

PROJECT TITLE: Evaluation of malt barley varieties under irrigated and dryland conditions – 2006

PROJECT LEADER:

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PROJECT PERSONNEL:

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OBJECTIVE: To select the best adapted experimental lines for release and to determine the best adapted varieties of malt barley for eastern Montana.

RESULTS:

Dryland site:

Soil type: Williams clay loam

Previous crops: 2005 - fallow, 2004 – safflower, 2003 - small grain plots

Residual soil N to 3 ft: 100 lb N/ac

Residual soil P to 6 in: 31 ppm

Applied fertilizer: None

Herbicides: 1.5 pt/ac Bronate applied May 25

Precipitation April – August, 2006: 9.62 inches

Ave (58 yr) precipitation April – August: 9.45 inches

Precipitation September 2005 – August 2006: 13.77 inches

Ave (58 yr) precipitation September – August: 13.85 inches

Irrigated site:

Soil type: Savage silty clay

Previous crops: 2005 – safflower, 2004 – sugarbeets, 2003 – spring wheat

Residual soil N to 4 ft: 96 lb N/ac

Residual soil P to 6 in: 15 ppm

Applied fertilizer: 200 lb/A 18-46-0 applied Nov 7, 2005

Irrigated (flood) on: Jun 7, Jun 21

Herbicides: 2 pt/ac Buctil applied on May 25

Precipitation April – August, 2006: 9.28 inches

Ave (58 yr) precipitation April – August: 9.45 inches

Precipitation September 2005 – August 2006: 14.65 inches

Ave (58 yr) precipitation September – August: 13.85 inches

Comments:

Above average precipitation in April provided good soil moisture at planting. Conditions were hot in May and June, with below average but timely rainfall.

Dryland: Agronomic data from a dryland malt barley yield trial conducted in cooperation with the barley breeder in Bozeman are shown in Table 1. Tradition, Craft, Morex and Drummond yielded significantly more than the check variety, Harrington. Five-year summaries for yield, test weight, protein content and percent plump seed are shown in Tables 2-5.

Irrigated: Agronomic data from an irrigated malt barley yield trial conducted in cooperation with the barley breeder in Bozeman are shown in Table 6. Tradition, Robust, Drummond, Legacy, Conrad, and Calgary yielded significantly more than the check variety, Harrington. Five-year summaries for yield, test weight, protein content, percent plump, and lodging are shown in Tables 7-11.

A malt barley yield trial was grown under sprinkler (Table 12) and flood (Table 13) irrigated conditions in cooperation with barley breeders from North Dakota State University in Fargo. Lacey and Tradition were the highest-yielding named varieties under sprinkler irrigation and Tradition was the highest-yielding named variety under flood irrigation. Protein contents were higher under sprinkler irrigation than under flood irrigation.

SUMMARY: The experiments reported under this project are all of the replicated small plot type. Twenty-two lines and varieties of malt barley were tested under dryland and irrigated conditions in cooperation with the barley breeder at Montana State University in Bozeman. Twenty-five lines and varieties were tested under flood and sprinkler irrigation in cooperation with the barley breeders from North Dakota State University in Fargo.

FUTURE PLANS: New experimental lines and varieties of malt barley will continue to be tested under dryland and irrigated conditions to identify those which will perform best in eastern Montana. Closer cooperation with North Dakota State University will allow testing of experimental lines from North Dakota as well as from Montana, so that when those lines are released as varieties, information will be available as to their performance in this region.

Table 1. Agronomic data obtained from a statewide malt barley yield trial grown under dryland fallow conditions at the MSU Eastern Agricultural Research Center, Sidney, MT
 Planted: April 13 Harvested: July 26

Entry	heading*	height, cm	grain protein	% plump	% regular	test wt, lb/bu	yield, bu/a	
Tradition	60.0	69.7	11.47	90.7	8.3	50.7	90.9	a
Craft	61.7	77.0	13.28	83.7	13.0	50.8	90.9	a
Morex	59.3	76.7	12.25	86.0	12.3	50.7	87.4	a
Drummond	60.0	64.0	12.37	86.7	12.0	50.2	86.1	a
Metcalfe	60.3	66.0	12.24	89.0	9.3	50.5	85.8	
Legacy	60.0	63.0	10.64	79.0	19.3	49.0	85.8	
MT970229	63.3	65.0	12.87	85.7	11.3	50.8	85.2	
Boulder	62.0	63.8	12.73	87.3	10.3	52.0	84.7	
Xena	62.3	67.2	12.68	53.0	40.7	47.7	83.4	
Hays	62.7	61.3	11.28	69.7	23.0	46.8	82.8	
Conrad	63.3	63.5	12.34	81.3	15.3	48.7	82.3	
Merit	62.7	65.3	12.04	75.3	20.3	46.2	81.9	
Hockett	61.0	62.3	11.33	86.7	10.7	50.8	81.6	
Haxby	62.3	67.2	12.84	73.0	22.3	53.0	81.1	
Kendall	61.7	64.7	12.83	84.7	12.7	48.8	79.6	
Robust	59.7	72.5	11.76	78.0	19.7	50.2	79.5	
Eslick	63.0	63.5	12.37	70.0	25.3	49.0	76.5	
Geraldine	63.3	61.3	12.25	60.3	32.3	48.0	76.4	
Stellar	59.7	57.8	10.92	90.0	8.3	49.5	76.0	
Calgary	63.0	54.0	12.44	70.7	25.3	48.3	74.3	
Harrington	63.3	63.5	11.79	74.3	21.0	46.8	73.5	
Copeland	63.0	69.8	12.47	73.3	22.3	46.8	68.0	
Average	61.7	65.4	12.15	78.6	18.0	49.3	81.5	
Probability	<0.001	0.001	0.025	<0.001	<0.001	<0.001	0.066	
CV (S/mean)	1.8	8.0	6.8	7.4	26.2	2.2	9.3	
CV (SE/mean)	1.1	4.6	3.9	4.3	15.1	1.3	5.4	
LSD (0.05)	1.9	8.7	1.37	9.6	7.7	1.8	12.5	

* days from planting

a indicates significantly greater yield than check variety, Harrington, at probability of 0.05

x indicates significantly lower yield than check variety, Harrington, at probability of 0.05

Table 2. Relative yielding abilities of malt barley varieties as compared to Harrington when grown under dryland conditions at the EARC, Sidney, Montana.

Variety	2002	2003 ¹	2003 ²	2004	2005	2006	Ave	as % of Harrington
Haxby	--	85.3	--	111.4	84.5	81.1	90.6	111.4
Craft	57.9	89.3	76.6	104.0	76.4	90.9	82.5	110.1
Tradition	53.2	91.9	--	103.0	71.0	90.9	82.0	108.9
Conrad	--	--	--	--	77.8	82.3	80.1	108.0
Xena	--	--	--	--	76.7	83.4	80.1	108.0
Stellar	--	--	--	--	83.8	76.0	79.9	107.8
Hockett	--	87.1	--	107.8	72.7	81.6	87.3	107.3
MT970229	--	--	--	--	73.7	85.2	79.5	107.2
Eslick	--	--	--	--	81.9	76.5	79.2	106.9
Metcalfe	59.6	--	72.7	103.8	74.5	85.8	79.3	105.1
Kendall	56.5	--	76.5	105.2	77.1	79.6	79.0	104.7
Legacy	47.1	78.6	70.9	107.5	80.1	85.8	78.3	104.6
Morex	62.6	--	62.3	101.7	74.4	87.4	77.7	102.9
Drummond	57.7	--	68.8	101.4	73.1	86.1	77.4	102.6
Boulder	--	--	--	--	67.3	84.7	76.0	102.6
Geraldine	--	--	--	--	75.2	76.4	75.8	102.3
Calgary	--	--	--	--	74.3	74.3	74.3	100.3
Harrington	51.3	72.2	72.9	104.9	74.7	73.5	74.9	100.0
Robust	57.3	--	66.3	98.9	72.4	79.5	74.9	99.2
Hays	--	--	--	--	63.6	82.8	73.2	98.8
Merit	51.1	77.7	61.0	98.2	70.2	81.9	73.4	97.9
Copeland	--	--	--	100.6	72.5	68.0	80.4	95.3

¹ Intrastate trial ² malt barley trial

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 3. Relative test weights of malt barley varieties as compared to Harrington when grown under dryland conditions at the EARC, Sidney, Montana.

Variety	2002	2003 ¹	2003 ²	2004	2005	2006	Ave	as % of Harrington
Boulder	--	--	--	--	51.3	52.0	51.7	111.6
Haxby	--	52.3	--	52.8	50.3	53.0	52.1	109.7
MT970229	--	--	--	--	50.8	50.8	50.8	109.7
Craft	49.5	51.5	51.3	51.7	50.7	50.8	50.9	108.6
Hockett	--	50.8	--	51.0	50.0	50.8	50.7	106.7
Geraldine	--	--	--	--	49.7	48.0	48.9	105.5
Eslick	--	--	--	--	48.2	49.0	48.6	105.0
Robust	45.8	--	51.0	50.0	48.5	50.2	49.1	104.9
Stellar	--	--	--	--	47.5	49.5	48.5	104.8
Drummond	47.0	--	50.3	50.0	47.5	50.2	49.0	104.7
Tradition	47.3	49.5	--	49.7	48.3	50.7	49.1	104.4
Conrad	--	--	--	--	47.8	48.7	48.3	104.2
Metcalf	47.0	--	48.2	50.0	47.7	50.5	48.7	104.0
Xena	--	--	--	--	48.5	47.7	48.1	103.9
Morex	46.3	--	48.8	49.3	46.0	50.7	48.2	103.0
Calgary	--	--	--	--	47.0	48.3	47.7	102.9
Legacy	46.7	47.7	48.5	48.7	46.0	49.0	47.8	101.8
Kendall	44.3	--	48.0	49.8	47.5	48.8	47.7	101.8
Hays	--	--	--	--	46.8	46.8	46.8	101.1
Harrington	45.3	47.3	46.2	50.0	45.8	46.8	46.9	100.0
Copeland	--	--	--	48.5	45.5	46.8	46.9	98.7
Merit	44.3	46.7	44.0	45.8	45.5	46.2	45.4	96.8

¹ Intrastate trial ² malt barley trial

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 4. Relative protein contents of malt barley varieties as compared to Harrington when grown under dryland conditions at the EARC, Sidney, Montana.

Variety	2002	2003 ¹	2003 ²	2004	2005	2006	Ave	as % of Harrington
Craft	12.8	12.6	13.3	13.1	11.0	13.3	12.7	109.5
MT970229	--	--	--	--	10.9	12.9	11.9	108.7
Haxby	--	11.5	--	12.7	10.7	12.8	11.9	105.8
Xena	--	--	--	--	10.4	12.7	11.6	105.5
Boulder	--	--	--	--	10.3	12.7	11.5	105.0
Morex	12.6	--	12.3	12.8	11.3	12.2	12.2	105.0
Metcalf	12.6	--	13.3	12.5	10.5	12.2	12.2	104.8
Kendall	13.8	--	12.0	12.3	10.0	12.8	12.2	104.5
Hays	--	--	--	--	11.5	11.3	11.4	104.1
Robust	12.5	--	12.4	12.4	11.0	11.8	12.0	103.1
Merit	12.8	11.7	12.3	11.9	10.6	12.0	11.9	102.6
Geraldine	--	--	--	--	10.2	12.2	11.2	102.3
Copeland	--	--	--	12.0	10.1	12.5	11.5	102.1
Eslick	--	--	--	--	9.9	12.4	11.2	101.8
Calgary	--	--	--	--	9.9	12.4	11.2	101.8
Drummond	11.3	--	12.3	12.4	10.5	12.4	11.8	101.0
Conrad	--	--	--	--	9.8	12.3	11.1	100.9
Harrington	12.3	11.2	12.1	12.0	10.1	11.8	11.6	100.0
Tradition	11.6	12.0	--	12.6	9.5	11.5	11.4	99.7
Hockett	--	11.6	--	11.6	9.7	11.3	11.1	98.0
Legacy	12.2	11.7	11.2	11.6	10.2	10.6	11.3	97.1
Stellar	--	--	--	--	10.0	10.9	10.5	95.4

¹ Intrastate trial ² malt barley trial

NOTE: Average protein percents in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 5. Relative percent plump of malt barley varieties as compared to Harrington when grown under dryland conditions at the EARC, Sidney, Montana.

Variety	2002	2003 ¹	2003 ²	2004	2005	2006	Ave	as % of Harrington
Boulder	--	--	--	--	94	87	90.5	113.1
Craft	82	72	73	94	89	84	82.3	112.3
MT970229	--	--	--	--	93	86	89.5	111.9
Stellar	--	--	--	--	86	90	88.0	110.0
Kendall	62	--	58	94	94	85	78.6	108.6
Drummond	65	--	74	86	80	87	78.4	108.3
Conrad	--	--	--	--	92	81	86.5	108.1
Robust	67	--	77	84	80	78	77.2	106.6
Hockett	--	73	--	95	94	87	87.3	106.1
Metcalf	66	--	42	92	88	89	75.4	104.1
Tradition	69	70	--	89	88	91	81.4	101.8
Copeland	--	--	--	94	86	73	84.3	100.8
Harrington	71	78	40	91	86	74	73.3	100.0
Merit	69	73	40	88	89	75	72.3	98.6
Haxby	--	63	--	91	85	73	78.0	94.8
Legacy	74	57	56	80	66	79	68.7	93.6
Eslick	--	--	--	--	79	70	74.5	93.1
Morex	42	--	57	80	67	86	66.4	91.7
Hays	--	--	--	--	76	70	73.0	91.3
Calgary	--	--	--	--	70	71	70.5	88.1
Geraldine	--	--	--	--	80	60	70.0	87.5
Xena	--	--	--	--	84	53	68.5	85.6

¹ Intrastate trial ² malt barley trial

NOTE: Average plump percents in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 6. Agronomic data obtained from a statewide malt barley yield trial grown under sprinkle irrigated conditions at the MSU Eastern Agricultural Research Center, Sidney, MT
 Planted: May 1 Harvested: August 1

Entry	heading*	height, cm	lodging index	grain protein	test wt, lb/bu	% plump	% regular	yield, bu/a	
Tradition	51.0	82.7	0.0	11.21	48.0	90.0	8.7	113.6	a
Robust	50.7	89.3	2.3	11.58	48.0	85.0	13.7	112.5	a
Drummond	50.0	84.7	1.0	11.95	46.2	78.3	19.0	111.6	a
Legacy	51.0	85.7	3.0	10.68	45.7	71.3	25.0	110.4	a
Conrad	54.3	74.3	0.0	12.36	48.8	89.0	9.3	109.2	a
Calgary	53.7	62.0	0.0	12.99	47.8	83.7	13.3	107.1	a
Eslick	54.0	81.7	0.0	11.71	48.7	83.3	13.3	105.0	
Boulder	53.0	75.0	0.0	12.27	50.8	88.7	9.0	104.7	
Copeland	55.3	92.7	1.3	11.53	46.8	80.3	16.7	104.2	
Xena	54.7	83.0	0.0	11.79	47.7	78.0	19.0	103.9	
Stellar	50.7	80.3	0.7	11.04	44.5	80.3	17.3	103.0	
Craft	53.3	89.7	0.7	13.25	50.2	85.7	12.0	99.9	
MT970229	54.3	79.3	0.0	12.17	50.8	90.3	8.0	98.9	
Kendall	54.0	80.7	0.0	11.93	47.3	90.0	8.3	98.9	
Hockett	52.3	76.7	0.0	10.89	48.3	86.7	10.7	98.9	
Geraldine	55.0	74.3	0.0	11.84	48.0	78.7	17.7	98.8	
Haxby	51.7	80.0	0.3	12.02	49.8	76.0	18.3	97.6	
Morex	50.0	91.7	4.3	11.59	45.0	65.0	30.0	97.2	
Metcalfe	53.0	82.3	0.0	12.18	47.8	86.7	11.3	94.1	
Harrington	55.0	81.0	0.3	11.04	47.7	90.0	9.0	93.5	
Merit	54.7	81.7	0.0	12.29	44.8	80.7	15.7	91.5	
Hays	56.0	80.7	0.0	12.96	44.3	57.3	35.3	85.9	
Average	53.1	81.3	0.6	11.88	47.6	81.6	15.5	101.8	
Probability	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	
CV (S/mean)	1.0	4.8	89.0	5.5	2.0	6.2	25.0	7.2	
CV (SE/mean)	0.6	2.8	51.4	3.2	1.2	3.6	14.4	4.1	
LSD (0.05)	0.9	6.4	0.9	1.08	1.6	8.3	6.4	12.0	

*days from planting

a indicates significantly greater yield than check variety, Harrington, at probability of 0.05

Table 7. Relative yielding abilities of malt barley varieties grown under irrigation at the Eastern Agricultural Research Center, Sidney, Montana.

Cultivar	2002	2003 ¹	2003 ²	2004	2005	2006	Ave	as % of Harrington
Conrad	--	--	--	--	129.3	109.2	119.3	125.1
Calgary	--	--	--	--	125.1	107.1	116.1	121.8
Eslick	--	--	--	--	125.2	105.0	115.1	120.7
Xena	--	--	--	--	125.3	103.9	114.6	120.2
Stellar	--	--	--	--	123.2	103.0	113.1	118.6
Boulder	--	--	--	--	121.0	104.7	112.9	118.4
Legacy	94.2	130.4	142.3	151.2	117.6	110.4	124.4	117.0
Drummond	98.1	--	130.2	138.2	118.4	111.6	119.3	114.9
Tradition	89.0	131.0	--	141.8	113.2	113.6	117.7	113.8
Geraldine	--	131.3	128.2	--	128.5	98.8	121.7	113.2
Copeland	--	--	--	126.9	128.7	104.2	119.9	113.1
Haxby	--	128.3	--	144.4	120.8	97.6	122.8	112.5
MT970229	--	--	--	--	112.6	98.9	105.8	110.9
Craft	--	137.0	131.1	128.1	113.5	99.9	121.9	109.4
Robust	87.3	--	119.5	127.4	106.6	112.5	110.7	106.6
Hockett	--	121.6	--	127.9	115.0	98.9	115.9	106.1
Morex	88.2	--	123.4	127.5	107.0	97.2	108.7	104.6
Merit	77.2	121.6	122.9	139.4	108.4	91.5	110.2	103.6
Kendall	80.0	--	118.5	125.6	114.9	98.9	107.6	103.6
Metcalf	78.8	--	117.5	122.2	120.8	94.1	106.7	102.7
Harrington	80.4	118.6	120.8	127.3	97.2	93.5	106.3	100.0
Hays	--	--	--	--	94.2	85.9	90.1	94.4

¹ Intrastate trial ² malt barley trial

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety.

Table 8. Relative test weights of malt barley varieties grown under irrigation at the Eastern Agricultural Research Center, Sidney, Montana.

Cultivar	2002	2003 ¹	2003 ²	2004	2005	2006	Ave	as % of Harrington
Boulder	--	--	--	--	51.0	50.8	50.9	107.5
Haxby	--	52.8	--	53.7	51.2	49.8	51.9	107.3
MT970229	--	--	--	--	50.3	50.8	50.6	106.8
Craft	--	53.0	52.8	52.5	50.7	50.2	51.8	106.4
Conrad	--	--	--	--	51.0	48.8	49.9	105.4
Hockett	--	51.3	--	52.0	50.8	48.3	50.6	104.7
Eslick	--	--	--	--	50.3	48.7	49.5	104.5
Geraldine	--	51.3	52.5	--	50.8	48.0	50.7	104.1
Xena	--	--	--	--	49.7	47.7	48.7	102.9
Calgary	--	--	--	--	49.2	47.8	48.5	102.4
Metcalfe	47.0	--	49.0	51.3	50.2	47.8	49.1	102.3
Robust	48.2	--	50.2	49.7	48.8	48.0	49.0	102.1
Kendall	46.0	--	50.0	50.7	50.5	47.3	48.9	101.9
Tradition	46.3	50.0	--	48.8	49.0	48.0	48.4	101.1
Copeland	--	--	--	49.2	49.3	46.8	48.4	101.1
Harrington	46.0	49.7	50.2	49.0	47.0	47.7	48.3	100.0
Drummond	46.7	--	48.3	48.8	47.5	46.2	47.5	99.0
Legacy	45.8	48.2	48.5	48.0	48.3	45.7	47.4	98.2
Merit	43.8	49.2	49.5	49.0	47.7	44.8	47.3	98.1
Morex	45.0	--	48.5	48.0	47.7	45.0	46.8	97.6
Stellar	--	--	--	--	47.3	44.5	45.9	96.9
Hays	--	--	--	--	46.0	44.3	45.2	95.4

¹ Intrastate trial ² malt barley trial

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare test weights only to the check variety.

Table 9. Relative protein contents of malt barley varieties grown under irrigation at the Eastern Agricultural Research Center, Sidney, Montana.

Cultivar	2002	2003 ¹	2003 ²	2004	2005	2006	Ave	as % of Harrington
Calgary	--	--	--	--	14.6	13.0	13.8	116.5
Craft	--	11.3	12.1	12.0	14.2	13.2	12.6	113.6
Boulder	--	--	--	--	14.2	12.3	13.3	111.8
Haxby	--	11.8	--	11.7	14.0	12.0	12.4	111.7
MT970229	--	--	--	--	14.1	12.2	13.2	111.0
Hays	--	--	--	--	13.3	13.0	13.2	111.0
Morex	12.7	--	11.1	12.4	14.5	11.6	12.5	110.1
Kendall	12.6	--	11.8	12.0	13.5	11.9	12.4	109.2
Drummond	12.6	--	11.2	11.5	14.4	12.0	12.3	109.0
Conrad	--	--	--	--	13.3	12.4	12.9	108.4
Robust	12.2	--	11.2	11.4	14.5	11.6	12.2	107.6
Tradition	12.3	10.5	--	11.6	14.2	11.2	12.0	107.0
Eslick	--	--	--	--	13.6	11.7	12.7	106.8
Metcalf	12.7	--	11.5	10.9	12.8	12.2	12.0	106.2
Xena	--	--	--	--	13.1	11.8	12.5	105.1
Merit	11.7	10.2	11.3	10.9	12.7	12.3	11.5	103.3
Stellar	--	--	--	--	13.4	11.0	12.2	103.0
Geraldine	--	10.2	11.0	--	13.3	11.8	11.6	102.9
Hockett	--	10.7	--	10.6	13.2	10.9	11.4	102.5
Copeland	--	--	--	11.1	12.1	11.5	11.6	102.1
Legacy	11.7	10.0	10.0	10.6	14.1	10.7	11.2	100.3
Harrington	11.6	10.3	11.0	10.3	12.7	11.0	11.2	100.0

¹ Intrastate trial ² malt barley trial

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare protein contents only to the check variety.

Table 10. Relative plump percent of malt barley varieties grown under irrigation at the Eastern Agricultural Research Center, Sidney, Montana.

Cultivar	2002	2003 ¹	2003 ²	2004	2005	2006	Ave	as % of Harrington
Conrad	--	--	--	--	95	89	92.0	105.1
Tradition	89	94	--	94	96	90	92.6	104.3
Hockett	--	92	--	97	95	87	92.8	104.2
Boulder	--	--	--	--	93	89	91.0	104.0
MT970229	--	--	--	--	91	90	90.5	103.4
Craft	--	94	93	95	92	86	92.0	102.4
Kendall	84	--	91	95	94	90	90.8	101.8
Metcalfe	89	--	88	95	94	87	90.6	101.6
Robust	92	--	91	90	95	85	90.6	101.6
Stellar	--	--	--	--	97	80	88.5	101.1
Drummond	92	--	93	94	94	78	90.2	101.1
Harrington	88	91	93	90	85	90	89.5	100.0
Haxby	--	92	--	96	91	76	88.8	99.7
Copeland	--	--	--	94	90	80	88.0	99.6
Legacy	93	91	91	87	97	71	88.3	98.7
Eslick	--	--	--	--	89	83	86.0	98.3
Merit	78	93	87	87	90	81	86.0	96.1
Xena	--	--	--	--	89	78	83.5	95.4
Calgary	--	--	--	--	83	84	83.5	95.4
Geraldine	--	85	89	--	84	79	84.3	93.9
Morex	84	--	88	86	92	65	83.0	93.0
Hays	--	--	--	--	78	57	67.5	77.1

¹ Intrastate trial ² malt barley trial

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare protein contents only to the check variety.

Table 11. Relative lodging indices of malt barley varieties grown under irrigation at the Eastern Agricultural Research Center, Sidney, Montana.

Cultivar	2002	2003 ¹	2003 ²	2004	2005	2006	Ave	as % of Harrington
Morex	4.2	--	5.7	2.7	1.3	4.3	3.6	151.7
Harrington	1.7	4.7	3.3	0.7	6.0	0.3	2.8	100.0
Hays	--	--	--	--	4.4	0.0	2.2	69.8
Metcalfe	1.0	--	3.7	0.0	0.3	0.0	1.0	41.7
Legacy	0.0	0.0	1.0	2.3	0.0	3.0	1.1	37.7
Copeland	--	--	--	0.0	1.3	1.3	0.9	37.1
Kendall	0.3	--	3.3	0.0	0.3	0.0	0.8	32.5
Robust	0.3	--	0.3	1.0	0.0	2.3	0.8	32.5
Merit	1.3	0.7	1.3	0.0	1.0	0.0	0.7	25.7
Haxby	--	2.3	--	0.0	0.0	0.3	0.7	22.2
Craft	--	0.0	1.3	0.0	1.3	0.7	0.7	22.0
Eslick	--	--	--	--	1.3	0.0	0.7	20.6
Tradition	--	0.3	--	1.3	0.0	0.0	0.4	13.7
Hockett	--	1.0	--	0.0	0.3	0.0	0.3	11.1
Stellar	--	--	--	--	0.0	0.7	0.4	11.1
Geraldine	--	0.3	0.3	--	0.7	0.0	0.3	9.1
Drummond	0.0	--	0.0	0.0	0.0	1.0	0.2	8.3
Conrad	--	--	--	--	0.3	0.0	0.2	4.8
Xena	--	--	--	--	0.0	0.0	0.0	0.0
Calgary	--	--	--	--	0.0	0.0	0.0	0.0
Boulder	--	--	--	--	0.0	0.0	0.0	0.0
MT970229	--	--	--	--	0.0	0.0	0.0	0.0

¹ Intrastate trial ² malt barley trial

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare protein contents only to the check variety.

Table 12. Agronomic data obtained from a malt barley yield trial grown under sprinkle irrigated conditions at the MSU Eastern Agricultural Research Center, Sidney, MT, in cooperation with breeders from NDSU.

Planted: May 4 Harvested: August 4

Entry	heading*	height, cm	lodging index	percent protein	plump	regular	test wt, lb/bu	yield, bu/ac
LACEY	46.7	83.5	1.3	12.43	70.0	25.0	49.8	112.2
TRADITION	46.7	82.0	0.3	11.74	76.0	20.0	49.2	111.7
ND20299	45.7	78.7	1.7	11.50	85.0	13.0	49.0	108.3
ND20666	48.0	79.5	0.3	12.84	73.0	23.0	47.7	106.4
DRUMMOND	46.0	84.0	1.0	13.09	64.0	32.0	47.7	105.9
ND21306	46.3	79.7	0.3	11.77	76.0	19.0	49.3	105.4
2ND21863	49.3	83.0	0.3	12.71	87.0	11.0	50.7	104.5
M109	46.0	82.3	1.0	11.88	71.0	26.0	49.3	104.0
LEGACY	48.7	84.7	2.3	11.76	59.0	34.0	47.2	103.5
6B99-6774	49.7	83.5	2.0	12.10	65.0	30.0	49.5	103.5
ROBUST	46.3	88.3	2.7	12.77	70.0	25.0	50.0	103.0
M122	46.7	84.3	2.0	12.68	65.0	29.0	49.2	103.0
STANDER	46.7	80.3	2.3	11.94	76.0	20.0	49.7	101.6
ND21300	45.7	81.0	1.7	12.07	63.0	32.0	48.0	101.6
ND21562	46.7	79.0	0.7	11.36	50.0	41.0	47.2	101.1
CONLON	45.0	80.0	3.3	13.03	87.0	10.0	51.3	100.6
ND20448	45.7	87.7	1.0	11.79	87.0	12.0	49.5	99.2
STELLAR-ND	46.7	82.5	1.7	11.91	78.0	19.0	46.5	99.1
ND21533	48.0	77.0	1.3	12.04	55.0	38.0	46.8	98.2
BOWMAN	45.7	80.0	4.0	13.64	85.0	13.0	51.3	95.3
ND20508	46.3	96.0	3.0	14.06	64.0	31.0	48.7	94.8
ND21532	47.3	76.7	1.7	11.77	48.0	45.0	45.7	93.8
MOREX	45.3	87.0	8.0	12.81	58.0	36.0	47.7	90.0
RAWSON	48.3	89.2	1.0	13.11	95.0	3.0	50.7	89.5
AC METCALFE	50.7	87.7	2.0	14.73	77.0	18.0	49.2	76.0
Average	47.0	83.1	1.9	12.46	71.4	24.2	48.8	100.5
Probability	<0.001	<0.001	<0.001	<0.001			<0.001	0.001
CV (S/MEAN)	1.2	3.9	63.7	3.6			1.5	8.0
CV (SE/MEAN)	0.7	2.2	36.8	2.1			0.8	4.6
LSD (0.05)	0.9	5.3	2.0	0.73	1 rep	1 rep	1.2	13.3

*days from planting

Table 13. Agronomic data obtained from a malt barley yield trial grown under flood irrigated conditions at the MSU Eastern Agricultural Research Center, Sidney, MT, in cooperation with breeders from NDSU.

Planted: May 4 Harvested: August 3

Entry	heading, days from planting	height, cm	lodging index	percent protein	Plump	Regular	test wt, lb/bu	yield, bu/ac
TRADITION	46.7	89.7	0.7	10.94	72.0	24.0	48.2	104.0
ND20299	46.3	81.3	1.7	10.35	85.0	13.0	48.2	98.7
DRUMMOND	46.3	91.3	3.0	11.29	79.0	18.0	46.7	95.3
ND21300	46.0	81.3	2.7	10.84	70.0	26.0	46.8	94.3
LACEY	47.0	85.3	4.3	11.75	46.0	47.0	47.8	93.9
M122	48.0	90.7	3.7	11.77	60.0	32.0	46.8	93.8
M109	46.7	80.7	2.7	11.06	80.0	18.0	48.3	93.4
STANDER	47.7	83.3	1.3	11.60	86.0	12.0	48.8	92.4
ND21562	47.3	82.0	2.7	10.75	56.0	37.0	46.3	91.4
ND20666	47.3	76.7	0.0	11.60	81.0	16.0	47.8	90.0
ND21306	47.0	82.0	2.0	11.57	70.0	26.0	47.2	89.0
LEGACY	49.7	89.3	3.7	10.31	69.0	28.0	45.8	88.0
CONLON	45.0	74.0	1.3	12.22	91.0	7.0	48.8	88.0
ND21532	48.3	78.0	2.7	11.18	54.0	40.0	44.3	87.1
ROBUST	47.0	90.3	4.0	12.26	38.0	50.0	47.2	86.6
RAWSON	49.0	84.7	0.0	12.06	96.0	3.0	49.8	86.1
ND20448	46.0	88.7	2.0	10.69	91.0	8.0	47.7	86.1
STELLAR-ND	46.7	88.0	5.0	12.12	57.0	36.0	44.5	86.1
MOREX	45.3	93.0	3.0	10.99	54.0	39.0	46.7	85.6
2ND21863	51.0	83.0	0.0	11.66	85.0	12.0	49.2	84.7
6B99-6774	49.3	89.7	2.3	11.21	65.0	29.0	47.8	84.2
ND21533	48.3	78.0	1.3	10.84	36.0	52.0	45.5	83.7
BOWMAN	48.0	80.0	0.0	12.27	92.0	7.0	51.0	81.3
ND20508	48.0	101.0	3.3	13.10	32.0	57.0	46.7	76.4
AC METCALFE	51.7	86.0	0.0	13.17	75.0	21.0	47.5	62.9
Average	47.6	85.1	2.1	11.50	68.8	26.3	47.4	88.1
Probability	<0.001	<0.001	<0.001	<0.001			<0.001	<0.001
CV (S/MEAN)	1.1	4.3	48.5	6.0			2.3	5.9
CV (SE/MEAN)	0.6	2.5	28.0	3.5			1.3	3.4
LSD (0.05)	0.9	6.0	1.7	1.14			1.8	8.6