.0
Claymore	139.2			49.9	12.2	14.1	76.8	4.0	41.1	6.7
Conrad	141.1	130.8	**131.2***	52.1	12.0	13.8	91.4	1.0	37.7	4.7
Eslick	149.2	145.3		51.6	12.1	13.3	75.7	4.4	35.7	3.7
Genie	149.9			51.1	11.8	12.4	86.0	1.5	34.8	3.0
Growler	134.4			48.4	11.7	14.4	79.7	3.6	37.3	5.3
Haxby	144.3	129.5	123.9	53.8	12.0	13.8	92.3	1.3	40.9	4.7
Haybet	106.3			46.6	13.3	15.4	52.4	7.6	42.8	5.3
Hays	149.8			48.9	11.7	13.3	74.2	3.6	38.3	3.0
Hockett	138.5	125.9	**126.3***	51.3	12.0	14.1	84.7	2.4	35.0	6.0
Lavina	140.0	116.5	113.6	48.1	12.6	13.9	70.3	5.1	42.8	3.0
Merit 57	134.5			48.4	11.4	14.2	76.2	3.8	37.5	6.7
Moravian 165	136.4			52.0	11.7	14.2	89.0	1.7	42.0	4.0
Odyssey	**178.6****			50.5	11.8	11.1	95.2	0.4	33.7	1.0
Oreana	**168.7***			51.6	11.9	12.2	83.0	2.1	35.7	5.0
Synergy	137.4			51.0	11.7	13.4	87.2	1.6	41.1	5.7
Experimental										
09WA-265-12	108.0			55.3	12.1	14.2	64.9	7.4	39.4	6.7
MT090190	142.8	133.1		52.7	12.7	12.1	92.8	0.8	40.0	3.0
MT124027	157.3			50.2	12.4	13.6	84.8	2.0	37.5	6.3
MT124073	135.6			50.9	12.1	13.9	85.1	1.7	40.8	5.3
MT124128	139.1			53.1	12.9	12.1	94.9	0.5	34.3	3.7
Average	142.1	130.4	126.3	50.9	12.0	13.5	82.8	2.6	38.3	4.5
PLSD (p=0.05)	16.9	ns	14.6	1.4	0.6	1.0	7.6	2.0	2.7	2.7
CV%	7.2	7.6	8.4	1.7	2.8	4.4	5.6	47.8	4.3	36.7

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. 173794)

Planted:	April 13, 2017
Harvested:	August 2, 2017
Fertility:	100-0-25-20 N-P-K-S lb/a on April 6, 2017
Herbicide:	Weld 24 oz/a + MCPA 8 oz/a on May 16, 2017
Insecticide/Fungicide:	Province 1.3 oz/a; Priaxor 3.5 oz./a May 16, 2017
Previous Crop:	Barley
Irrigation:	overhead sprinkler

Table 4. Performance of 22 spring barley cultivars and experimental lines tested under irrigated conditions near Hysham, Montana during 2017. Cultivars listed alphabetically. (Exp. 173795).

1/ Cultivar	2/ Grain Yield 2017	2016-17	2015-17	Test Weight	Grain Moisture	3/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	4/ Lodging
	-------- bushels/acre --------			- lb/bu	- % -	- % -	- % -	- % -	-	0-9
Commercial										
AC Metcalfe	**170.9***	**136.5***	127.3	53.9	9.9	10.8	95.2	0.8	37.7	0.3
Balster	**174.0***			53.5	9.9	11.6	94.8	0.8	40.6	0.0
Bill coors	160.0			54.1	10.3	11.8	96.8	0.5	33.6	0.3
CDC	**169.9***	**135.0***		54.7	10.1	11.3	95.7	0.8	41.7	0.3
Champion	**169.6***	**146.7****	**140.2****	55.2	10.3	11.2	97.1	0.4	38.3	0.0
Claymore	**182.3***			54.4	10.1	10.3	96.8	0.5	41.5	0.0
Conrad	169.4	**144.0***	**137.8***	54.0	10.2	11.8	96.2	0.7	35.0	0.0
Eslick	**176.3***	**142.5***		54.5	10.3	10.8	92.7	1.0	38.1	0.0
Genie	**170.1***			54.8	10.1	10.7	96.5	0.6	33.9	0.0
Growler	**174.5***			53.8	9.9	11.3	97.0	0.7	39.8	0.0
Haxby	136.2	110.1	106.3	56.1	10.2	11.4	95.5	0.5	40.6	0.0
Haybet										
Hays										
Hockett	168.8	**139.8***	**131.5***	55.0	10.3	11.4	96.3	0.7	38.8	0.0
Lavina										
Merit 57	168.6			53.9	10.2	11.4	91.3	1.4	40.8	0.0
Moravian	153.0			54.2	9.8	11.6	94.1	1.0	43.6	0.0
Odyssey	**188.6****			53.7	9.9	10.6	97.7	0.5	34.5	0.0
Oreana	**184.7***			54.3	10.2	10.2	96.3	0.6	31.4	0.3
Synergy	**181.4***			53.9	10.1	11.1	97.1	0.5	42.7	0.0
Experimental										
09WA-265-	147.7			62.9	11.3	11.0	91.2	0.5	43.6	0.7
MT090190	168.2	**143.3***		54.5	10.6	10.3	96.7	0.4	41.2	0.0
MT124027	**178.6***			54.5	10.5	10.6	92.1	0.9	36.4	0.3
MT124073	159.2			55.1	10.2	11.1	96.6	0.6	45.1	0.0
MT124128	**170.6***			54.6	10.9	10.2	98.0	0.5	34.9	0.0
Average	169.2	137.2	128.6	54.8	10.2	11.0	95.5	0.7	38.8	0.1
PLSD	19.1	16.1	10.7	0.9	0.5	ns	2.8	0.5	4.8	ns
CV%	6.8	10.2	10.2	1.0	2.9	6.2	1.8	44.9	7.5	338.8

1/ Cultivars Haybet, Hays and Lavina were grazed/damaged by deer and were excluded from data analysis.
2/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
3/ Grain protein values adjusted to12 percent moisture basis.
4/ 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. 163795)

Planted:	March 27, 2017
Harvested:	July 26, 2017
Fertility:	130-0-0 lb/a NPK in March, 2017
Herbicide:	Weld 22 oz./a + Axial 16 oz./a
Fungicide:	Nexicor 4 oz./a
Previous Crop:	Sugar beet
Irrigation:	flood
Precipitation:	n/a

Table 5. Grain yield[1/] of 25 spring barley cultivars tested at four locations in south central Montana during 2017. Varieties listed by declining four-location average yield.

Cultivar	Dryland			Irrigated			Four Location Average
	Huntley	Broadview	Ave.	Fromberg	Hysham	Ave.	
	bushels/acre						
Odyssey	**114.5***	**30.0***	72.3	**178.6****	**188.6****		**128.0****
Oreana	**119.1***	27.8	73.7	**168.7***	**184.7***	**176.7***	**125.2***
Champion	**118.7***	**34.3****	76.2	159.1	**169.6***	**164.4***	**120.3***
MT124027	**120.3***	22.9	71.8	157.3	**178.6***	**167.9***	**119.9***
Claymore	**121.8****	25.9	73.7	139.2	**182.3***	160.8	**117.2***
Eslick	**117.2***	26.2	71.6	149.2	**176.3***	**162.8***	**117.2***
Balster	**118.1***	**30.3***	74.1	142.2	**174.0***	158.1	**116.1***
Synergy	**113.4***	**30.6***	72.4	137.4	**181.4***	159.4	**115.9***
Genie	**114.2***	25.8	69.8	149.9	**170.1***	160.0	114.9
Bill coors 100	106.2	27.4	66.5	**164.0***	160.0	162.0	114.2
Conrad	**113.0***	26.7	69.5	141.1	169.4	155.2	112.4
MT124073	**121.3***	**30.0***	75.8	135.6	159.2	147.4	111.6
Growler	112.4	24.9	68.1	134.4	**174.5***	154.4	111.3
AC Metcalfe	**114.9***	**31.7***	73.5	127.4	**170.9***	149.1	111.3
MT124128	100.9	**33.8***	67.5	139.1	**170.6***	154.9	111.2
CDC Copeland	111.5	**32.8***	72.2	129.6	**169.9***	149.7	111.0
Hockett	107.9	**29.1***	68.4	138.5	168.8	153.6	111.0
Merit 57	**116.7***	22.6	70.2	134.5	168.6	151.6	110.9
MT090190	109.0	20.3	64.4	142.8	168.2	155.5	109.9
Moravian 165	**113.4***	**28.6***	71.9	136.4	153.0	144.7	108.3
09WA-265-12	109.3	22.5	66.5	108.0	147.7	127.8	97.2
Haxby	**119.3***			144.3	136.2	140.2	
Haybet	70.6			106.3			
Hays	112.5			149.8		**183.6****	
Lavina	111.5			140.0			
Average	112.3	27.8	71.0	142.1	169.2	156.4	114.0
PLSD (p=0.05)	8.8	6.2	ns	16.9	19.1	21.5	12.3
CV%	4.5	13.4	6.7	7.2	6.8	7.0	7.3

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 6. Performance of 25 spring barley cultivars and experimental lines tested under dryland and irrigated conditions at four locations in south central Montana during 2017. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield 2017	2016-17	2015-17	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	111.3	97.3	95.1	50.9	10.2	13.0	76.1	2.5	35.4
Balster	**116.1***			49.6	10.1	12.7	78.9	2.4	34.4
Bill coors 100	114.2			49.9	10.1	12.6	84.8	2.1	30.2
CDC Copeland	111.0	99.6		50.3	10.0	13.4	75.9	2.9	37.0
Champion	**120.3***	106.6	**104.9****	52.9	10.5	12.4	75.3	2.0	35.6
Claymore	**117.2***			50.3	10.5	12.6	66.7	3.9	35.7
Conrad	112.4	97.7	97.2	51.4	10.4	12.9	85.1	1.8	33.5
Eslick	**117.2***	100.2		51.4	10.3	12.4	59.1	8.2	32.1
Genie	114.9			51.2	10.2	12.1	84.0	1.7	30.0
Growler	111.3			48.8	9.8	13.3	80.0	3.0	34.7
Haxby									
Haybet									
Hays									
Hockett	111.0	94.8	94.6	52.1	10.5	12.6	85.0	1.6	34.6
Lavina									
Merit 57	110.9			48.8	10.0	12.9	71.6	5.0	35.2
Moravian 165	108.3			51.0	10.1	13.0	78.6	2.8	38.8
Odyssey	**128.0****			49.5	10.0	11.7	86.0	1.7	31.3
Oreana	**125.2***			51.5	10.3	11.7	79.6	2.0	29.8
Synergy	**115.9***			50.6	10.2	12.3	81.7	1.8	36.9
Experimental									
09WA-265-12	97.2			58.4	10.9	12.6	57.5	9.2	36.8
MT090190	109.9	99.0		52.3	10.7	11.4	85.0	1.2	35.8
MT124027	**119.9***			51.0	10.5	11.9	79.4	1.9	33.8
MT124073	111.6			51.5	10.4	12.6	82.6	2.0	38.5
MT124128	111.2			53.2	10.9	11.3	94.8	0.6	33.2
Average	114.0	99.3	97.9	51.2	10.3	12.4	78.5	2.9	34.4
PLSD (p=0.05)	12.3	ns	4.9	1.7	0.4	0.8	16.8	4.3	2.5
CV%	7.3	7.5	8.1	1.8	2.9	5.8	6.3	71.2	6.2
Location Years	4	8	12	4	4	4	4	4	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 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 7. Performance of 22 spring barley cultivars and experimental lines tested under irrigated conditions at two locations in south central Montana during 2017. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2017	Grain Yield 1/ 2016-17	Grain Yield 1/ 2015-17	Test Weight	Grain Moisture	Grain Protein 2/	Plump Kernels	Thin Kernels	Plant Height	Lodgin 3/
	-------- bushels/acre --------			- lb/bu	- % -	- % -	- % -	- % -	-	0-9
Commercial										
AC Metcalfe	149.1	128.9	125.2	52.4	10.8	12.5	88.2	1.5	37.7	3.0
Balster	158.1			51.3	10.9	12.7	89.5	1.4	38.5	2.5
Bill coors 100	162.0			53.1	11.1	12.0	95.2	0.6	33.1	1.2
CDC Copeland	149.7	130.4		52.3	10.8	12.9	88.4	1.9	41.1	3.2
Champion	**164.4***	**145.8****	**139.9****	54.7	11.2	12.3	95.7	0.4	39.6	1.0
Claymore	160.8			52.1	11.1	12.2	86.8	2.3	41.3	3.3
Conrad	155.2	**137.4***	**134.5***	53.1	11.1	12.8	93.8	0.8	36.4	2.3
Eslick	**162.8***	**143.9***		53.1	11.2	12.1	84.2	2.7	36.9	1.8
Genie	160.0			53.0	10.9	11.6	91.2	1.1	34.3	1.5
Growler	154.4			51.1	10.8	12.9	88.4	2.2	38.5	2.7
Haxby	140.2	119.8	115.1	54.9	11.1	12.6	93.9	0.9	40.7	2.3
Hockett	153.6	132.9	**128.9***	53.1	11.1	12.7	90.5	1.6	36.9	3.0
Merit 57	151.6			51.1	10.8	12.8	83.7	2.6	39.2	3.3
Moravian 165	144.7			53.1	10.8	12.9	91.6	1.4	42.8	2.0
Odyssey	**183.6****			52.1	10.9	10.8	96.5	0.5	34.1	0.5
Oreana	**176.7***			53.0	11.1	11.2	89.6	1.3	33.5	2.7
Synergy	159.4			52.5	10.9	12.2	92.1	1.1	41.9	2.8
Experimental										
09WA-265-12	127.8			59.1	11.7	12.6	78.1	4.0	41.5	3.7
MT090190	155.5	**138.2***		53.6	11.7	11.2	94.7	0.6	40.6	1.5
MT124027	**167.9***			52.4	11.5	12.1	88.4	1.5	36.9	3.3
MT124073	147.4			53.0	11.2	12.5	90.8	1.2	43.0	2.7
MT124128	154.9			53.8	11.9	11.2	96.5	0.5	34.6	1.8
Average	156.4	134.7	128.7	53.1	11.1	12.2	90.4	1.4	38.3	2.1
PLSD (p=0.05)	21.5	12.7	12.7	2.3	0.5	1.2	9.6	ns	3.4	ns
CV%	7.0	8.9	9.3	1.3	2.8	5.2	3.5	54.4	6.0	48.8
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 8. Performance of 21 spring barley cultivars and experimental lines tested under dryland conditions at two locations in south central Montana during 2017. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield 2017	2016-17	2015-17	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernel	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	73.5	65.7	**64.9***	49.3	9.6	13.5			33.2
Balster	74.1			47.8	9.3	12.6			30.3
Bill coors 100	66.5			46.6	9.2	13.3			27.4
CDC Copeland	72.2	68.7		48.3	9.1	13.8			32.9
Champion	76.2	67.4	**69.9****	51.0	9.8	12.5			31.6
Claymore	73.7			48.5	9.8	13.1			30.0
Conrad	69.5	57.9	59.9	49.7	9.7	12.9			30.6
Eslick	71.6	56.4		49.7	9.4	12.7			27.3
Genie	69.8			49.5	9.4	12.7			25.7
Growler	68.1			46.5	8.8	13.8			30.8
Hockett	68.4	56.7	60.3	51.0	9.8	12.4			32.2
Merit 57	70.2			46.4	9.2	13.0			31.3
Moravian 165	71.9			48.8	9.4	13.2			34.8
Odyssey	72.3			46.9	9.2	12.5			28.5
Oreana	73.7			50.0	9.5	12.2			26.1
Synergy	72.4			48.8	9.4	12.4			31.9
Experimental									
09WA-265-12	66.5			57.7	10.1	12.6			32.2
MT090190	64.4	59.8		50.9	9.7	11.6			31.0
MT124027	71.8			49.7	9.6	11.7			30.8
MT124073	75.8			50.1	9.7	12.8			33.9
MT124128	67.5			52.6	9.9	11.5			31.8
Average	71.0	61.8	63.8	49.5	9.5	12.7			30.7
PLSD (p=0.05)	ns	ns	6.1	2.5	0.6	1.1			2.9
CV%	6.7	5.5	6.5	2.2	2.9	6.2			6.3
Location Years	2	4	6	2	2	2			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).