RESULTS OF AGRONOMIC AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2001

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PROJECT TITLE: Dryland and Irrigated Spring Barley Performance Trials near Bridger, Hysham, Molt and Ryegate, Montana. (Exps. 013691, 013692, 013794 and 013795).

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OBJECTIVES: To provide barley 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: Off-station spring barley trials were established under dryland conditions near Molt and Ryegate, and under irrigation near Bridger and Hysham, Montana (Fig. 1). Sixteen spring barley entries were planted at each location, however, the dryland sites were oriented towards feed-type cultivars whereas malt-types dominated the entries tested on irrigated sites. Consequently, only eight of the spring barley cultivars tested were grown under both dryland and irrigated conditions.

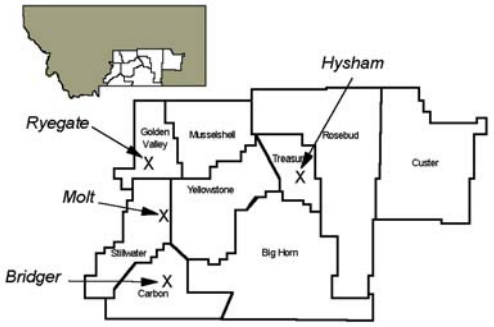

Figure 1. 2001 off-station spring barley trial locations in south central Montana.

All studies were planted using a randomized complete block design with three replications. Dryland test plots consisted of a 15-foot, 4-row plot with 12-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 (pounds per bushel) and percent grain moisture content were obtained for each plot using a Dickey-john GAC 2100 grain analyzer. Grain protein (%) was determined for each entry bulked across replications 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. Reported plant height values have been rounded to the nearest inch. Lodging of some entries was noted at the irrigated locations. Lodging severity 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 subsample retained above a 6-64" slotted screen and passing through a 5½-64" slotted screen, respectively, following 30 oscillations on a sieve shaker.

RESULTS:

All four spring barley off-station trials were planted in the spring of 2001, but only two of the sites, Bridger and Ryegate, were harvested. The Molt dryland site was planted into a minimum-tilled seedbed that was last cultivated during the fall of 2000. Very little moisture was received at this site during the fall and winter months. To conserve surface soil moisture at planting, the trial was direct seeded prior to spring tillage. Fairly uniform stands did emerge, but hot, dry conditions during May and early June caused some seedling mortality, stunted crop growth and reduced tillering of those plants that did establish. Like most areas in the region, 5 to 7 inches of rain was received at this site between mid-June to mid-July. The excess precipitation promoted the germination and growth of volunteer barley, which eventually overran the plots. After several attempts to salvage the Molt spring barley trial using hand weeding, the site was abandoned because of the excess volunteer barley contamination. The irrigated trial at Hysham possessed uniform stands and displayed excellent growth during the growing season. Yield potential of the spring barley cultivars planted at Hysham appeared quite high. Unfortunately, a custom harvester hired by the Hysham site cooperator inadvertently combined the trial before University personnel were able to harvest the plots for research purposes.

The Ryegate dryland trial was plagued by early season drought stress similar to that experienced at Molt, but the Ryegate trial did not receive the mid-season precipitation experienced at the Molt location. Average spring barley yields at Ryegate during 2001 were 30.0 bu/ac (Table 1). No difference in yield was detected between the 16 barley cultivars tested. Test weights averaged 46.7 lb/bu, with only 'Haxby', 'Lewis' and 'MTLB 13' spring barley averaging test weights equal to, or heavier than, 48 lb/bu. Grain protein levels were high as a result of the hot, dry conditions that prevailed during the grain fill period. Average protein levels were 17.1 percent and ranged from 15.0 percent for 'Gallatin' to 18.7 percent for 'MT970116'. Mean percent plump and thin kernels were 35.7 and 37.9 percent, respectively.

The irrigated off-station spring barley trial grown at Bridger during 2001 did not yield as good as spring barley studies grown at this location during previous years. No foliar diseases were evident, but the site did possess excess residual soil nitrogen. Soil samples taken at planting revealed more than 300 pounds of NO_3-N in the top 24 inches of the soil profile. Although irrigation and seasonal rainfall provided adequate moisture for crop growth and development, the excess soil nitrogen appeared to stunt the barley study more than the spring wheat trial grown concurrently at this site. Mean plant height of the barley was only three inches taller at Bridger compared to the dryland site at Ryegate, but was approximately ten inches shorter than the plant height observed among spring barleys planted at Bridger the previous year (Table 2). Mean yield of the 16 spring barley cultivars grown at Bridger in 2001 was 81.2 bu/ac, approximately 50 percent of the yield obtained under irrigation at Bridger in 2000. No difference in yield among the 16 cultivars was detected. All cultivars tested at Bridger produced test weights heavier than 50 lb/bu, averaging 52.6 lb/bu. The elevated soil nitrate levels resulted in high grain protein levels, averaging 18.6 percent, rendering all cultivars

tested at this site unsuitable for malting purposes. Grain proteins varied from 17.3 percent for Gallatin to 20.0 percent for 'Galena'. In spite of the depressed yields, percent plumb kernels averaged 91.0 percent.

SUMMARY:

The loss of two locations prior to harvest limits the scope of environments comparing spring barley performance. Based on three-year averages analyzed for the Ryegate site, 'Baroness', Gallatin and 'Xena' have been the highest yielding spring barleys under dryland conditions. Given the relatively poor performance of the barleys tested at Bridger in 2001, insufficient data is available from the Bridger location to confidently predict which malt or feed types would be best adapted from an agronomic standpoint for production under irrigation in south central Montana.

FUTURE PLANS:

Off-station spring barley variety evaluations will continue in 2002 at Molt, Ryegate, Bridger and Hysham.

Table 1. Performance of 16 spring barley cultivars and experimental lines tested under dryland conditions near Ryegate, Montana during 2001. Cultivars listed alphabetically. (Exp. 013692).

	1/ Grain Yield			Test	Grain	2/ Grain	Plump	Thin	Plant
Cultivar	2001	2000-2001	1999-2001	Weight	Moisture	Protein	Kernels	Kernels	Height
	---------- bushels/acre ----------			lb/bu	%	%	%	%	inches
Baronesse	36.7	27.5	**42.4****	46.1	8.9	15.4	36.6	38.0	17
Chinook	36.9	22.1	35.7	47.2	8.9	16.0	67.7	16.8	17
Gallatin	32.2	22.4	**37.2***	46.2	8.4	15.0	31.6	41.6	20
H3860224	20.6			45.9	9.1	17.0	39.6	33.9	17
Harrington	31.3	20.8	35.3	45.3	8.9	16.2	37.6	33.6	19
Haxby (MT950186)	27.6	16.6	35.8	48.0	9.1	18.1	41.4	34.1	19
Lewis	28.9	17.7	30.5	48.8	9.2	17.2	43.2	31.3	21
MT960099	30.7	22.7		45.2	9.6	18.0	19.2	53.6	16
MT960100	25.9	20.5		47.8	9.3	17.1	49.9	27.7	20
MT960228	31.7	23.4	36.5	45.8	8.9	17.3	25.4	46.8	18
MT970116	25.8			46.2	9.3	18.7	19.3	49.9	16
MTLB 5	27.8	19.2	33.7	47.6	8.6	18.6	23.2	45.6	18
MTLB 13	37.2	22.3	35.8	48.1	9.0	16.7	28.2	41.0	20
Stark	31.9	17.5	33.9	46.2	9.0	16.9	39.0	38.9	19
Valier	25.5	19.5	34.1	46.5	9.7	17.9	26.8	45.2	18
Xena	28.5	20.9	**38.1***	46.1	9.7	16.7	42.3	27.5	18
Average	30.0	20.9	35.8	46.7	9.1	17.1	35.7	37.9	18.4
LSD (p=0.05)	ns	ns	5.4	2.1	ns	-	16.3	15.7	ns
CV%	24.5	27.5	15.9	2.7	6.6	-	27.4	24.9	10.8

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).

Ryegate Dryland Spring Barley (Exp. 013692)

Planted:	April 3, 2001
Harvested:	August 8, 2001
Fertility:	11-52-00, 120 lb/a in-furrow, April 3, 2001
	40-20-00, 125 lb/a broadcast, May 3, 2001
Herbicide:	Harmony Extra, 0.5 oz/a; Bronate, 1 pt/a; R-11, 1 pt/a, May 3, 2001
Insecticide:	none
Previous Crop:	summer fallow
Precipitation:	not available

Table 2. Performance of 16 spring barley cultivars and experimental lines tested under irrigated conditions near Bridger, Montana during 2001. Cultivars listed alphabetically. (Exp. 013794).

Entry	Grain Yield 1/ 2001	Grain Yield 1/ 2000-2001	Test Weight	Grain Moisture	Grain Protein 2/	Plump Kernels	Thin Kernels	Plant Height	Lodging 3/
	-- bushels/acre --		lb/bu	%	%	%	%	inches	0-9
B2L20-36	87.3	**117.7***	51.7	8.2	18.8	94.0	2.1	19	0.3
B2L20-42	71.0	108.6	50.8	8.2	18.5	93.8	1.5	21	1.0
BARI 6B932978	60.9		51.9	8.6	18.4	95.0	2.0	20	0.0
Baronesse	93.5	**134.8****	52.7	8.8	18.6	88.5	5.8	20	0.7
Busch Agr 1202	61.0	103.9	52.1	8.8	18.9	80.8	8.5	20	0.0
Chinook	83.0	**123.0***	54.1	8.7	17.7	95.6	2.6	20	0.3
Coors C37	88.6	**131.7***	53.7	8.3	18.1	93.9	2.6	18	0.0
Foster	69.4	102.4	52.2	8.3	18.8	93.8	2.9	17	0.0
Galena	58.4	108.7	52.7	8.5	20.0	88.3	5.6	19	0.0
Gallatin	103.5	**132.3***	53.6	8.5	17.3	86.4	6.9	22	0.0
Garnett	97.6		52.1	8.9	17.8	91.6	5.1	24	0.7
Harrington	86.6	**119.9***	53.7	8.6	18.4	93.2	3.1	23	0.7
Merit	75.9	**128.3***	52.7	8.7	19.5	88.3	4.8	23	0.7
Morex	86.3	**115.6***	51.6	8.0	19.0	90.9	2.2	20	0.3
MTLB 5	92.5	**132.0***	53.0	9.0	18.7	88.3	5.6	21	0.7
Stander	84.1	**122.3***	52.5	8.3	18.7	93.1	3.0	19	0.0
Average	81.2	120.1	52.6	8.5	18.6	91.0	4.0	20.3	0.3
LSD (p=0.05)	ns	20.4	1.3	0.5	-	6.0	3.3	ns	ns
CV%	27.1	14.7	1.5	3.4	-	4.0	48.9	15.7	198.7

1/ Yields are based on 48 pound standard bushel weight and adjusted to 13.0 percent moisture content.
2/ Grain protein values adjusted to 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).

Bridger Irrigated Spring Barley (Exp. 013794)

Planted:	April 2, 2001
Harvested:	August 6, 2001
Fertility:	11-52-00, 120 lb/a in-furrow, April 2, 2001
Herbicide:	Harmony Extra, 0.5 oz/a; Bronate, 1 pt/a; R-11, 1 pt/a, May 22, 2001
Insecticide:	Malathion, 1 pt/a; R-11, 1 pt/a, May 22, 2001
Previous Crop:	summer fallow
Irrigation:	profile flooded, May 16, 2001 profile flooded, July 3, 2001
Precipitation:	6.39 inches