PROJECT TITLE: Evaluation of spring wheat, durum, barley, and oat varieties under minimum-till, continuous cropping conditions – 2003

PROJECT LEADER:
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OBJECTIVE: To determine the best adapted varieties of spring wheat, durum, and barley for production under no-till continuous cropping conditions in eastern Montana.

MATERIALS AND METHODS: All trials were replicated three times. Plots were 20 feet long and seven rows wide, with eight inches between rows. At harvest, all rows were harvested with a plot combine and tested for yield, test weight, and protein contents.

Planting dates in 2002 were

Crop	Planting date	Harvest date	Plot size
Spring wheat	Apr 18	Jul 30	100 ft^2, entire plot harvested.
Durum	Apr 18	Jul 30	100 ft^2, entire plot harvested.
Barley	Apr 18	Jul 30	100 ft^2, entire plot harvested.

Soil type: Williams clay loam
Previous crops: 2002 - spring wheat, 2001 - safflower, 2000 - small grain plots
Residual soil N to 3 ft: 112.1 lb N/ac
Residual soil P to 12 in: 28 ppm
Residual soil K to 12 in: 225 ppm
Residual soil S to 12 in: 9 lb/ac
Applied fertilizer: 30 lb N/acre as granular 46-0-0 applied at planting
Herbicides: 1.0 pt/ac Roundup applied April 17, 2.5 pt/ac Hoelon and 0.125 pt/ac MCP ester applied 28 May

Precipitation April – August, 2003: 10.44 inches
Ave (55 yr) precipitation April – August: 9.50 inches
Precipitation September 2002 – August 2003: 15.04 inches
Ave (55 yr) precipitation September – August: 13.88 inches

Comments:
Very good rainfall in March through June resulted in good growth. Very hot temperatures occurred in July and August, but yields and quality were still very good because of good moisture through bloom and the early part of grain fill.

RESULTS:
Spring wheat: Twenty lines and varieties of spring wheat were tested under dryland recrop conditions (Table 1). Outlook and Reeder yielded significantly more than the check variety, McNeal. Ernest and Ember yielded significantly less. Average yield was 32.3 bu/acre. Five-year summaries for yield, test weight, height, and protein content are shown in Tables 2 through 5.

Durum: Sixteen durum varieties were tested under dryland recrop conditions (Table 6). No varieties yielded significantly more or less than the check variety, Mountrail. Average yield was 30.9 bu/acre. Five-year summaries for yield, test weight, height, and protein content are shown in Tables 7 through 10.

Barley: Sixteen barley lines and varieties were tested under dryland recrop conditions (Table 11). Harrington yielded significantly less than the check variety, Gallatin. None yielded significantly more. Average yield was 48.4 bu/acre. Five-year summaries for yield, test weight, height, and protein content are shown in Tables 12 through 15.

SUMMARY: The experiments reported under this project are all of the replicated small plot type. The three-year crop rotation is commercial small grain, small grain yield trials, safflower. Bromoxynil at a rate of 1.5 pt/acre is used for broadleaf weed control in the small grain, and trifluralin at a rate of 1.5 pt/acre is used in the safflower. This weed control and crop rotation have been effective in controlling weeds in the yield trial plots, but volunteer small grain has been a problem in some years, although not a severe problem in 2002.

FUTURE PLANS: New varieties will continue to be tested under continuous cropping conditions to identify those which will perform best under these conditions. Closer cooperation with the Williston Research Center 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 under continuous cropping conditions.

Table 1. Agronomic data obtained from a dryland recrop spring wheat yield trial conducted at the Eastern Agricultural Research Center, Sidney, MT, 2003.
Planting date: 18 April 2003 Harvest date: 30 July 2003

entry	heading, days from planting	height, cm	protein content	test wt, lb/bu	yield, bu/ac
Outlook	62.7	77.0	16.13	56.8	37.7a
Reeder	61.0	71.0	17.64	59.0	35.2a
Express	60.0	67.0	16.41	56.7	35.1
Scholar	61.7	88.0	17.22	59.5	34.0
Hank	58.3	70.7	16.83	56.0	33.6
McKenzie	60.7	81.0	16.92	58.3	33.1
ND741	61.7	83.0	16.35	57.5	32.7
Amidon	62.0	84.0	16.72	59.2	32.5
Explorer*	58.7	74.7	16.89	58.2	32.4
Granite	63.0	71.7	18.43	61.3	32.4
McNeal	62.0	77.7	16.75	56.3	32.0
Barrie	61.3	77.7	18.02	58.7	32.0
Conan	60.7	69.7	16.09	59.5	31.8
Parshall	62.0	81.3	18.37	58.8	31.5
Laser	58.3	82.3	18.22	56.7	31.4
Choteau	61.3	70.3	16.44	58.7	31.1
Gunner	63.0	79.7	18.05	59.2	30.9
MT9918	60.0	78.3	17.51	58.0	29.9
Ernest	61.7	83.3	18.47	59.0	28.6x
Ember	59.3	77.0	18.05	59.7	28.4x
mean	61.0	77.3	17.28	58.4	32.3
Probability	<0.001	<0.001	<0.001	<0.001	<0.001
CV (S/mean)	1.1	4.5	4.1	0.9	5.7
CV (SE/mean)	0.7	2.6	2.3	0.5	3.3
LSD 0.05	1.1	5.7	1.16	0.8	3.1

Check variety is McNeal with an average yield of 32.0 bu/acre.
a indicates significantly greater yield than check variety, McNeal
x indicates significantly lower yield than check variety, McNeal
* hard white wheat

Table 2. Relative yields of spring wheat varieties as compared to McNeal when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of McNeal
Outlook	--	--	53.8	19.0	37.7	36.8	115.5
Reeder	53.3	17.0	55.6	20.7	35.2	36.4	114.7
Scholar	49.8	15.8	52.2	19.0	34.0	34.2	107.8
Parshall	54.6	16.0	50.6	16.8	31.5	33.9	106.9
Express	--	--	48.2	18.8	35.1	34.0	106.7
Amidon	50.1	15.8	47.1	18.0	32.5	32.7	103.2
ND741	--	--	--	--	32.7	32.7	102.2
Granite	--	--	--	--	32.4	32.4	101.3
Gunner	--	--	50.2	14.8	30.9	32.0	100.2
McNeal	47.2	15.6	45.0	18.7	32.0	31.7	100.0
Conan	48.2	16.5	43.2	18.6	31.8	31.7	99.9
Choteau	--	--	47.3	16.7	31.1	31.7	99.4
Hank	--	--	--	16.5	33.6	25.1	98.8
Laser	--	--	--	--	31.4	31.4	98.1
Ernest	50.5	15.8	43.4	16.4	28.6	30.9	97.6
McKenzie	--	--	--	15.1	33.1	24.1	95.1
AC Barrie	--	--	--	15.7	32.0	23.9	94.1
MT9918	--	--	--	--	29.9	29.9	93.4
Explorer	--	13.7	39.2	18.6	32.4	26.0	93.4
Ember	--	--	--	13.5	28.4	21.0	82.6

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 spring wheat varieties as compared to McNeal when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of McNeal
Granite	--	--	--	--	61.3	61.3	108.9
Parshall	63.0	63.0	63.3	58.0	58.8	61.2	104.2
Scholar	61.7	62.6	61.8	59.0	59.5	60.9	103.7
Gunner	--	--	62.5	57.2	59.2	59.6	103.4
Conan	61.5	62.9	61.2	58.5	59.5	60.7	103.3
MT9918	--	--	--	--	58.0	58.0	103.0
Ember	--	--	--	56.8	59.7	58.3	102.8
Reeder	61.2	63.0	61.3	57.5	59.0	60.4	102.8
Ernest	62.2	62.7	60.8	57.2	59.0	60.4	102.8
ND741	--	--	--	--	57.5	57.5	102.1
Amidon	60.5	61.8	61.0	57.2	59.2	59.9	102.0
Choteau	--	--	60.7	55.3	58.7	58.2	101.0
McKenzie	--	--	--	56.0	58.3	57.2	100.9
Laser	--	--	--	--	56.7	56.7	100.7
AC Barrie	--	--	--	55.0	58.7	56.9	100.4
Outlook	--	--	60.0	56.3	56.8	57.7	100.1
McNeal	59.7	61.1	59.7	57.0	56.3	58.8	100.0
Express	--	--	60.2	56.0	56.7	57.6	99.9
Explorer	--	60.7	58.2	55.8	58.2	58.2	99.5
Hank	--	--	--	54.8	56.0	55.4	97.8

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 heights of spring wheat varieties as compared to McNeal when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of McNeal
Ernest	86	53	84	61	83	73.4	111.6
Scholar	89	46	81	58	88	72.4	110.0
Amidon	91	46	84	56	84	72.2	109.7
McKenzie	--	--	--	61	81	71.0	108.4
ND741	--	--	--	--	83	83.0	106.4
Parshall	86	46	81	56	81	70.0	106.4
Laser	--	--	--	--	82	82.0	105.1
Gunner	--	--	81	51	80	70.7	105.0
Outlook	--	--	79	53	77	69.7	103.5
McNeal	76	51	71	53	78	65.8	100.0
AC Barrie	--	--	--	53	78	65.5	100.0
MT9918	--	--	--	--	78	78.0	100.0
Ember	--	--	--	53	77	65.0	99.2
Reeder	74	51	71	56	71	64.6	98.2
Explorer	--	48	69	53	75	61.3	96.8
Conan	76	48	69	51	70	62.8	95.4
Granite	--	--	--	--	72	72.0	92.3
Choteau	--	--	69	46	70	61.7	91.6
Hank	--	--	--	48	71	59.5	90.8
Express	--	--	64	48	67	59.7	88.6

NOTE: Average heights 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 protein contents of spring wheat varieties as compared to McNeal when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of McNeal
Parshall	15.1	14.2	14.1	15.8	18.4	15.5	113.6
Reeder	14.8	14.8	14.2	15.4	17.6	15.4	112.4
Gunner	--	--	12.7	16.0	18.0	15.6	110.9
AC Barrie	--	--	--	16.6	18.0	17.3	110.9
Ernest	14.4	14.6	13.1	15.0	18.5	15.1	110.7
Granite	--	--	--	--	18.4	18.4	109.5
Laser	--	--	--	--	18.2	18.2	108.3
Ember	--	--	--	15.2	18.0	16.6	106.4
Scholar	13.0	14.0	12.9	15.4	17.2	14.5	106.1
Explorer	--	14.0	12.9	15.4	16.9	14.8	104.6
MT9918	--	--	--	--	17.5	17.5	104.2
Amidon	13.0	14.6	12.5	14.3	16.7	14.2	104.1
Express	--	--	12.4	15.0	16.4	14.6	104.0
McKenzie	--	--	--	15.5	16.9	16.2	103.8
Choteau	--	--	12.4	14.6	16.4	14.5	103.1
Outlook	--	--	12.3	14.6	16.1	14.3	102.1
Hank	--	--	--	14.8	16.8	15.8	101.3
McNeal	11.7	14.5	10.9	14.4	16.8	13.7	100.0
Conan	11.6	14.1	12.2	14.2	16.1	13.6	99.9
ND741	--	--	--	--	16.4	16.4	97.6

NOTE: Average protein contents 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.
in the same years. Compare only to the check variety.

Table 6. Agronomic data obtained from a dryland recrop durum yield trial conducted at the Eastern Agricultural Research Center, Sidney, MT, 2003.
Planting date: 18 April 2003 Harvest date: 30 July 2003

entry	heading, days from planting	height, inches	protein content	HVA color	test wt, lb/bu	yield, bu/ac
Lebsock	62.0	29.5	16.15	89.1	61.0	33.5
Navigator	64.7	25.9	14.94	85.5	61.0	33.2
Dilse	64.3	29.8	16.45	93.5	61.2	32.9
Kyle	65.3	33.8	16.39	86.8	60.2	32.7
Laser SW	58.0	31.4	15.97	81.9	56.2	31.9
Ben	62.7	30.7	15.86	90.3	61.5	31.8
Avonlea	62.0	31.8	17.33	96.4	59.2	31.7
Mountrail	63.3	29.4	17.18	83.9	58.7	31.1
YU-894-75	63.7	29.4	16.77	95.3	60.2	30.3
Pathfinder	64.0	23.4	16.86	83.6	59.3	30.0
Pierce	62.7	28.5	17.11	91.8	60.0	30.0
Plaza	63.0	25.2	16.11	81.7	59.2	29.7
Maier	62.3	29.1	16.91	92.8	60.0	29.6
Munich	62.0	27.2	17.08	89.3	58.7	29.5
Belzer	63.7	29.9	16.42	81.0	59.7	29.0
Renville	62.3	31.4	17.88	88.8	58.8	27.5
mean	62.9	29.1	16.59	88.2	59.7	30.9
probability	<0.001	<0.001	0.014	<0.001	<0.001	0.084
CV (S/mean)	1.0	3.5	4.6	3.1	1.0	7.2
CV (SE/mean)	0.6	2.0	2.7	1.8	0.6	4.2
LSD 0.05	1.0	1.7	1.28	4.6	1.0	3.7

Mountrail is the check variety with an average yield on 31.1 bu/ac

Table 7. Relative yields of durum varieties compared to Mountrail when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of Mountrail
Dilse	--	--	--	22.2	32.9	27.6	105.2
Mountrail	61.2	15.6	53.6	21.3	31.1	36.6	100.0
YU-894-75	--	--	--	--	30.3	30.3	97.4
Maier	57.2	14.4	52.6	22.7	29.6	35.3	96.6
Plaza	55.4	13.5	55.2	22.2	29.7	35.2	96.3
AC Avonlea	--	17.3	43.0	24.2	31.7	29.1	95.6
Pierce	--	--	49.2	21.4	30.0	33.5	94.9
Lebsock	51.4	13.8	51.3	22.9	33.5	34.6	94.6
Ben	54.6	13.4	49.8	22.7	31.8	34.5	94.3
AC Navigator	--	--	42.9	23.8	33.2	33.3	94.2
Kyle	54.7	12.4	50.4	21.6	32.7	34.4	94.0
Renville	58.1	13.6	49.1	21.3	27.5	33.9	92.8
Munich	50.4	14.1	--	23.6	29.5	29.4	91.0
AC Pathfinder	--	--	40.7	25.5	30.0	32.1	90.8
Belzer	49.7	13.4	49.6	22.3	29.0	32.8	89.7

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 durum varieties as compared to Mountrail when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of Mountrail
Dilse	--	--	--	57.8	61.2	59.5	103.3
YU-894-75	--	--	--	--	60.2	60.2	102.6
Lebsock	59.5	63.0	62.0	59.2	61.0	60.9	102.5
Ben	58.2	62.8	63.0	58.3	61.5	60.8	102.2
AC Navigator	--	--	59.8	60.2	61.0	60.3	102.0
Kyle	57.9	62.4	62.8	59.3	60.2	60.5	101.7
Maier	59.3	63.3	61.5	58.3	60.0	60.5	101.7
Pierce	--	--	62.5	57.0	60.0	59.8	101.2
AC Pathfinder	--	--	60.7	59.3	59.3	59.8	101.1
AC Avonlea	--	63.3	60.5	58.8	59.2	60.5	100.9
Plaza	58.3	63.3	60.7	58.2	59.2	59.9	100.8
Munich	58.5	62.2	--	57.0	58.7	59.1	100.5
Renville	58.4	62.6	61.7	57.3	58.8	59.8	100.5
Mountrail	57.7	62.3	62.2	56.5	58.7	59.5	100.0
Belzer	56.1	61.8	59.8	56.5	59.7	58.8	98.8

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 heights of durum varieties in inches as compared to Mountrail when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of Mountrail
Kyle	38	19	38	23	34	30.4	111.8
AC Avonlea	--	20	31	22	32	26.3	105.0
Renville	36	20	33	22	31	28.4	104.4
Belzer	36	21	33	21	30	28.2	103.7
Ben	35	21	33	21	31	28.2	103.7
Mountrail	36	18	33	20	29	27.2	100.0
Dilse	--	--	--	19	30	24.5	100.0
YU-894-75	--	--	--	--	29	29.0	100.0
Pierce	--	--	31	21	28	26.7	97.6
Lebsock	32	18	30	20	30	26.0	95.6
Maier	31	18	31	20	29	25.8	94.9
AC Pathfinder	--	--	31	21	23	25.0	91.5
Munich	28	19	--	20	27	23.5	91.3
AC Navigator	--	--	27	19	26	24.0	87.8
Plaza	27	18	25	18	25	22.6	83.1

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

Table 10. Relative protein contents of durum varieties as compared to Mountrail when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of Mountrail
Maier	15.5	14.3	14.2	16.5	16.9	15.5	103.6
AC Avonlea	--	14.7	14.6	15.4	17.3	15.5	103.5
Kyle	15.6	15.2	13.6	16.5	16.4	15.5	103.5
Renville	15.4	13.3	13.7	16.6	17.9	15.4	102.9
Pierce	--	--	13.4	16.6	17.1	15.7	101.5
Ben	15.4	14.8	13.6	16.1	15.9	15.2	101.5
Munich	15.6	14.0	--	15.9	17.1	15.7	101.3
Belzer	15.0	13.6	14.1	15.8	16.4	15.0	100.3
Mountrail	14.8	13.5	12.9	16.3	17.2	14.9	100.0
Lebsock	15.5	13.9	12.9	15.4	16.2	14.8	98.9
Dilse	--	--	--	16.6	16.4	16.5	98.5
Plaza	14.2	14.0	13.2	15.6	16.1	14.6	97.9
YU-894-75	--	--	--	--	16.8	16.8	97.7
AC Pathfinder	--	--	13.5	14.9	16.9	15.1	97.6
AC Navigator	--	--	14.1	15.6	14.9	14.9	96.1

NOTE: Average protein contents 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 11. Agronomic data obtained from a dryland recrop barley yield trial conducted at the Eastern Agricultural Research Center, Sidney, MT.
Planting date: 18 April 2003 Harvest date: 30 July 2003

Variety	Days to heading [1]	Height, inches	Protein content	Test wt, lb/bu	Yield bu/acre	
Baronesse	65.7	58.7	12.99	47.7	52.9	
Haybet	63.0	63.0	12.05	46.3	52.5	
MT970116	61.7	67.3	12.18	47.8	52.2	
Haxby	62.3	62.3	12.25	49.5	51.8	
Gallatin	63.0	65.0	11.98	47.8	51.3	
MT960099	66.0	54.0	12.30	47.3	49.9	
Valier	65.0	60.7	13.17	48.0	48.8	
MT970155	64.0	58.7	12.42	48.5	48.7	
MT970229	63.3	58.0	12.13	51.0	48.6	
MT970148	62.3	56.3	12.54	45.5	47.6	
MT960101	66.0	54.3	12.34	47.2	46.8	
MT960228	63.7	59.0	12.32	46.7	46.6	
Conlon	59.0	65.7	11.81	49.8	46.5	
WPB Xena	63.3	58.3	13.31	46.3	45.9	
Hays	64.0	52.7	12.58	46.2	45.8	
Harrington	64.3	62.7	12.52	45.5	44.1	x
mean	63.5	59.8	12.43	47.6	48.8	
probability	<0.001	<0.001	0.754	0.011	0.439	
CV (S/mean)	0.9	6.2	6.9	3.5	9.5	
$LSD_{0.05}$	0.5	3.6	4.0	2.0	5.5	

Check variety is Gallatin with an average yield of 27.6 bu/acre.
x indicates significantly lower yield than check variety, Gallatin, at a probability of <0.05

[1] Heading date is number of days from planting

Table 12. Relative yields of barley varieties compared to Gallatin when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of Gallatin
MT960228	94.1	25.9	71.8	28.9	46.6	53.5	104.0
Baronesse	87.3	26.4	72.0	26.1	52.9	52.9	103.0
Valier	97.9	25.2	65.9	26.5	48.8	52.9	102.8
Haybet	--	--	--	--	52.5	52.5	102.3
Gallatin	85.2	25.8	67.1	27.6	51.3	51.4	100.0
Xena	88.7	26.1	67.7	28.6	45.9	51.4	100.0
MT970116	--	--	62.9	29.5	52.2	48.2	99.0
MT960099	--	26.3	66.3	24.4	49.9	41.7	97.1
MT970229	--	--	--	27.6	48.6	38.1	96.6
Harrington	93.3	21.8	60.8	27.1	44.1	49.4	96.1
MT970155	--	--	--	--	48.7	48.7	94.9
MT970148	--	--	--	--	47.6	47.6	92.8
Conlon	--	--	62.9	25.1	46.5	44.8	92.1
Hays	--	--	--	--	45.8	45.8	89.3
MT960101	--	--	--	23.5	46.8	35.2	89.1
Haxby	50.8	26.0	63.3	35.4	51.8	45.5	88.4

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 13. Relative test weights of barley varieties compared to Gallatin when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of Gallatin
MT970229	--	--	--	46.8	51.0	48.9	103.9
Haxby	50.8	52.8	49.8	47.3	49.5	50.0	102.1
MT970155	--	--	--	--	48.5	48.5	101.5
MT970116	--	--	48.7	47.8	47.8	48.1	100.8
Gallatin	48.7	53.3	49.0	46.3	47.8	49.0	100.0
Valier	48.9	52.0	49.7	46.5	48.0	49.0	100.0
MT960101	--	--	--	46.2	47.2	46.7	99.3
Baronesse	48.8	52.2	48.5	45.2	47.7	48.5	98.9
Conlon	--	--	46.8	44.2	49.8	46.9	98.4
MT960228	48.1	52.3	47.8	45.2	46.7	48.0	98.0
MT960099	--	51.5	47.5	46.0	47.3	48.1	97.9
Xena	48.0	52.3	46.7	45.7	46.3	47.8	97.5
Haybet	--	--	--	--	46.3	46.3	96.9
Hays	--	--	--	--	46.2	46.2	96.7
Harrington	46.4	51.5	47.0	43.8	45.5	46.8	95.6
MT970148	--	--	--	--	45.5	45.5	95.2

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 14. Relative heights of barley varieties in inches compared to Gallatin when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of Gallatin
MT970116	--	--	28	22	26	25.3	102.7
Gallatin	31	18	28	20	26	24.6	100.0
Haybet	--	--	--	--	25	25.0	96.2
Conlon	--	--	26	19	26	23.7	95.9
Xena	29	17	26	20	23	23.0	93.5
Valier	31	15	26	19	24	23.0	93.5
Haxby	28	17	25	20	25	23.0	93.5
MT960228	30	16	25	19	23	22.6	91.9
MT970229	--	--	--	19	23	21.0	91.3
Harrington	29	15	25	18	25	22.4	91.1
MT970155	--	--	--	--	23	23.0	88.5
Baronesse	28	15	23	17	23	21.2	86.2
MT970148	--	--	--	--	22	22.0	84.6
Hays	--	--	--	--	21	21.0	80.8
MT960101	--	--	--	16	21	18.5	80.4
MT960099	--	12	23	16	21	18.0	78.3

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

Table 15. Relative protein contents of barley varieties compared to Gallatin when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	1999	2000	2001	2002	2003	Ave	as % of Gallatin
MT970229	--	--	--	16.6	12.1	14.4	113.0
MT960101	--	--	--	16.1	12.3	14.2	111.8
Hays	--	--	--	--	12.6	12.6	105.0
MT970148	--	--	--	--	12.5	12.5	104.2
MT970155	--	--	--	--	12.4	12.4	103.3
MT970116	--	--	9.7	15.7	12.2	12.5	103.3
Valier	11.8	12.2	10.2	13.9	13.2	12.3	102.9
Baronesse	12.0	12.2	10.0	13.8	13.0	12.2	102.3
Harrington	11.7	12.4	9.8	13.8	12.5	12.0	101.0
MT960099	--	11.9	8.8	15.2	12.3	12.1	100.8
Gallatin	11.8	11.4	11.0	13.4	12.0	11.9	100.0
Haybet	--	--	--	--	12.0	12.0	100.0
Xena	10.8	11.0	8.8	14.2	13.3	11.6	97.5
MT960228	11.3	10.7	8.5	14.5	12.3	11.5	96.1
Conlon	--	--	9.3	13.2	11.8	11.4	94.2
Haxby	10.9	10.4	8.8	12.5	12.2	11.0	91.9

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.