

PROJECT TITLE: MALT BARLEY YIELD TRIAL – 2004

PROJECT LEADER:

Pat Hensleigh, MSU Dept Plant Sciences

PROJECT PERSONNEL:

Joyce Eckhoff, Eastern Ag Research Center, 1501 N Central Ave, Sidney, MT 59270

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

MATERIALS AND METHODS:

Dryland site:

Planted: April 8 Harvested: July 29

Soil type: Williams clay loam

Previous crops: 2003 - fallow, 2002 - safflower, 2001 - small grain plots

Residual soil N to 3 ft: 121 lb N/ac

Residual soil P to 6 in: 27 ppm

Residual soil K to 6 in: 282 ppm

Applied fertilizer: None

Herbicides: 2 pt/ac Bronate applied May 28

Precipitation April – August, 2004: 10.01 inches

Ave (56 yr) precipitation April – August: 9.44 inches

Precipitation September 2003 – August 2004: 13.50 inches

Ave (56 yr) precipitation September – August: 13.83 inches

Irrigated site:

Planted: April 21 Harvested: August 11

Previous crops: 2003 - safflower, 2002 - sugarbeets, 2001 – barley

Residual soil N to 3 ft: 80 lb N/ac

Residual soil P to 6 in: 27 ppm

Residual soil K to 6 in: 316 ppm

Applied fertilizer: 200 lb 18-46-0 applied October 28, 2003

Irrigated (sprinkler) on: May 4, May 17, Jun 21

Herbicides: 1.75 pt/ac Bronate applied Jun 8

Fungicide: 20 Oz/ac Tilt and 3 oz/ac Folicure applied Jun 24

Precipitation April – August, 2004: 6.45 inches

Ave (56 yr) precipitation April – August: 9.44 inches

Precipitation September 2003 – August 2004: 10.79 inches

Ave (56 yr) precipitation September – August: 13.83 inches

Comments:

Good soil moisture at planting, but winds from early March to the end of May dried the soil quickly. Grain planted into moisture did well, grain planted into dry soil did not emerge until irrigated. Summer was cooler than average.

RESULTS:

Statewide malt trial, dryland: Agronomic data from the dryland malt barley yield trial are shown in Table 1. No lines or varieties yielded significantly more than the check variety, Harrington. One variety yielded significantly less than Harrington. Five-year summaries for yield, test weight, protein contents and percent plump seed are shown in Tables 2-5.

Statewide malt trial, irrigated: Agronomic data from the irrigated malt barley yield trial are shown in Table 6. Four varieties yielded significantly more than the check variety, Harrington. One experimental line yielded significantly less than Harrington. Five-year summaries of yield, test weight, protein contents, percent plump, and lodging indices are shown in Tables 7-11.

North Dakota State University malt trial: Agronomic data from the sprinkle irrigated malt barley yield trial grown in cooperation with breeders from NDSU are shown in Table 12 and agronomic data from the flood irrigated malt barley yield trial grown in cooperation with breeders from NDSU are shown in Table 13. Nine lines and varieties yielded significantly more than the check variety, Morex, under sprinkler irrigation and nine lines and varieties yielded significantly more than the check variety, Morex, under flood irrigation.

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 under these conditions. 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

Line or variety	heading*	height, cm	grain protein content	test weight, lb/bu	plump %	regular %	yield, bu/ac
Haxby	73.7	78.3	12.67	52.8	91.0	8.0	111.4
Excel	68.3	80.7	11.24	49.3	78.0	21.0	109.1
MT981210	75.7	82.0	13.28	51.3	93.0	6.0	108.4
Gallatin	71.0	76.3	12.88	52.2	89.0	10.0	108.1
MT910189	71.0	76.3	11.62	51.0	95.0	4.0	107.8
Legacy	69.7	81.0	11.57	48.7	80.0	19.0	107.5
Baronesse	75.0	69.7	12.46	50.0	88.0	11.0	106.1
Kendall	76.0	79.0	12.30	49.8	94.0	5.0	105.2
Harrington	75.0	79.7	11.97	50.0	91.0	9.0	104.9
MT970116	72.7	84.7	13.08	51.7	94.0	6.0	104.0
Metcalfe	73.0	76.7	12.47	50.0	92.0	7.0	103.8
Tradition	73.0	84.0	12.63	49.7	89.0	10.0	103.0
Lacey	68.3	77.7	11.46	50.2	85.0	14.0	103.0
Morex	69.0	92.7	12.79	49.3	80.0	18.0	101.7
Drummond	71.0	83.0	12.38	50.0	86.0	13.0	101.4
Stander	71.0	78.7	11.83	49.3	89.0	10.0	101.2
Copeland	75.3	80.3	12.03	48.5	94.0	6.0	100.6
Conlon	65.7	82.3	12.88	52.0	98.0	2.0	100.4
Foster	67.3	82.0	11.43	48.8	89.0	11.0	100.0
MT981238	70.0	72.3	12.47	51.5	95.0	5.0	99.1
Robust	70.3	91.0	12.45	50.0	84.0	15.0	98.9
Coors 37	78.3	65.7	12.52	50.5	97.0	3.0	98.7
Merit	76.0	72.0	11.94	45.8	88.0	11.0	98.2
BA1202	75.3	75.0	13.03	48.2	95.0	5.0	96.2 x
Average	72.2	79.2	12.31	50.0			103.3
Probability	<0.001	<0.001	0.056	<0.001			0.022
CV (S/Mean) %	1.7	5.9	6.1	1.6			4.8
CV (SE/Mean)%	1.0	3.4	3.5	0.9			2.8
LSD (0.05 by t)	2.0	7.7	1.243	1.3			8.1

* days from planting

x indicates significantly lower yield than check variety, Harrington.

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

Variety	2000	2001	2002	2003 ¹	2003 ²	2004	Ave	as % of Harrington
MT981210	--	--	--	91.4	82.9	108.4	94.2	113.1
Haxby	--	--	--	85.3	--	111.4	98.4	111.1
Baronesse	97.4	69.2	62.5	85.4	74.9	106.1	82.6	111.0
MT910189	--	--	--	87.1	--	107.8	97.5	110.1
Excel	--	70.2	60.2	--	79.8	109.1	79.8	110.0
Tradition	--	63.4	53.2	91.9	--	103.0	77.9	107.5
MT970116	82.1	69.8	57.9	89.3	76.6	104.0	80.0	107.5
Gallatin	86.5	61.4	55.1	89.3	73.8	108.1	79.0	106.3
MT981238	--	--	--	88.3	76.7	99.1	88.0	105.6
Conlon	--	62.5	62.2	80.2	75.5	100.4	76.2	105.0
Kendall	--	--	56.5	--	76.5	105.2	79.4	104.0
Metcalfe	--	--	59.6	--	72.7	103.8	78.7	103.1
Coors 37	--	--	58.6	--	73.6	98.7	77.0	100.8
Harrington	83.6	61.3	51.3	72.2	72.9	104.9	74.4	100.0
Drummond	--	--	57.7	--	68.8	101.4	76.0	99.5
Legacy	--	55.4	47.1	78.6	70.9	107.5	71.9	99.1
Foster	--	62.2	57.1	--	65.0	100.0	71.1	97.9
BA 1202	--	--	57.6	--	69.5	96.2	74.4	97.5
Stander	--	--	51.0	--	70.8	101.2	74.3	97.3
Robust	--	58.9	57.3	--	66.3	98.9	70.4	96.9
Lacey	--	--	--	--	68.5	103.0	85.8	96.5
Merit	82.7	59.4	51.1	77.7	61.0	98.2	71.7	96.4
Copeland	--	--	--	--	--	100.6	100.6	95.9
Morex	70.3	44.4	62.6	--	62.3	101.7	68.3	91.3

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	2000	2001	2002	2003 ¹	2003 ²	2004	Ave	as % of Harrington
MT981238	--	--	--	51.8	52.2	51.5	51.8	108.4
Haxby	--	--	--	52.3	--	52.8	52.6	108.0
MT981210	--	--	--	51.7	50.5	51.3	51.2	107.0
MT970116	53.0	48.7	49.5	51.5	51.3	51.7	51.0	106.7
Conlon	--	48.0	46.2	52.3	52.2	52.0	50.1	106.3
Lacey	--	--	--	--	51.2	50.2	50.7	105.4
Gallatin	52.5	47.8	47.3	51.2	50.3	52.2	50.2	105.1
MT910189	--	--	--	50.8	--	51.0	50.9	104.6
Drummond	--	--	47.0	--	50.3	50.0	49.1	104.1
Stander	--	--	47.0	--	50.5	49.3	48.9	103.7
Metcalf	--	--	47.0	--	48.2	50.0	48.4	102.6
Baronesse	51.5	48.7	47.5	48.3	48.0	50.0	49.0	102.6
Coors 37	--	--	46.5	--	48.0	50.5	48.3	102.5
Robust	--	45.1	45.8	--	51.0	50.0	48.0	101.8
Tradition	--	45.5	47.3	49.5	--	49.7	48.0	101.3
Legacy	--	45.2	46.7	47.7	48.5	48.7	47.4	100.4
Kendall	--	--	44.3	--	48.0	49.8	47.4	100.4
Harrington	50.8	47.0	45.3	47.3	46.2	50.0	47.8	100.0
Foster	--	45.2	45.3	--	49.2	48.8	47.1	100.0
Excel	--	45.2	44.8	--	48.7	49.3	47.0	99.7
Morex	47.5	45.2	46.3	--	48.8	49.3	47.4	99.1
BA 1202	--	--	44.0	--	45.7	48.2	46.0	97.5
Copeland	--	--	--	--	--	48.5	48.5	97.0
Merit	50.5	45.8	44.3	46.7	44.0	45.8	46.2	96.7

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	2000	2001	2002	2003 ¹	2003 ²	2004	Ave	as % of Harrington
MT981210	--	--	--	12.2	12.9	13.3	12.8	108.8
Coors 37	--	--	13.3	--	13.6	12.5	13.1	108.2
Gallatin	10.7	11.6	13.2	12.0	13.4	12.9	12.3	108.2
Conlon	--	10.4	14.3	11.7	13.5	12.9	12.6	107.9
MT981238	--	--	--	12.8	12.7	12.5	12.7	107.6
MT970116	10.4	10.6	12.8	12.6	13.3	13.1	12.1	106.7
Metcalfe	--	--	12.6	--	13.3	12.5	12.8	105.5
BA 1202	--	--	13.1	--	12.2	13.0	12.8	105.2
Kendall	--	--	13.8	--	12.0	12.3	12.7	104.7
Haxby	--	--	--	11.5	--	12.7	12.1	104.3
Baronesse	9.8	10.7	12.5	12.6	12.9	12.5	11.8	104.1
Morex	10.1	11.4	12.6	--	12.3	12.8	11.8	103.9
Merit	11.2	10.9	12.8	11.7	12.3	11.9	11.8	103.8
Robust	--	10.4	12.5	--	12.4	12.4	11.9	101.5
Tradition	--	10.2	11.6	12.0	--	12.6	11.6	100.7
Harrington	10.0	10.6	12.3	11.2	12.1	12.0	11.4	100.0
MT910189	--	--	--	11.6	--	11.6	11.6	100.0
Copeland	--	--	--	--	--	12.0	12.0	100.0
Legacy	--	11.0	12.2	11.7	11.2	11.6	11.5	99.1
Drummond	--	--	11.3	--	12.3	12.4	12.0	98.9
Stander	--	--	11.3	--	12.6	11.8	11.9	98.1
Excel	--	10.4	11.7	--	12.2	11.2	11.4	96.8
Lacey	--	--	--	--	11.3	11.5	11.4	94.6
Foster	--	9.8	11.5	--	10.8	11.4	10.9	92.6

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	2000	2001	2002	2003 ¹	2003 ²	2004	Ave	as % of Harrington
Lacey	--	--	--	--	70	85	77.5	118.3
MT981238	--	--	--	79	70	95	81.3	116.7
Stander	--	--	85	--	59	89	77.7	115.3
MT981210	--	--	--	78	68	93	79.7	114.4
Drummond	--	--	65	--	74	86	75.0	111.4
MT970116	91	91	82	72	73	94	83.8	110.3
Conlon	--	92	33	94	81	98	79.6	109.6
Robust	--	79	67	--	77	84	76.8	107.7
Kendall	--	--	62	--	58	94	71.3	105.9
Foster	--	82	52	--	78	89	75.3	105.6
Copeland	--	--	--	--	--	94	94.0	103.3
Tradition	--	97	69	70	--	89	81.3	100.6
Harrington	93	83	71	78	40	91	76.0	100.0
MT910189	--	--	--	73	--	95	84.0	99.4
Metcalfe	--	--	66	--	42	92	66.7	99.0
Legacy	--	83	74	57	56	80	70.0	96.4
Merit	89	80	69	73	40	88	73.2	96.3
Excel	--	72	59	--	51	78	65.0	91.2
Haxby	--	--	--	63	--	91	77.0	91.1
BA 1202	--	--	63	--	26	95	61.3	91.1
Morex	86	76	42	--	57	80	68.2	90.2
Gallatin	86	76	63	60	31	89	67.5	88.8
Baronesse	94	82	63	36	23	88	64.3	84.6
Coors 37	--	--	5	--	33	97	45.0	66.8

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

Entry	heading*	height, cm	lodging index	grain protein content	test weight, lb/bu	plump %	regular %	yield, bu/ac	
Legacy	65.3	91.0	2.3	10.57	48.0	87.0	12.0	151.2	a
Foster	65.7	94.7	0.3	10.97	47.7	94.0	6.0	145.6	a
Haxby	67.7	87.0	0.0	11.71	53.7	96.0	3.0	144.4	a
Tradition	67.7	98.0	1.3	11.55	48.8	94.0	5.0	141.8	a
Excel	65.0	87.7	2.7	10.35	47.7	88.0	12.0	139.6	
Merit	70.0	88.3	0.0	10.93	49.0	87.0	11.0	139.4	
Lacey	66.3	97.0	0.3	11.49	50.0	92.0	7.0	138.8	
Baronesse	70.3	78.3	0.0	10.99	51.0	90.0	9.0	138.4	
Drummond	65.7	98.0	0.0	11.54	48.8	94.0	6.0	138.2	
MT981210	67.7	81.3	0.0	11.97	52.0	94.0	5.0	129.0	
MT970116	68.7	99.0	0.0	11.98	52.5	95.0	4.0	128.1	
MT910189	65.0	81.7	0.0	10.59	52.0	97.0	3.0	127.9	
Stander	67.0	89.3	0.0	10.59	49.2	94.0	5.0	127.9	
Morex	65.7	100.0	2.7	12.43	48.0	86.0	13.0	127.5	
Robust	66.3	101.3	1.0	11.44	49.7	90.0	10.0	127.4	
Harrington	68.3	87.3	0.7	10.32	49.0	90.0	8.0	127.3	
Copeland	70.0	98.3	0.0	11.08	49.2	94.0	5.0	126.9	
Coors 37	70.3	72.7	0.0	11.57	50.7	88.0	11.0	126.2	
Kendall	69.0	84.7	0.0	12.02	50.7	95.0	5.0	125.6	
Gallatin	68.3	83.7	0.0	11.49	52.2	91.0	7.0	125.1	
BA1202	69.3	85.7	0.0	11.12	49.2	94.0	5.0	124.8	
Conlon	59.3	85.3	0.0	12.22	51.8	97.0	3.0	123.2	
Prestige	68.7	82.0	0.0	9.76	51.3	94.0	5.0	122.8	
Metcalf	67.3	93.3	0.0	10.91	51.3	95.0	5.0	122.2	
Scarlett	71.7	71.3	0.0	9.96	50.0	96.0	3.0	120.7	
Barke	70.7	77.3	0.0	10.24	50.3	94.0	6.0	113.9	
MT981238	66.0	88.3	0.0	11.03	52.5	93.0	5.0	108.0	x
Average	67.52	88.25	0.4198	11.14	50.23	92.6	6.6	130.1	
Probability	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	
CV (S/Mean) %	2.5	7.3	152.8	5.8	1.5			6.5	
CV (SE/Mean)%	1.4	4.2	88.2	3.3	0.9			3.8	
LSD (0.05 by t)	2.7	10.5	1.1	1.05	1.3			13.8	

*days from planting

a indicates significantly greater yield than check variety, Harrington.

x indicates significantly lower yield than check variety, Harrington.

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

Cultivar	2000	2001	2002	2003 ¹	2003 ²	2004	Ave	as % of Harrington
Legacy	130.5	92.8	94.2	130.4	142.3	151.2	123.6	120.7
Excel	136.3	86.7	90.0	--	140.4	139.6	118.6	119.7
Lacey	--	96.6	--	--	136.6	138.8	124.0	119.2
Foster	122.9	91.8	89.6	--	130.7	145.6	116.1	117.2
Stander	130.1	97.1	87.7	--	133.9	127.9	115.3	116.4
Tradition	--	90.5	89.0	131.0	--	141.8	113.1	115.9
Baronesse	116.5	82.4	86.0	137.3	144.2	138.4	117.5	114.8
Drummond	--	--	98.1	--	130.2	138.2	122.2	111.6
Haxby	--	--	--	128.3	--	144.4	136.4	110.9
Robust	127.1	80.7	87.3	--	119.5	127.4	108.4	109.4
MT970116	--	--	--	137.0	131.1	128.1	132.1	108.0
Morex	113.3	75.2	88.2	--	123.4	127.5	105.5	106.5
Merit	118.2	72.5	77.2	121.6	122.9	139.4	108.6	106.1
Coors 37	111.2	76.5	82.1	--	129.4	126.2	105.1	106.0
MT981210	--	--	--	122.3	131.6	129.0	127.6	104.4
Conlon	--	83.5	87.2	116.6	120.5	123.2	106.2	103.9
Kendall	--	79.5	80.0	--	118.5	125.6	100.9	102.8
Gallatin	111.5	74.0	75.5	119.5	119.0	125.1	104.1	101.7
MT910189	--	--	--	121.6	--	127.9	124.8	101.5
BA1202	106.1	71.0	72.3	--	128.1	124.8	100.5	101.4
Harrington	103.1	64.0	80.4	118.6	120.8	127.3	102.4	100.0
Copeland	--	--	--	--	--	126.9	126.9	99.7
Metcalf	--	--	78.8	--	117.5	122.2	106.2	97.0
Prestige	--	--	--	--	--	122.8	122.8	96.5
Scarlett	--	--	--	--	--	120.7	120.7	94.8
MT981238	--	--	--	116.8	116.3	108.0	113.7	93.0
Barke	--	--	--	--	--	113.9	113.9	89.5

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 Ag Research Center, Sidney, Montana.

Cultivar	2000	2001	2002	2003 ¹	2003 ²	2004	Ave	as % of Harrington
Haxby	--	--	--	52.8	--	53.7	53.3	107.9
MT970116	--	--	--	53.0	52.8	52.5	52.8	106.3
Conlon	--	43.3	48.3	52.8	52.0	51.8	49.6	105.5
MT981238	--	--	--	52.2	52.0	52.5	52.2	105.2
Prestige	--	--	--	--	--	51.3	51.3	104.7
Gallatin	50.7	44.3	47.7	52.0	51.3	52.0	49.7	104.7
MT910189	--	--	--	51.3	--	52.0	51.7	104.7
Baronesse	51.7	43.8	47.2	52.0	51.7	51.0	49.6	104.5
MT981210	--	--	--	51.8	51.7	52.0	51.8	104.4
Lacey	--	43.5	--	--	50.7	50.0	48.1	103.4
Kendall	--	43.9	46.0	--	50.0	50.7	47.7	102.7
Coors 37	49.2	43.2	48.3	--	50.0	50.7	48.3	102.7
Barke	--	--	--	--	--	50.3	50.3	102.7
Scarlett	--	--	--	--	--	50.0	50.0	102.0
Robust	47.8	42.5	48.2	--	50.2	49.7	47.7	101.4
Metcalfe	--	--	47.0	--	49.0	51.3	49.1	101.4
Tradition	--	41.6	46.3	50.0	--	48.8	46.7	100.9
Copeland	--	--	--	--	--	49.2	49.2	100.4
Harrington	49.5	40.3	46.0	49.7	50.2	49.0	47.5	100.0
BA1202	--	41.0	44.5	--	49.7	49.2	46.1	99.4
Foster	46.7	43.4	46.3	--	49.3	47.7	46.7	99.3
Stander	46.2	42.0	46.7	--	49.2	49.2	46.7	99.3
Drummond	--	--	46.7	--	48.3	48.8	47.9	99.0
Merit	48.2	41.3	43.8	49.2	49.5	49.0	46.8	98.7
Legacy	46.7	41.8	45.8	48.2	48.5	48.0	46.5	98.0
Excel	46.5	40.2	46.7	--	48.0	47.7	45.8	97.5
Morex	45.7	41.3	45.0	--	48.5	48.0	45.7	97.2

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 Ag Research Center, Sidney, Montana.

Cultivar	2000	2001	2002	2003 ¹	2003 ²	2004	Ave	as % of Harrington
Haxby	--	--	--	11.8	--	11.7	11.8	114.1
MT981210	--	--	--	11.6	12.1	12.0	11.9	113.0
MT970116	--	--	--	11.3	12.1	12.0	11.8	112.0
Kendall	--	12.6	12.6	--	11.8	12.0	12.3	109.1
MT981238	--	--	--	11.5	11.8	11.0	11.4	108.5
Copeland	--	--	--	--	--	11.1	11.1	107.8
Drummond	--	--	12.6	--	11.2	11.5	11.8	107.3
Morex	10.9	11.7	12.7	--	11.1	12.4	11.8	107.1
Conlon	--	11.1	11.7	11.9	12.2	12.2	11.8	107.1
Metcalfe	--	--	12.7	--	11.5	10.9	11.7	106.7
Robust	10.9	12.4	12.2	--	11.2	11.4	11.6	105.8
Gallatin	10.4	11.9	12.6	10.8	11.8	11.5	11.5	105.8
Coors 37	10.8	11.7	12.6	--	11.3	11.6	11.6	105.6
Stander	11.4	12.4	12.9	--	10.3	10.6	11.5	104.9
Merit	12.1	12.1	11.7	10.2	11.3	10.9	11.4	104.8
MT910189	--	--	--	10.7	--	10.6	10.7	103.4
Foster	11.0	11.3	12.1	--	10.7	11.0	11.2	102.2
Tradition	--	10.6	12.3	10.5	--	11.6	11.3	101.8
Baronesse	10.2	12.1	12.0	10.4	10.6	11.0	11.1	101.7
BA1202	--	11.6	11.7	--	11.1	11.1	11.4	101.3
Legacy	10.9	12.5	11.7	10.0	10.0	10.6	11.0	100.8
Harrington	10.0	12.0	11.6	10.3	11.0	10.3	10.9	100.0
Lacey	--	11.2	--	--	10.6	11.5	11.1	100.0
Barke	--	--	--	--	--	10.2	10.2	99.0
Excel	10.3	11.9	10.8	--	10.9	10.4	10.9	98.9
Scarlett	--	--	--	--	--	10.0	10.0	97.1
Prestige	--	--	--	--	--	9.8	9.8	95.1

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

Cultivar	2000	2001	2002	2003 ¹	2003 ²	2004	Ave	as % of Harrington
Scarlett	--	--	--	--	--	96	96.0	106.7
Conlon	--	69	91	97	96	97	90.0	104.7
Copeland	--	--	--	--	--	94	94.0	104.4
Prestige	--	--	--	--	--	94	94.0	104.4
Barke	--	--	--	--	--	94	94.0	104.4
MT910189	--	--	--	92	--	97	94.5	104.4
BA1202	--	86	80	--	93	94	88.3	104.1
Haxby	--	--	--	92	--	96	94.0	103.9
Foster	--	69	94	--	95	94	88.0	103.8
Kendall	--	82	84	--	91	95	88.0	103.8
Coors 37	79	81	96	--	93	88	87.4	103.8
Drummond	--	--	92	--	93	94	93.0	103.0
MT970116	--	--	--	94	93	95	94.0	102.9
Baronesse	88	77	93	85	90	90	87.2	102.1
MT981210	--	--	--	94	91	94	93.0	101.8
Tradition	--	65	89	94	--	94	85.5	101.5
Merit	81	92	78	93	87	87	86.3	101.2
MT981238	--	--	--	92	91	93	92.0	100.7
Stander	--	64	92	--	91	94	85.3	100.6
Metcalfe	--	--	89	--	88	95	90.7	100.4
Harrington	82	68	88	91	93	90	85.3	100.0
Lacey	--	64	--	--	94	92	83.3	99.6
Robust	--	64	92	--	91	90	84.3	99.4
Legacy	--	65	93	91	91	87	85.4	99.3
Gallatin	76	72	87	86	89	91	83.5	97.9
Excel	--	62	86	--	86	88	80.5	95.0
Morex	77	51	84	--	88	86	77.2	91.7

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 Ag Research Center, Sidney, Montana.

Cultivar	2000	2001	2002	2003 ¹	2003 ²	2004	Ave	as % of Harrington
Morex	1.3	6.7	4.2	--	5.7	2.7	4.1	321.9
Excel	0.0	7.5	0.7	--	1.0	2.7	2.4	185.9
Stander	0.0	4.3	7.0	--	0.3	0.0	2.3	181.3
Kendall	--	5.2	0.3	--	3.3	0.0	2.2	154.4
BA1202	0.0	6.0	1.3	--	1.7	0.0	1.8	140.6
Robust	0.3	6.0	0.3	--	0.3	1.0	1.6	123.4
Tradition	--	5.0	--	0.3	--	1.3	2.2	122.2
Gallatin	0.0	5.3	1.0	3.0	3.0	0.0	2.1	110.8
Lacey	--	4.0	--	--	0.0	0.3	1.4	107.5
Harrington	0.7		1.7	4.7	3.3	0.7	2.2	100.0
Foster	0.0	4.5	1.3	--	0.0	0.3	1.2	95.3
Merit	0.3	6.3	1.3	0.7	1.3	0.0	1.7	89.2
Legacy	0.0	6.2	0.0	0.0	1.0	2.3	1.6	85.6
Metcalfe	--	--	1.0	--	3.7	0.0	1.6	82.5
MT981210	--	--	--	4.7	2.3	0.0	2.3	80.5
Conlon	--	5.5	2.0	0.0	0.0	0.0	1.5	72.1
Coors 37	0.0	3.0	0.7	--	0.3	0.0	0.8	62.5
Baronesse	0.0	5.3	0.3	0.3	1.0	0.0	1.2	62.2
Haxby	--	--	--	2.3	--	0.0	1.2	42.6
MT910189	--	--	--	1.0	--	0.0	0.5	18.5
MT970116	--	--	--	0.0	1.3	0.0	0.4	14.9
MT981238	--	--	--	0.3	0.3	0.0	0.2	6.9
Drummond	--	--	0.0	--	0.0	0.0	0.0	0.0
Copeland	--	--	--	--	--	0.0	0.0	0.0
Prestige	--	--	--	--	--	0.0	0.0	0.0
Scarlett	--	--	--	--	--	0.0	0.0	0.0
Barke	--	--	--	--	--	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.

Line or variety	Heading*	Height, cm	Grain protein	Percent plump	Percent regular	Test wt, lb/bu	Yield, bu/ac	
6B98-9170	66.0	112.7	12.49	95.0	4.3	49.5	161.0	a
Lacey	64.7	109.0	13.43	94.0	5.7	51.0	155.1	a
ND16301	65.0	110.7	12.83	95.0	4.3	48.0	152.1	a
M109	65.3	102.0	13.03	86.3	12.3	48.8	151.3	a
Stander	67.3	105.0	12.52	85.7	12.3	48.7	149.0	a
ND19669	64.0	106.3	12.90	83.7	13.0	48.2	138.3	a
Tradition	68.0	109.7	13.26	81.3	14.7	46.7	136.1	a
Drummond	66.7	111.3	13.75	80.7	15.3	47.2	132.4	a
Foster	64.3	110.0	13.30	90.3	8.7	47.7	131.5	a
Legacy	69.0	111.7	14.38	73.0	20.7	46.3	129.8	
ND19742	69.7	104.7	11.60	82.7	12.0	47.3	128.8	
ND19620	68.3	112.3	13.58	81.7	14.7	48.5	128.8	
ND19552	66.7	108.3	13.33	93.7	5.3	49.7	128.6	
ND18579	67.3	107.7	13.76	84.0	12.7	47.2	128.1	
Robust	65.3	109.0	14.15	86.7	12.0	49.7	127.7	
ND19360	69.0	113.0	14.10	72.7	19.7	45.7	127.7	
Conlon	62.3	97.0	13.27	96.7	3.0	52.2	126.9	
ND19728	66.3	110.3	12.86	82.7	14.0	46.7	125.0	
ND19655	70.3	118.0	13.54	82.3	13.3	48.8	124.6	
ND19400	68.7	109.7	14.46	78.3	16.3	45.7	119.9	
ND17711	68.0	113.7	14.10	77.7	17.3	47.2	115.8	
Bowman	62.3	97.7	13.58	91.7	7.3	51.2	115.1	
Morex	64.3	118.0	14.36	76.7	19.3	46.0	113.4	
ND19474	66.3	107.7	13.28	80.3	15.7	48.2	111.9	
ND19119	63.0	99.0	12.47	94.0	5.0	48.5	111.0	
Average	66.3	108.6	13.37	85.1	12.0	48.2	130.8	
Probability	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
CV (S/Mean) %	1.2	2.9	4.4	4.6	21.3	2.1	7.9	
LSD (0.05)	1.3	5.3	1.0	6.5	4.2	1.7	16.9	

*days from planting

a indicates significantly greater yield than check variety, Morex

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.

Line or variety	Heading*	Height, cm	Grain protein	Percent plump	Percent regular	Test wt, lb/bu	Yield, bu/ac	
M109	63.7	86.0	11.31	96.3	3.3	48.2	150.4	a
Legacy	67.7	96.7	11.44	95.0	4.3	47.5	137.4	a
ND19669	64.3	88.3	10.61	96.7	3.0	48.0	135.1	a
ND19620	66.3	98.3	10.47	97.0	2.7	48.3	135.1	a
Stander	65.3	93.7	10.97	95.7	3.7	48.3	134.3	a
Drummond	66.0	99.0	11.28	96.0	3.3	47.0	133.3	a
Lacey	65.3	92.7	11.41	97.0	2.7	48.3	132.9	a
Foster	65.3	91.3	11.09	98.0	2.0	47.2	132.7	a
ND19728	64.0	99.7	10.54	97.0	2.7	47.7	130.6	a
ND19742	67.0	90.7	11.16	97.3	2.7	47.8	129.0	
Robust	65.0	97.3	11.43	95.0	4.3	48.2	127.9	
ND19474	66.3	93.3	10.86	97.0	2.7	47.5	127.6	
ND18579	67.3	97.3	11.65	97.3	2.7	47.2	127.3	
6B98-9170	65.3	92.0	10.87	97.3	2.3	47.3	125.8	
ND19400	67.0	100.3	11.66	96.7	2.0	47.3	125.3	
ND16301	68.0	95.3	11.06	98.0	2.0	46.7	125.0	
ND19360	66.3	102.0	11.14	96.7	3.0	47.2	124.9	
Tradition	66.3	99.0	11.48	97.0	2.7	48.3	120.2	
ND19552	66.3	101.3	10.64	98.0	1.7	47.7	118.5	
ND17711	67.0	98.3	10.83	96.0	4.0	46.2	115.9	
ND19119	64.7	87.3	11.43	98.7	1.3	48.3	113.5	
Morex	63.0	101.3	11.14	94.0	5.3	47.5	113.5	
Conlon	63.0	85.0	11.31	98.7	1.0	51.0	111.3	
ND19655	67.3	100.7	11.20	96.3	3.3	47.7	111.2	
Bowman	63.3	81.7	11.03	96.3	2.7	51.0	107.3	
Average	65.7	94.8	11.12	96.8	2.9	47.9	125.8	
Probability	<0.001	<0.001	0.942	<0.001	<0.001	<0.001	<0.001	
CV (S/Mean) %	2.2	4.2	7.0	0.7	19.7	0.9	7.8	
LSD (0.05)	2.4	6.6	ns	1.0	0.9	0.7	16.0	

*days from planting

a indicates significantly greater yield than check variety, Morex