RESULTS OF AGRONOMIC AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2019

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 Barley 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 2019 off-station spring barley trials were conducted under dryland conditions at Huntley, and Broadview 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.

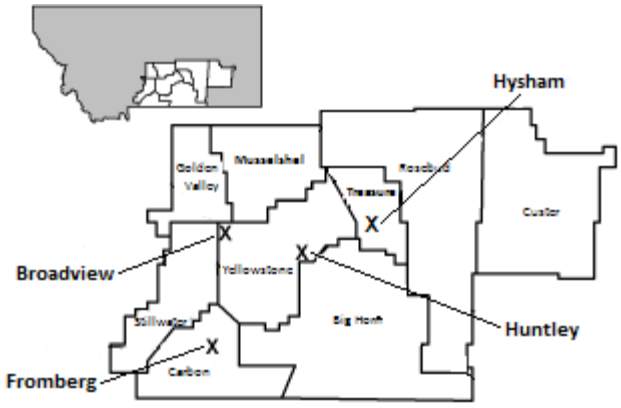

Figure 1. 2019 off-station spring barley trial locations in south central Montana.

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 2019 spring barley test sites had below average rain or snow accumulation during winter months except in February. Precipitation in April provided much needed moisture for planting of spring barley. Adequate soil moisture at spring barley planting and emergence resulted in good stand establishment. Above average rainfall from April to August resulted in an excellent spring barley crop. However, in August widespread thunderstorm and severe hail storm occurred near Huntley that resulted in 100 percent crop loss.

Dryland spring barley yield at Broadview averaged 83 bu/a (Table 1) that was almost double than the last year's yield at this site. The higher yield was mainly attributed to higher moisture availability during the grain filling period. The cultivar 'Genie' produced the highest yield of 115 bu/a. Test weight averaged 49.9 lb/bu and ranged from 43.0 lb/bu for 'Opera' to 53.5 for 'Craft'. Grain protein content averaged 11.2 percent. The percentage of plump kernels was 76 percent in the harvested grain. Percentage of thin kernels averaged 9.2 percent. Two (2018-2019) and three-years (2017- 2019) average yield for barley cultivars tested at Broadview under dryland condition was 63 and 53 bu/a respectively.

Relatively high lodging was observed for barley cultivars at Fromberg in 2019 averaging a score of 4.1 out of 9. Lodging score ranged from 0.7 for 'MT 124134' to 8.1 for 'Haybet' (Table 2). Spring barley yield averaged 129 bu/a under irrigation. Yield was highest at Fromberg among all locations tested in 2019. Yield ranged from 91 bu/a for Haybet to 155 bu/a for 'Fraser'. Five other commercial spring barley cultivars produced yield statistically equal to the highest yielding entry. Test weight averaged 50.1 lb/bu and ranged from 45.7 lb/bu to 52.9 lb/bu. Average grain protein content was 12.6 percent and ranged from 11.2 percent to 16.0 percent. The percentage of plump kernels averaged 85 percent in the harvested grain. Percentage of thin kernels averaged 6.1 percent. The average yield for barley cultivars tested over the past Two (2018-2019) and three-year (2017-2019) was 118 and 125 bu/a respectively. The cultivar Odyssey was the top yielding cultivar over the past 3-yrs with an average yield of 150 bu/a.

Spring barley lodging was also high at Hysham in 2019 with an average lodging score of 5.4 out of 9. Lodging score ranged from 2.0 for 'MT 124664' to 8.5 for Odyssey and Opera (Table 3). The feed barley cultivars Haybet, 'Hays' and 'Lavina' were lost to wildlife grazing and were excluded from data analysis. Spring barley yield under irrigation at Hysham averaged 116 bu/a. Yield ranged from 91 bu/a for Opera to 142 bu/a for 'Champion'. Cultivars Fraser and 'MT 124128' also produced grain yield that was statistically equal to the yield of Champion. Average test weight was 49.0 lb/bu and ranged from 42.8 to 51.4 lb/bu. Grain protein content averaged 13.1 percent and ranged from 11.5 to 14.9 percent. Barley

quality was good at Hysham where mean percent plump and thin kernels were 87 and 5.2 percent, respectively. Two and three years averaged yield for barley cultivars tested during 2017 to 2019 at Hysham was 118 and 135 bu/a respectively.

SUMMARY:

Above-average precipitation and lower than normal temperature at planting and during grain filling period boosted spring barley yield and quality at some location in 2019. A severe hailstorm on August 11 at Huntley resulted in 100 percent crop loss. Averaged across all locations, Champion was the top yielding cultivar producing 128 bu/a followed by Genie and Fraser with 125 bu/a (Table 4). Cultivar Champion also had the highest yield under irrigated condition, while cultivar Genie produced the highest yield under dryland condition at Broadview. Averaged over the three-year (2017-2019) Odyssey was the highest yielding cultivars under irrigation (Table 5). Averaged across all locations over the past two and three-years grain yield was 101 and 103 bu/a respectively (Table 5). Averaged across locations grain protein content was 12.9 percent. Overall test weight averaged 49.9 lb/bu. Averaged over locations the percentage of plump kernels averaged 86 percent in the harvested grain (Table 5), and was slightly higher, 88 percent, under irrigation (Table 6).

Table 1. Performance of 25 spring barley cultivars and experimental lines tested under dryland conditions near Broadview, Montana during 2019. Cultivars listed alphabetically. (Exp. 193692).

1/ Cultivar	2/ Grain Yield 2019	2018-19	2017-19	Test Weight	Grain Moisture	3/ Grain Protein	Plump Kernels	Thin Kernel	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	77.2	54.5	46.9	50.8	11.3	14.2	81.8	6.8	39.8
Balster	85.1	61.4	51.0	48.0	11.2	14.2	69.7	11.6	37.3
CDC Copeland	88.4	67.9	56.2	49.8	11.1	14.4	77.4	10.3	42.4
Champion	89.1	68.3	57.0	52.4	11.5	12.9	77.2	7.5	36.9
Conrad	86.5	66.7	53.4	49.4	11.3	14.4	78.8	7.7	39.3
Craft	80.4			53.5	11.4	13.4	89.5	3.2	42.3
Expedition	97.6			49.5	11.2	13.3	71.2	9.9	34.5
Fraser	89.8	65.3		48.9	11.2	13.6	82.0	6.1	38.3
Genie	**115.1****	82.3	63.4	52.4	11.3	13.0	80.0	10.0	36.1
Growler	98.3	67.3	53.2	47.1	11.0	14.3	76.8	9.8	38.6
Haxby	85.4	63.4		53.4	11.5	13.5	83.9	5.6	37.6
Haybet	71.1	50.2		48.3	10.8	14.8	48.2	21.2	46.2
Hays	77.3	57.9		46.8	10.8	14.5	45.1	26.9	40.1
Hockett	92.6	67.0	54.4	51.4	11.3	12.5	87.1	4.9	36.0
Lavina	71.5	57.4		47.6	11.0	14.1	48.1	20.0	42.5
Merit 57	71.9	53.2	43.0	45.9	10.9	14.2	64.8	17.0	40.2
Odyssey	86.0	69.6	56.4	45.8	10.9	12.9	77.5	6.6	34.5
Opera	80.8			43.0	11.1	13.1	43.7	20.0	30.7
Synergy	86.0	62.9	52.1	50.7	11.3	13.1	89.8	3.5	39.5
Voyager	89.5			50.7	11.4	13.9	79.1	4.9	38.8
Experimental									
MT124112	74.8	60.7		52.0	11.6	11.8	88.9	3.7	35.7
MT124113	62.1			50.8	11.2	12.4	85.8	4.7	35.6
MT124128	76.7			52.1	11.3	12.3	80.6	2.9	35.6
MT124134	74.3	62.0		53.1	11.5	11.6	93.0	2.0	35.8
MT124664	58.8			53.4	11.3	11.9	93.7	2.6	34.0
Average	82.6	63.2	53.4	49.9	11.2	13.4	75.8	9.2	37.9
PLSD (p=0.05)	14.4	ns	ns	1.3	0.3	0.8	10.8	7.7	3.8
CV%	10.7	11.7	10.9	1.4	1.3	3.3	7.9	65.2	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 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. 193692)

Planted:	April 17, 2019
Harvested:	August 26, 2019
Fertility:	10 gallons/a of 28.1-0-0-5 NPKS 5/12/2019
Herbicide:	n/a
Previous Crop:	Safflower
Precipitation:	n/a

Table 2. Performance of 25 spring barley cultivars and experimental lines tested under irrigated conditions near Fromberg, Montana during 2019. Cultivars listed alphabetically. (Exp. 193794).

Cultivar	1/ Grain Yield 2019	2018-19	2017-19	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	3/ Lodging
	-------- bushels/acre --------			- lb/bu	- % -	- % -	- % -	- % -	-	0-9
Commercial										
AC Metcalfe	129.7	**120.8***	123.0	51.9	12.0	13.2	89.4	4.1	38.4	3.8
Balster	135.7	**131.2***	**134.9***	48.8	11.4	12.4	87.8	5.3	38.6	4.2
CDC Copeland	117.1	114.7	119.6	49.7	11.4	13.3	88.3	5.5	42.3	6.5
Champion	**153.7***	**129.9***	**139.7***	52.2	11.8	12.7	90.1	4.2	39.8	1.5
Conrad	126.2	117.2	125.2	50.6	11.5	13.3	90.4	4.3	37.3	3.0
Craft	122.5			51.6	11.5	12.9	90.8	5.2	39.8	5.9
Expedition	137.9			50.6	11.8	12.5	59.2	3.5	35.0	4.1
Fraser	**155.1****	**138.9****		51.2	11.8	12.0	95.5	2.4	38.9	1.9
Genie	**141.2***	**129.7***	**136.5***	50.6	11.8	12.6	83.7	8.3	34.8	5.1
Growler	133.6	**119.9***	124.8	49.9	11.7	12.4	89.6	4.2	37.8	4.5
Haxby	**144.3***	**129.3***	**134.3***	52.9	11.5	12.3	90.8	4.3	36.8	2.9
Haybet	91.7	76.3	86.3	45.7	11.5	16.0	50.1	23.2	42.4	8.1
Hays	124.9	110.4	123.5	47.6	11.6	12.5	69.2	14.4	40.0	4.2
Hockett	115.2	108.5	118.5	50.2	12.0	13.1	84.5	7.2	35.4	5.7
Lavina	101.0	81.9	101.3	45.9	11.1	14.2	59.1	18.4	40.2	7.7
Merit 57	117.8	**120.9***	125.5	48.4	11.4	13.2	77.9	10.6	41.1	6.8
Odyssey	**149.9***	**135.8***	**150.1****	48.9	11.2	11.2	93.2	3.3	32.9	3.2
Opera	118.0			44.9	11.3	11.9	78.7	9.1	31.8	7.7
Synergy	**141.0***	**128.5***	131.5	51.1	11.8	12.6	92.4	3.5	37.2	2.5
Voyager	136.9			52.1	11.7	12.3	94.1	2.6	39.6	2.3
Experimental										
MT124112	125.2	111.6		51.2	12.1	11.6	95.9	1.3	35.6	2.6
MT124113	132.6			50.7	12.1	11.6	91.8	3.1	34.5	3.7
MT124128	125.9			51.4	12.2	12.1	94.8	1.9	34.6	1.7
MT124134	124.9	113.4		52.4	12.4	11.5	95.1	0.7	35.2	0.7
MT124664	130.6			51.6	12.6	12.0	94.5	1.6	36.1	1.7
Average	129.3	117.7	125.0	50.1	11.7	12.6	85.1	6.1	37.4	4.1
PLSD (p=0.05)	17.1	19.7	18.4	0.9	0.4	0.7	18.2	3.4	3.0	2.6
CV%	7.6	7.8	8.0	1.0	2.0	3.0	13.0	31.6	4.5	35.7

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. 193794)	
Planted:	April 11, 2019
Harvested:	August 16, 2019
Fertility:	100-0-25-20 N-P-K-S lb/a on April 6, 2019
Herbicide:	n/a
Insecticide/Fungicide:	n/a
Previous Crop:	Sugar beet
Irrigation:	overhead sprinkler

Table 3. Performance of 22 spring barley cultivars and experimental lines tested under irrigated conditions near Hysham, Montana during 2019. Cultivars listed alphabetically. (Exp. 193795).

1/ Cultivar	2/ Grain Yield 2019	2018-19	2017-19	Test Weight	Grain Moisture	3/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	4/ Lodging
	-------- bushels/acre --------			- lb/bu	- % -	- % -	- % -	- % -	-	0-9
Commercial										
AC Metcalfe	105.8	109.1	129.7	49.9	10.9	14.0	82.8	6.8	41.1	5.5
Balster	117.1	116.1	135.4	47.7	10.3	14.0	84.3	6.1	39.0	6.5
CDC Copeland	98.6	111.5	131.0	48.6	10.4	13.8	84.8	6.3	41.5	6.0
Champion	**142.5****	132.0	144.5	51.2	10.8	13.0	90.3	3.9	40.0	3.0
Conrad	118.3	119.8	136.3	49.7	10.7	14.1	90.5	3.3	37.8	6.0
Craft	113.8			50.0	10.4	14.9	85.7	6.2	42.3	5.0
Expedition	117.1			47.5	10.5	13.0	78.5	8.8	33.3	7.7
Fraser	**129.8***	122.8		49.6	10.7	12.1	92.1	3.1	41.5	3.3
Genie	117.3	125.9	140.7	48.2	10.4	13.9	72.1	13.1	36.7	6.7
Growler	115.9	124.5	141.1	48.3	10.6	13.2	87.5	5.5	40.2	5.0
Haxby	119.0	97.5	110.4	50.4	10.9	14.4	87.9	5.3	40.7	5.5
Haybet										
Hays										
Hockett	119.3	120.3	136.4	48.8	10.6	13.9	86.6	6.5	37.7	7.7
Lavina										
Merit 57	121.8	119.6	135.9	49.4	10.4	13.5	89.3	4.1	40.3	6.3
Odyssey	98.1	112.3	137.7	44.2	9.9	13.2	82.6	6.3	33.1	8.5
Opera	90.9			42.8	9.7	12.5	70.6	13.6	32.1	8.5
Synergy	114.7	117.0	138.5	49.6	10.2	12.6	92.7	2.6	39.2	4.5
Voyager	114.0			49.4	10.8	13.3	91.2	3.3	38.6	5.7
Experimental										
MT124112	119.5	119.4		49.3	10.9	12.2	94.0	2	38.1	3.3
MT124113	111.5			50.6	10.6	11.7	95.2	1.9	37.0	3.7
MT124128	**133.4***			50.8	10.8	12.3	93.9	2.5	36.2	4.7
MT124134	125.3	128.3		51.4	10.9	11.9	94.4	1.8	38.7	3.0
MT124664	111.3			50.6	10.8	11.5	94.0	2.2	37.1	2.0
Average	116.1	118.4	134.8	49.0	10.5	13.1	87.3	5.2	38.3	5.4
PLSD	16.4	ns	ns	1.0	0.3	0.7	4.6	2.2	2.9	1.9
CV%	8.6	8.1	7.1	1.2	1.5	3.1	3.2	25.4	4.6	21.7

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. 193795)	
Planted:	April 12, 2019
Harvested:	August 22, 2019
Fertility:	130-0-0 lb/a NPK in March, 2019
Herbicide:	n/a
Previous Crop:	Sugar beet
Irrigation:	flood
Precipitation:	n/a

Table 4. Grain yield[1/] of 25 spring barley cultivars tested at three locations in south central Montana during 2019. Varieties listed by declining three-location average yield.

Cultivar	Dryland	Irrigated			Three Location
	Broadview	Fromberg	Hysham	Ave.	Average
	---------- bushels/acre ----------				
Champion	89.1	**153.7***	**142.5****	**147.4****	**128.0****
Genie	**115.1****	**141.2***	117.3	**129.4***	**125.5***
Fraser	89.8	**155.1****	**129.8***	**142.2***	**124.8***
Expedition	97.6	137.9	117.1	**128.7***	**118.4***
Growler	98.3	133.6	115.9	125.3	**116***
Haxby	85.4	**144.3***	119.0	**130.2***	**115.3***
Synergy	86.0	**141.0***	114.7	**129.0***	**114.7***
Voyager	89.5	136.9	114.0	124.6	**112.9***
Odyssey	86.0	**149.9***	98.1	125.8	**112.6***
MT124128	76.7	125.9	**133.4***	**130.5***	**112.6***
Balster	85.1	135.7	117.1	125.4	**112.0***
Conrad	86.5	126.2	118.3	123.3	**111.0***
Hockett	92.6	115.2	119.3	117.2	109.5
MT124134	74.3	124.9	125.3	125.1	108.1
MT124112	74.8	125.2	119.5	121.7	106.1
Craft	80.4	122.5	113.8	118.3	105.7
AC Metcalfe	77.2	129.7	105.8	117.6	104.1
Merit 57	71.9	117.8	121.8	119.5	103.6
MT124113	62.1	132.6	111.5	120.9	101.3
CDC Copeland	88.4	117.1	98.6	107.1	100.9
MT124664	58.8	130.6	111.3	120.8	100.1
Opera	80.8	118.0	90.9	105.3	97.1
Haybet	71.1	91.7			
Hays	77.3	124.9			
Lavina	71.5	101.0			
Average	82.6	129.3	116.1	124.3	110.9
PLSD (p=0.05)	14.4	17.1	16.4	**20.5**	17.0
CV%	10.7	7.6	8.6	8.4	8.6

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 5. Performance of 25 spring barley cultivars and experimental lines tested under dryland and irrigated conditions at three locations in south central Montana during 2019. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield 2019	2018-19	2017-19	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	104.1	93.9	98.7	50.7	11.4	13.9	84.5	6.2	40.1
Balster	**112.0***	101.1		48.3	10.9	13.5	82.2	7.4	38.2
CDC Copeland	100.9	97.1		49.3	11.0	13.9	83.0	7.2	42.2
Champion	**128.0****	107.0	**111.2****	51.9	11.3	12.8	86.1	5.2	38.9
Conrad	**111.0***	100.4	**104.0***	49.8	11.2	14.0	86.6	5.3	38.9
Craft	105.7			51.7	11.1	13.6	87.6	5.0	41.2
Expedition	**118.4***			49.2	11.2	12.9	69.6	7.4	34.3
Fraser	**124.8***	107.2		50.0	11.2	12.5	90.9	3.6	39.3
Genie	**125.5***	**111.1**		50.3	11.2	13.1	77.2	10.3	35.8
Growler	**116***	101.4		48.5	11.1	13.2	84.7	6.4	38.6
Haxby	**115.3***	94.1		52.3	11.3	13.4	87.9	5.1	38.4
Haybet									
Hays									
Hockett	109.5	97.8	**102.0***	50.1	11.3	13.2	86.0	6.3	36.3
Lavina									
Merit 57	103.6	97.5		48.0	10.9	13.7	77.7	10.5	40.6
Odyssey	**112.6***	101.7		46.3	10.6	12.3	83.8	5.8	33.2
Opera	97.1			43.5	10.7	12.5	63.0	14.3	31.1
Synergy	**114.7***	102.2		50.4	11.1	12.7	90.4	3.6	38.6
Voyager	**112.9***			50.8	11.3	13.1	89.1	3.3	39.2
Experimental									
MT124112	106.1	96.8		50.9	11.5	11.9	94.0	2.2	36.4
MT124113	101.3			50.9	11.3	11.8	92.0	2.9	35.8
MT124128	**112.6***			51.5	11.4	12.2	90.3	2.3	35.5
MT124134	108.1	98.4		52.3	11.6	11.7	94.9	1.6	36.6
MT124664	100.1			51.9	11.6	11.8	93.7	2.0	36.1
Average	110.9	100.5	102.5	49.9	11.2	12.9	85.2	5.6	37.5
PLSD (p=0.05)	17.0	**10.8**	9.5	1.7	0.3	0.8	9.4	3.6	1.9
CV%	8.6	8.4	8.3	1.3	1.7	3.4	9.6	54.4	5.2
Location Years	3	7	11	3	3	3	3	3	3

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 6. Performance of 22 spring barley cultivars and experimental lines tested under irrigated conditions at two locations in south central Montana during 2019. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2019	2018-19	2017-19	Test Weight	Grain Moisture	Grain Protein 2/	Plump Kernels	Thin Kernels	Plant Height	Lodgin 3/
	-------- bushels/acre --------			- lb/bu	- % -	- % -	- % -	- % -	-	0-9
Commercial										
AC Metcalfe	117.6	114.9	126.3	50.8	11.5	13.8	86.1	5.9	40.2	5.3
Balster	125.4	123.7	**135.1***	48.2	10.8	13.2	86.1	5.7	38.6	5.4
CDC Copeland	107.1	113.1	125.3	49.1	10.9	13.6	86.6	5.9	41.9	6.5
Champion	**147.4****	131.0	**142.1***	51.6	11.3	12.8	90.2	4.2	39.9	2.5
Conrad	123.3	118.5	*	50.1	11.1	13.8	90.5	4.0	37.7	4.7
Craft	118.3			51.0	10.9	13.8	88.2	5.3	40.8	5.0
Expedition	**128.7***			49.0	11.2	12.7	68.8	6.2	34.3	5.8
Fraser	**142.2***	130.9		50.4	11.2	12.0	93.8	2.6	40.2	2.3
Genie	**129.4***	127.8	**138.6***	49.4	11.1	13.2	77.9	10.6	35.6	5.8
Growler	125.3	122.2	**133.0***	49.1	11.1	12.8	88.5	5.0	39.0	4.8
Haxby	**130.2***	113.4	122.3	51.6	11.2	13.4	89.3	5.0	38.7	4.6
Haybet										0.0
Hays										0.0
Hockett	117.2	114.4	127.5	49.5	11.3	13.6	85.6	7.1	36.5	6.8
Lavina										0.0
Merit 57	119.5	120.3	**130.7***	49.0	10.9	13.3	83.6	7.4	40.7	6.3
Odyssey	125.8	124.1	**143.9****	46.6	10.5	12.1	87.9	4.6	32.8	5.6
Opera	105.3			44.0	10.5	12.2	74.6	10.9	31.6	7.8
Synergy	**129.0***	122.7	**135.0***	50.4	11.0	12.5	92.5	2.8	38.4	3.4
Voyager	124.6			50.8	11.2	12.8	92.7	2.9	39.0	3.8
Experimental										
MT124112	121.7	115.5		50.2	11.5	11.9	95.0	1.7	36.5	2.8
MT124113	120.9			50.7	11.4	11.6	93.5	2.3	35.9	3.5
MT124128	**130.5***			51.2	11.5	12.1	94.4	2.2	35.2	3.0
MT124134	125.1	120.8		51.8	11.6	11.8	94.8	1.6	37.1	2.2
MT124664	120.8			51.2	11.7	11.7	94.3	1.8	37.0	1.7
Average	124.3	120.9	132.5	49.8	11.2	12.7	87.9	4.8	37.6	4.0
PLSD (p=0.05)	20.5	ns	13.5	1.7	0.4	1.0	9.8	3.7	2.3	2.3
CV%	8.4	7.9	7.5	1.1	1.9	3.3	9.5	30.7	4.6	34.1
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).