MONTANA STATE UNIVERSITY
MONTANA AGRICULTURAL EXPERIMENT STATION

RESULTS OF AGRONOMIC AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2015

The 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 2015 off-station spring barley trials were conducted under dryland conditions near Hardin and Broadview, and under irrigation near Fromberg and Hysham Montana (Fig. 1). Twenty spring barley entries comprised of 16 commercial cultivars and 4 experimental lines, representing both feed and malt types, were grown at all locations.

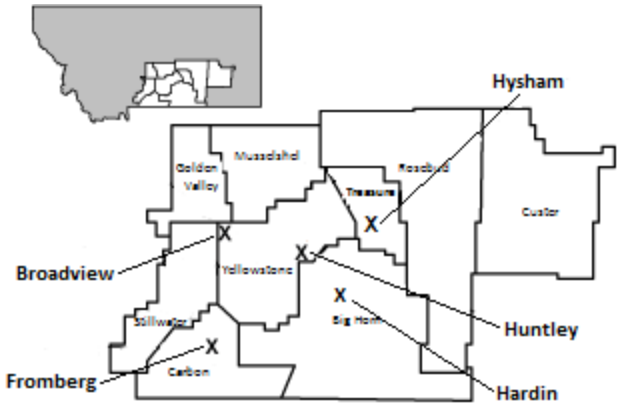

Figure 1. 2015 off-station spring barley trial locations in south central Montana.

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

Dryland test plots consisted of a 15-foot, 4-row plot with 12-inch row spacing, while irrigated plots were 15-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 2015 spring barley test sites had below average rain or snow accumulation during winter months except in January. Precipitation during winter months provided adequate soil moisture for spring barley planting and emergence. Below-average precipitation in the spring resulted in early season drought stress at all test sites that accelerated barley growth and caused early maturity. Rain shower in May and June provided the much needed moisture for barley production. However, spring barley never recovered from early drought stress that resulted in earliest spring barley harvest in south eastern Montana. Spring barley crop at Hardin was not harvested due to poor stand (10-15%).

Dryland spring barley yield at Broadview averaged 45 bu/a (Table 1), about same as last year at this site. Yield ranged from 35 bu/a for 'Haybet' to 54 bu/a for 'Champion'. Four other entries produced yield, ranged from 39 to 50 bu/a, that was statistically equal to the highest yielding cultivar. Test weight was good and averaged 49.3 lb/bu. Test weight ranged from 44.8 lb/bu for 'Moravian 115' to 52.6 for Champion. Grain protein content averaged 12.6 percent and ranged from 11.2 to 15.0 percent. The percentage of plump kernels was 61 percent in the harvested grain. Percentage of thin kernels averaged 18 percent. Two- and three-year averaged yield for barley cultivars tested during 2013 to 2015 at Broadview was 45 and 37 bu/a respectively.

Spring barley lodging was moderately high at Fromberg in 2015 for most of the entries, averaging a lodging score of 5.2 out of 9. (Table 2). Lodging score varied from 3.7 for 'Stockford' to 7.7 for Haybet. Spring barley yield was good and averaged 125 bu/a under irrigation. Yield was highest at Fromberg among all locations tested in 2015. Yield ranged from 74 bu/a for Haybet to 142 bu/a for 'MT100120' (Table 2). Merit was the highest yielding commercial cultivar at Fromberg. Thirteen other commercial spring barley cultivars produced yield statistically equal to the highest yielding entry. The test weight averaged 48.1 lb/bu and ranged from 43.6 lb/bu to 51.9 lb/bu. Average grain protein content was 11.3 percent and ranged from 11.6 percent to 13.4 percent. The percentage of plump kernels averaged 87 percent in the harvested grain. Experimental line 'MT100126' produced the highest percentage of plump kernels while among the commercial entries 'AC Metcalf' and Merit produced the highest percentage of plump kernels. Percentage of thin kernels averaged 5.4 percent. Two- and three-

years averaged yield for barley cultivars tested during 2013 to 2015 was 123 and 102 bu/a respectively.

Spring barley yield under irrigation at Hysham in 2015 averaging 115 bu/a (Table 3). Lodging was relatively low for barley cultivars at Hysham in 2015 with an average lodging score of 2.0 out of 9. Champion had the highest lodging score (3.7) among the commercial entries. Yield ranged from 91 bu/a for 'craft' to 141 bu/a for 'Moravian 153'. Average test weight was 52.7 lb/bu. All entries produced test weight heavier than 48 lb/bu. Grain protein averaged 9.6 percent and ranged from 8.7 to 10.5 percent. Barley quality was excellent at Hysham where mean percent plump and thin kernels were 95 and 2 percent, respectively. Except for Moravian 153, all barley entries produced plump kernel more than 90 percent. No statistical difference in two- and three-years averaged yield was observed for spring barley entries tested at Hysham.

SUMMARY:

Below-average precipitation in the spring caused early season drought stress that resulted in earliest spring barley harvest in south eastern Montana. Champion was the top yielding commercial cultivar under dryland condition in 2015 (Table 1). Averaged across all locations cultivar Moravian 153 has the highest grain yield in 2015, though statistically not significant (Table 4). Averaged across all locations over the past two- and three-years (2013-2015) averaged yield was 93 and 86 bu/a respectively (Table 5). Moravian 69 was the top yielding commercial cultivar under irrigated condition over the past two-years (Table 6). Averaged across locations grain protein content was 11.1 percent (Table 5). Overall test weight averaged 50.3 lb/bu. Averaged over locations the percentage of plump kernels averaged 83 percent in the harvest grain (Table 5), but was 92 percent under irrigation (Table 6).

Table 1. Performance of 20 spring barley cultivars and experimental lines tested under dryland conditions near Broadview, Montana during 2015. Cultivars listed alphabetically. (Exp. 153692).

Cultivar	1/ Grain Yield 2015	2014-2015	2013-2015	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	45.0	42.7	34.6	46.9	9.5	12.7	60.8	16.7	25.5
Champion	**54.4****	51.0	41.9	52.6	10.0	12.2	65.2	12.9	24.9
Conrad	42.1	44.7	36.8	49.6	9.8	13.9	71.5	13.3	25.3
Craft	**49.6***	46.3	38.1	52.4	9.8	11.9	76.4	9.9	27.4
Harrington	45.6	41.5	33.6	50.3	9.9	11.6	62.1	17.6	25.1
Haxby	**48.3***	51.5	41.6	52.3	10.0	11.8	61.0	14.8	25.1
Haybet	35.0			46.7	9.4	12.7	32.1	35.1	30.8
Hockett	**48.0***	46.2	37.7	51.1	10.1	11.7	75.0	10.3	25.2
Lavina	45.9			46.7	9.4	12.8	37.4	31.3	24.9
Merit	45.7			48.5	9.5	15.0	58.3	19.8	25.7
Moravian 115	44.0	43.6	35.2	44.8	9.2	14.7	59.9	21.2	22.0
Moravian 150	42.3			47.9	9.6	12.7	60.4	19.3	21.0
Moravian 153	**46.7***			48.7	9.9	12.1	61.9	15.4	22.2
Moravian 165	45.4	45.4		49.1	9.5	13.8	67.5	14.9	29.0
Moravian 69	45.4	37.6	33.0	46.5	9.4	13.0	55.8	21.4	22.0
Stockford	39.0			48.9	9.8	11.8	71.9	12.8	27.4
Experimental									
MT100120	40.6	40.0		51.2	10.2	11.2	64.0	15.0	25.9
MT100126	43.5	46.1		51.3	9.1	12.4	61.8	20.3	26.1
MT124027	42.9			49.1	9.6	12.4	64.6	15.4	26.9
MT124728	41.8			50.5	9.7	11.8	60.3	16.3	18.2
Average	44.6	44.7	37.0	49.3	9.7	12.6	61.4	17.7	25.0
PLSD (p=0.05)	7.6	ns	ns	2.4	ns	ns	15.8	9.4	5.1
CV%	10.3	12.2	13.0	3.0	4.0	11.8	15.6	32.1	12.4

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 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. 153692)	
Planted:	April 14, 2015
Harvested:	July 31, 2015
Fertility:	n/a
Herbicide:	n/a
Previous Crop:	summer fallow
Precipitation:	n/a

Table 2. Performance of 20 spring barley cultivars and experimental lines tested under irrigated conditions near Fromberg, Montana during 2015. Cultivars listed alphabetically. (Exp. 153794).

Cultivar	1/ Grain Yield 2015	1/ Grain Yield 2014-2015	1/ Grain Yield 2013-2015	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	3/ Lodging
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -	0-9
Commercial										
AC Metcalfe	**126.7***	115.2	98.0	50.5	12.7	10.8	92.2	3.0	42.8	4.0
Champion	**129.1***	122.8	107.7	50.8	12.9	11.7	90.9	3.9	40.9	4.7
Conrad	**131.9***	118.0	97.6	49.8	12.4	11.5	89.5	4.0	41.6	5.0
Craft	**124.6***	122.4	105.7	50.0	13.2	12.2	88.5	4.1	44.1	6.0
Harrington	**136.2***	120.2	101.3	49.3	12.3	10.6	92.5	2.3	37.7	5.0
Haxby	112.5	109.9	97.8	51.5	12.8	11.9	91.6	4.0	42.3	6.0
Haybet	74.7			43.6	13.4	15.0	56.3	20.1	43.3	7.7
Hockett	**127.0***	124.5	104.1	49.7	12.8	11.2	86.9	6.8	40.8	6.3
Lavina	107.7			45.0	12.3	11.8	73.8	11.8	42.5	7.0
Merit	**141.1***			46.2	11.6	11.2	92.3	2.9	40.8	5.3
Moravian 115	115.7	123.6	103.1	45.4	12.3	11.6	86.4	5.2	31.5	5.0
Moravian 150	**136.4***			44.0	12.4	11.0	88.6	4.1	33.6	4.7
Moravian 153	**133.5***			43.9	12.6	10.2	78.0	8.1	33.9	5.0
Moravian 165	**125.2***	128.6		47.1	12.8	11.7	88.9	4.8	45.3	5.3
Moravian 69	**134.9***	136.0	110.7	45.0	13.2	10.4	75.2	10.0	34.8	5.0
Stockford	98.4			47.4	12.7	11.7	88.9	4.8	44.4	3.7
Experimental										
MT100120	**141.9****	126.5		49.9	12.7	9.7	93.9	2.5	44.2	4.0
MT100126	**133.5***	132.7		51.9	12.6	10.2	96.1	1.4	43.7	4.3
MT124027	**130.7***			49.8	12.5	10.2	92.0	3.1	42.0	6.3
MT124728	**141.4***			50.9	12.8	11.1	95.5	1.0	39.9	3.7
Average	125.2	123.4	102.9	48.1	12.6	11.3	86.9	5.4	40.5	5.2
PLSD (p=0.05)	19.8	ns	ns	2.3	0.9	1.9	8.8	5.2	2.2	2.0
CV%	9.6	10.7	10.9	2.8	4.2	10.2	6.1	58.6	3.3	23.8

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. 153794)	
Planted:	March 26, 2015
Harvested:	August 15, 2015
Fertility:	100 lb N/a preplant; 120 lb N/a top dress in May, 2015
Herbicide:	n/a
Previous Crop:	Sugar beet
Irrigation:	overhead sprinkler

Table 3. Performance of 17 spring barley cultivars and experimental lines tested under irrigated conditions near Hysham, Montana during 2015. Cultivars listed alphabetically. (Exp. 153795).

1/ Cultivar	2/ Grain Yield 2015	2014-2015	2013-2015	Test Weight	Grain Moisture	3/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height	4/ Lodging
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -	0-9
Commercial										
AC Metcalfe	108.8	106.3	110.3	53.7	10.4	9.5	95.4	1.5	38.8	2.0
Champion	127.1	118.1	126.1	53.0	10.4	9.9	95.3	1.8	38.8	3.7
Conrad	125.5	114.2	117.0	52.8	10.5	10.5	96.8	1.1	36.0	1.0
Craft	91.3	101.0	108.9	53.0	10.3	10.0	93.9	3.3	41.2	1.7
Harrington	122.9	112.6	114.1	52.6	10.3	9.9	94.6	1.8	36.7	3.0
Haxby	98.7	102.4	115.9	53.7	10.2	9.3	95.8	1.5	40.0	3.3
Haybet	-	-	-	-	-	-	-	-	42.1	-
Hockett	114.8	107.6	114.1	54.4	10.5	9.5	98.0	0.8	37.4	3.0
Lavina	-	-	-	-	-	-	-	-	38.2	-
Merit	115.7			52.3	10.3	10.4	96.5	1.8	38.5	2.3
Moravian 115	123.4	127.3	119.4	50.1	10.1	9.2	94.4	2.3	27.7	1.3
Moravian 150	**129.8***			51.6	10.1	9.4	92.6	2.0	28.6	1.7
Moravian 153	**141.2****			51.0	10.1	9.1	87.4	4.1	31.5	3.0
Moravian 165	109.4	112.4		52.7	10.1	9.8	94.0	1.9	41.1	2.0
Moravian 69	124.1	128.5	132.8	51.9	10.1	9.1	91.0	2.9	29.0	1.7
Stockford	-	-	-	-	-	-	-	-	46.1	-
Experimental										
MT100120	100.3	95.0		52.9	10.0	9.2	95.5	1.6	40.8	0.3
MT100126	100.4	107.5		52.7	10.1	8.9	95.6	2.0	40.3	0.0
MT124027	120.1			53.2	10.3	8.7	96.5	1.0	38.5	2.0
MT124728	115.5			53.6	10.4	10.1	95.6	1.3	36.9	2.3
Average	115.8	111.1	117.6	52.7	10.2	9.6	94.6	1.9	36.6	2.0
PLSD (p=0.05)	13.8	ns	ns	1.3	0.2	0.8	3.8	2.0	3.6	1.3
CV%	7.2	10.1	9.6	1.5	1.1	5.0	2.4	62.4	6.0	38.1

1/ Cultivars Haybet, Lavina and Stockford 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. 153795)	
Planted:	March 26, 2015
Harvested:	July 13, 2015
Fertility:	60 lb N/a preplant, 140 lb N/a top dress in spring
Previous Crop:	n/a
Irrigation:	flood
Precipitation:	n/a

Table 4. Grain yield[1/] of 20 spring barley cultivars tested at three locations in south central Montana during 2015. Varieties listed by declining average yield.

Cultivar	Dryland	Irrigated			Three Location Average
	Broadview	Fromberg	Hysham	Ave.	
		bushels/acre			
Moravian 153	**46.7***	**133.5***	**141.2****	137.3	107.1
Champion	**54.4****	**129.1***	127.1	128.1	103.5
Moravian 150	42.3	**136.4***	**129.8***	133.1	102.8
Harrington	45.6	**136.2***	122.9	129.5	101.6
Moravian 69	45.4	**134.9***	124.1	129.5	101.5
Merit	45.7	**141.1***	115.7	128.4	100.8
Conrad	42.1	**131.9***	125.5	128.7	99.9
MT124728	41.8	**141.4***	115.5	128.4	99.5
MT124027	42.9	**130.7***	120.1	125.4	97.9
Hockett	**48.0***	**127.0***	114.8	120.9	96.6
Moravian 115	44.0	115.7	123.4	119.5	94.4
MT100120	40.6	**141.9****	100.3	121.1	94.3
AC Metcalfe	45.0	**126.7***	108.8	117.8	93.5
Moravian 165	45.4	**125.2***	109.4	117.3	93.3
MT100126	43.5	**133.5***	100.4	117.0	92.5
Craft	**49.6***	**124.6***	91.3	108.0	88.5
Haxby	**48.3***	112.5	98.7	105.6	86.5
Haybet	35.0	74.7	-	-	-
Lavina	45.9	107.7	-	-	-
Stockford	39.0	98.4	-	-	-
Average	44.6	125.2	115.8	123.3	97.3
PLSD (p=0.05)	7.6	19.8	13.8	ns	ns
CV%	10.3	9.6	7.2	8.4	9.0

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 17 spring barley cultivars and experimental lines tested under dryland and irrigated conditions at three locations in south central Montana during 2015. Cultivars listed alphabetically.

Cultivar	1/ Grain Yield 2015	1/ Grain Yield 2014-2015	1/ Grain Yield 2013-2015	Test Weight	Grain Moisture	2/ Grain Protein	Plump Kernels	Thin Kernels	Plant Height
	-------- bushels/acre --------			- lb/bu -	- % -	- % -	- % -	- % -	- inches -
Commercial									
AC Metcalfe	93.5	88.1	81.0	50.4	10.9	11.0	82.8	7.1	35.7
Champion	103.5	97.7	92.2	52.1	11.1	11.3	83.8	6.2	34.9
Conrad	99.9	92.3	83.8	50.7	10.9	11.9	85.9	6.1	34.3
Craft	88.5	89.9	84.2	51.8	11.1	11.4	86.2	5.8	37.6
Harrington	101.6	91.5	83.0	50.7	10.8	10.7	83.1	7.2	33.2
Haxby	86.5	87.9	85.1	52.5	11.0	11.0	82.8	6.8	35.8
Hockett	96.6	93.0	85.5	51.7	11.1	10.8	86.6	6.0	34.5
Merit	100.8			49.0	10.5	12.2	82.4	8.2	35.0
Moravian 115	94.4	98.2	85.9	46.7	10.6	11.8	80.2	9.6	27.1
Moravian 150	102.8			47.9	10.7	11.0	80.5	8.4	27.7
Moravian 153	107.1			47.8	10.9	10.5	75.8	9.2	29.2
Moravian 165	93.3	95.5		49.7	10.8	11.8	83.5	7.2	38.5
Moravian 69	101.5	100.7	92.2	47.8	10.9	10.8	74.0	11.4	28.6
Experimental									
MT100120	94.3	87.2		51.4	10.9	10.0	84.5	6.4	37.0
MT100126	92.5	95.4		52.0	10.6	10.5	84.5	7.9	36.7
MT124027	97.9			50.7	10.8	10.4	84.3	6.5	35.8
MT124728	99.5			51.7	11.0	11.0	83.8	6.2	31.7
Average	97.3	93.1	85.9	50.3	10.8	11.1	82.6	7.4	33.7
PLSD (p=0.05)	ns	ns	ns	2.2	ns	1.1	6.9	ns	3.1
CV%	9.0	11.3	11.2	2.4	3.5	9.9	8.1	51.0	7.0
Location Year	3	6	9	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 17 spring barley cultivars and experimental lines tested under irrigated conditions at two locations in south central Montana during 2015. Cultivars listed alphabetically.

Cultivar	Grain Yield 1/ 2015	Grain Yield 1/ 2014-2015	Grain Yield 1/ 2013-2015	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	117.8	110.7	104.2	52.1	11.5	10.2	93.8	2.2	40.8	3.0
Champion	128.1	**120.5***	116.9	51.9	11.6	10.8	93.1	2.9	39.9	4.2
Conrad	128.7	116.1	107.3	51.3	11.4	11.0	93.2	2.6	38.8	3.0
Craft	108.0	111.7	107.3	51.5	11.8	11.1	91.2	3.7	42.7	3.8
Harrington	129.5	116.4	107.7	51.0	11.3	10.2	93.6	2.1	37.2	4.0
Haxby	105.6	106.2	106.9	52.6	11.5	10.6	93.7	2.8	41.1	4.7
Hockett	120.9	116.0	109.1	52.0	11.7	10.3	92.4	3.8	39.1	4.7
Merit	128.4			49.3	11.0	10.8	94.4	2.4	39.6	3.8
Moravian 115	119.5	**125.4***	111.3	47.7	11.2	10.4	90.4	3.8	29.6	3.2
Moravian 150	133.1			47.8	11.2	10.2	90.6	3.0	31.1	3.2
Moravian 153	137.3			47.4	11.3	9.6	82.7	6.1	32.7	4.0
Moravian 165	117.3	**120.5***		49.9	11.4	10.8	91.5	3.4	43.2	3.7
Moravian 69	129.5	**132.3****	121.8	48.5	11.7	9.7	83.1	6.5	31.9	3.3
Experimental										
MT100120	121.1	110.7		51.4	11.3	9.5	94.7	2.1	42.5	2.2
MT100126	117.0	**120.1***		52.3	11.3	9.5	95.9	1.7	42.0	2.2
MT124027	125.4			51.5	11.4	9.4	94.2	2.1	40.2	4.2
MT124728	128.4			52.3	11.6	10.6	95.6	1.1	38.4	3.0
Average	123.3	117.2	110.3	50.6	11.4	10.3	92.0	3.1	38.3	3.0
PLSD (p=0.05)	ns	15.1	ns	2.9	ns	0.9	6.1	ns	1.9	ns
CV%	8.4	10.5	10.2	2.2	3.1	8.1	4.4	72.3	4.8	27.8
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).