PROJECT TITLE: Evaluation of spring wheat, durum, barley, and oat varieties under minimum-till, continuous cropping conditions – 2004

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 2004 were

Crop	Planting date	Harvest date	Plot size
Spring wheat	Apr 8	Aug 6	100 ft^2, entire plot harvested.
Durum	Apr 8	Aug 6	100 ft^2, entire plot harvested.
Barley	Apr 8	Jul 27	100 ft^2, entire plot harvested.

Soil type: Williams clay loam
Previous crops: 2003 - spring wheat, 2002 - safflower, 2001 - small grain plots
Residual soil N to 3 ft: lb N/ac
Residual soil P to 6 in: ppm
Residual soil K to 6 in: ppm
Applied fertilizer: 200 lb/ac 18-46-0
Herbicides: 2 pt/ac Bronate applied Jun 8

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

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 rain in late May. Emergence in the recrop trials was variable. Summer was cooler than average.

RESULTS:
Spring wheat: Twenty lines and varieties of spring wheat were tested under dryland recrop conditions (Table 1). Outlook yielded most, although no lines or varieties yielded significantly more or less than the check variety, McNeal. Average yield was 24.5 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). MT01695 and AC Avonlea yielded significantly more than the check variety, Mountrail. Belzer and Kyle yielded significantly less than Mountrail. Average yield was 15.6 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). Haybet, Lacey, Haxby, and Conlon yielded significantly more than the check variety, Gallatin. None yielded significantly less. Average yield was 26.6 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 was not a severe problem in 2004.

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, 2004.

entry	heading, days from planting	height, cm	protein content	test wt, lb/bu	yield, bu/ac
Outlook	76.0	65.7	14.44	57.8	30.1
MT0245	75.0	55.0	16.80	59.5	29.5
Hanna	73.3	72.7	15.53	60.8	29.0
Steele ND	72.7	66.7	14.69	60.2	28.1
Ember	71.3	66.7	14.61	61.5	26.8
MT0249	70.3	55.7	14.92	59.7	26.5
MT0266	69.7	56.3	16.62	58.3	26.0
Reeder	73.0	58.7	17.19	60.0	25.0
McNeal	74.7	62.7	13.85	56.8	24.5
ND751	73.7	68.3	14.99	61.3	24.5
Freyr	71.3	66.7	15.93	60.8	24.4
Choteau	73.0	58.3	15.00	59.8	24.2
Scholar	74.7	58.7	16.15	59.3	23.1
Granite	73.7	54.7	16.63	60.7	23.1
McKenzie	73.7	68.0	17.50	58.8	22.9
Hank	69.0	54.7	16.83	58.0	22.0
Amidon	73.7	64.0	16.59	59.3	21.7
NDSW0246	73.3	65.3	17.35	59.8	21.3
Norpro	72.7	56.3	16.86	60.5	19.8
Dapps	71.0	66.7	18.01	59.2	18.1
mean	72.8	62.1	16.02	59.6	24.5
Probability	0.001	0.002	0.057	<0.001	0.041
CV (S/mean)	2.4	9.1	9.6	1.6	16.4
CV (SE/mean)	1.4	5.2	5.5	0.9	9.4
LSD 0.05	2.8	9.3	2.53	1.6	6.6

Check variety is McNeal with an average yield of 24.5 bu/acre.

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

Cultivar	2000	2001	2002	2003	2004	Ave	as % of McNeal
MT0245	--	--	--	--	29.5	29.5	120.4
Hanna	--	--	--	--	29.0	29.0	118.4
Outlook	--	53.8	19.0	37.7	30.1	35.2	117.0
Reeder	17.0	55.6	20.7	35.2	25.0	30.7	113.0
MT0249	--	--	--	--	26.5	26.5	108.2
SteeleND	--	--	--	32.7	28.1	30.4	107.6
MT0266	--	--	--	--	26.0	26.0	106.1
Scholar	15.8	52.2	19.0	34.0	23.1	28.8	106.1
McNeal	15.6	45.0	18.7	32.0	24.5	27.2	100.0
ND751	--	--	--	--	24.5	24.5	100.0
Freyr	--	--	--	--	24.4	24.4	99.6
Amidon	15.8	47.1	18.0	32.5	21.7	27.0	99.5
Choteau	--	47.3	16.7	31.1	24.2	29.8	99.3
Granite	--	--	--	32.4	23.1	27.8	98.2
Hank	--	--	16.5	33.6	22.0	24.0	95.9
McKenzie	--	--	15.1	33.1	22.9	23.7	94.5
Ember	--	--	13.5	28.4	26.8	22.9	91.4
NDSW0246	--	--	--	--	21.3	21.3	86.9
Norpro	--	--	--	--	19.8	19.8	80.8
Dapps	--	--	--	--	18.1	18.1	73.9

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	2000	2001	2002	2003	2004	Ave	as % of McNeal
ND751	--	--	--	--	61.3	61.3	107.9
Granite	--	--	--	61.3	60.7	61.0	107.9
Hanna	--	--	--	--	60.8	60.8	107.0
Freyr	--	--	--	--	60.8	60.8	107.0
Norpro	--	--	--	--	60.5	60.5	106.5
NDSW0246	--	--	--	--	59.8	59.8	105.3
MT0249	--	--	--	--	59.7	59.7	105.1
MT0245	--	--	--	--	59.5	59.5	104.8
Ember	--	--	56.8	59.7	61.5	59.3	104.6
Dapps	--	--	--	--	59.2	59.2	104.2
SteeleND	--	--	--	57.5	60.2	58.9	104.1
Scholar	62.6	61.8	59.0	59.5	59.3	60.4	103.9
Reeder	63.0	61.3	57.5	59.0	60.0	60.2	103.4
MT0266	--	--	--	--	58.3	58.3	102.6
Amidon	61.8	61.0	57.2	59.2	59.3	59.7	102.6
Choteau	--	60.7	55.3	58.7	59.8	58.6	102.0
McKenzie	--	--	56.0	58.3	58.8	57.7	101.8
Outlook	--	60.0	56.3	56.8	57.8	57.7	100.5
McNeal	61.1	59.7	57.0	56.3	56.8	58.2	100.0
Hank	--	--	54.8	56.0	58.0	56.3	99.2

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

Table 4. Relative heights of spring wheat varieties in cm as compared to McNeal when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	2000	2001	2002	2003	2004	Ave	as % of McNeal
Hanna	--	--	--	--	73	73.0	115.9
McKenzie	--	--	61	81	68	70.0	108.2
ND751	--	--	--	--	68	68.0	107.9
SteeleND	--	--	--	83	67	75.0	106.4
Freyr	--	--	--	--	67	67.0	106.3
Dapps	--	--	--	--	67	67.0	106.3
Amidon	46	84	56	84	64	66.8	105.7
Scholar	46	81	58	88	59	66.4	105.1
Outlook	--	79	53	77	66	68.8	103.8
NDSW0246	--	--	--	--	65	65.0	103.2
Ember	--	--	53	77	67	65.7	101.5
McNeal	51	71	53	78	63	63.2	100.0
Reeder	51	71	56	71	59	61.6	97.5
Choteau	--	69	46	70	58	60.8	91.7
Granite	--	--	--	72	55	63.5	90.1
Hank	--	--	48	71	55	58.0	89.7
MT0249	--	--	--	--	56	56.0	88.9
MT0266	--	--	--	--	56	56.0	88.9
Norpro	--	--	--	--	56	56.0	88.9
MT0245	--	--	--	--	55	55.0	87.3

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	2000	2001	2002	2003	2004	Ave	as % of McNeal
Dapps	--	--	--	--	18.0	18.0	130.4
NDSW0246	--	--	--	--	17.4	17.4	126.1
Norpro	--	--	--	--	16.9	16.9	122.5
MT0245	--	--	--	--	16.8	16.8	121.7
MT0266	--	--	--	--	16.6	16.6	120.3
Freyr	--	--	--	--	15.9	15.9	115.2
Granite	--	--	--	18.4	16.2	17.3	113.1
Reeder	14.8	14.2	15.4	17.6	17.2	15.8	112.5
Hanna	--	--	--	--	15.5	15.5	112.3
McKenzie	--	--	15.5	16.9	17.5	16.6	110.9
ND751	--	--	--	--	15.0	15.0	108.7
MT0249	--	--	--	--	14.9	14.9	108.0
Hank	--	--	14.8	16.8	16.8	16.1	107.6
Scholar	14.0	12.9	15.4	17.2	16.2	15.1	107.5
Ember	--	--	15.2	18.0	14.6	15.9	106.2
Amidon	14.6	12.5	14.3	16.7	16.6	14.9	106.1
Choteau	--	12.4	14.6	16.4	15.0	14.6	104.5
Outlook	--	12.3	14.6	16.1	14.4	14.4	102.7
SteeleND	--	--	--	16.4	14.7	15.6	101.6
McNeal	14.5	10.9	14.4	16.8	13.8	14.1	100.0

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 6. Agronomic data obtained from a dryland recrop durum yield trial conducted at the Eastern Agricultural Research Center, Sidney, MT, 2004.

entry	heading, days from planting	height, inches	HVA color	protein content	test wt, lb/bu	yield, bu/ac	
MT01695	71.7	50.7	74.4	15.55	58.0	22.6	a
Avonlea	73.7	65.3	80.5	16.93	57.8	19.7	a
Maier	73.7	59.3	82.9	16.27	59.2	18.7	
Pierce	73.3	60.7	78.7	16.07	59.0	17.4	
Plaza	75.0	52.3	77.8	15.91	58.9	17.0	
Renville	74.3	60.0	79.3	15.25	58.7	16.0	
Dilse	74.7	55.3	83.8	16.89	58.5	16.0	
MT01617	73.0	43.7	68.5	15.83	59.1	15.8	
Ben	71.0	63.7	79.6	16.86	59.1	15.6	
Munich	71.7	50.7	82.8	16.62	58.2	15.5	
Mountrail	75.3	56.7	80.2	16.91	58.1	15.4	
Lebsock	73.0	60.0	77.2	16.20	58.5	14.2	
Pathfinder	73.7	49.7	77.9	16.64	58.2	13.4	
Navigator	76.3	47.0	79.4	15.92	58.0	12.8	
Belzer	75.0	56.7	68.6	17.34	56.4	10.8	x
Kyle	76.3	77.3	67.0	16.78	56.5	8.4	x
mean	73.9	56.8	77.4	16.37	58.2	15.6	
probability	<0.001	<0.001	0.189	0.874	0.019	<0.001	
CV (S/mean)	1.7	11.8	9.7	8.1	1.6	15.0	
CV (SE/mean)	1.0	6.8	5.6	4.7	0.9	8.7	
LSD 0.05	2.1	11.2	ns	ns	1.6	3.9	

a indicates significantly greater yield than check variety, Mountrail, at probability <0.05
x indicates significantly lower yield than check variety, Mountrail at probability <0.05

Mountrail is the check variety with an average yield on 15.4 bu/ac

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

Cultivar	2000	2001	2002	2003	2004	Ave	as % of Mountrail
MT01695	--	--	--	--	22.6	22.6	146.8
Dilse	--	--	22.2	32.9	16.0	23.7	104.9
MT01617	--	--	--	--	15.8	15.8	102.6
Maier	14.4	52.6	22.7	29.6	18.7	27.6	100.7
Plaza	13.5	55.2	22.2	29.7	17.0	27.5	100.4
Mountrail	15.6	53.6	21.3	31.1	15.4	27.4	100.0
AC Avonlea	17.3	43.0	24.2	31.7	19.7	27.2	99.2
Munich	14.1	--	23.6	29.5	15.5	20.7	99.2
Lebsock	13.8	51.3	22.9	33.5	14.2	27.1	99.1
Ben	13.4	49.8	22.7	31.8	15.6	26.7	97.3
Pierce	--	49.2	21.4	30.0	17.4	29.5	97.2
Renville	13.6	49.1	21.3	27.5	16.0	25.5	93.1
AC Navigator	--	42.9	23.8	33.2	12.8	28.2	92.8
Kyle	12.4	50.4	21.6	32.7	8.4	25.1	91.6
Belzer	13.4	49.6	22.3	29.0	10.8	25.0	91.3
AC Pathfinder	--	40.7	25.5	30.0	13.4	27.4	90.3

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	2000	2001	2002	2003	2004	Ave	as % of Mountrail
Dilse	--	--	57.8	61.2	58.5	59.2	102.4
Ben	62.8	63.0	58.3	61.5	59.1	60.9	102.3
Lebsock	63.0	62.0	59.2	61.0	58.5	60.7	102.0
MT01617	--	--	--	--	59.1	59.1	101.7
Maier	63.3	61.5	58.3	60.0	59.2	60.5	101.5
AC Navigator	--	59.8	60.2	61.0	58.0	59.8	101.5
Pierce	--	62.5	57.0	60.0	59.0	59.6	101.3
Kyle	62.4	62.8	59.3	60.2	56.5	60.2	101.1
AC Pathfinder	--	60.7	59.3	59.3	58.2	59.4	100.8
Plaza	63.3	60.7	58.2	59.2	58.9	60.1	100.8
AC Avonlea	63.3	60.5	58.8	59.2	57.8	59.9	100.6
Renville	62.6	61.7	57.3	58.8	58.7	59.8	100.4
Munich	62.2	--	57.0	58.7	58.2	59.0	100.2
Mountrail	62.3	62.2	56.5	58.7	58.1	59.6	100.0
MT01695	--	--	--	--	58.0	58.0	99.8
Belzer	61.8	59.8	56.5	59.7	56.4	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	2000	2001	2002	2003	2004	Ave	as % of Mountrail
Kyle	19	38	23	34	30	28.8	118.0
AC Avonlea	20	31	22	32	26	26.2	107.4
Ben	21	33	21	31	25	26.2	107.4
Renville	20	33	22	31	24	26.0	106.6
Belzer	21	33	21	30	22	25.4	104.1
Mountrail	18	33	20	29	22	24.4	100.0
Dilse	--	--	19	30	22	23.7	100.0
Pierce	--	31	21	28	24	26.0	100.0
Lebsock	18	30	20	30	24	24.4	100.0
Maier	18	31	20	29	23	24.2	99.2
Munich	19	--	20	27	20	21.5	96.6
AC Pathfinder	--	31	21	23	20	23.8	91.3
MT01695	--	--	--	--	20	20.0	90.9
Plaza	18	25	18	25	21	21.4	87.7
AC Navigator	--	27	19	26	19	22.8	87.5
MT01617	--	--	--	--	17	17.0	77.3

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

Cultivar	2000	2001	2002	2003	2004	Ave	as % of Mountrail
AC Avonlea	14.7	14.6	15.4	17.3	16.9	15.8	102.7
Kyle	15.2	13.6	16.5	16.4	16.8	15.7	102.2
Maier	14.3	14.2	16.5	16.9	16.3	15.6	101.8
Ben	14.8	13.6	16.1	15.9	16.9	15.5	100.7
Belzer	13.6	14.1	15.8	16.4	17.3	15.4	100.5
Mountrail	13.5	12.9	16.3	17.2	16.9	15.4	100.0
Renville	13.3	13.7	16.6	17.9	15.2	15.3	99.9
Pierce	--	13.4	16.6	17.1	16.1	15.8	99.8
Munich	14.0	--	15.9	17.1	16.6	15.9	99.5
Dilse	--	--	16.6	16.4	16.9	16.6	99.0
AC Pathfinder	--	13.5	14.9	16.9	16.6	15.5	97.8
Plaza	14.0	13.2	15.6	16.1	15.9	15.0	97.4
Lebsock	13.9	12.9	15.4	16.2	16.2	14.9	97.1
AC Navigator	--	14.1	15.6	14.9	15.9	15.1	95.6
MT01617	--	--	--	--	15.8	15.8	93.5
MT01695	--	--	--	--	15.6	15.6	92.3

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.

Variety	heading, days from planting	Height, cm	Protein content	Test wt, lb/bu	Yield bu/acre	
Haybet	77.7	53.3	11.80	45.2	32.2	a
Lacey	76.3	48.0	11.27	46.3	32.1	a
Haxby	77.3	45.3	11.38	50.5	31.8	a
Conlon	69.0	55.7	11.93	49.3	31.6	a
Tradition	75.0	51.7	12.83	47.0	28.1	
MT910189	76.7	44.3	11.26	46.8	27.9	
MT970116	77.0	50.7	13.49	47.3	27.5	
Hays	85.3	42.3	11.01	44.3	27.2	
MT970229	79.7	47.0	11.44	47.0	25.2	
Baronesse	81.0	44.7	11.76	46.3	24.9	
Gallatin	77.3	49.3	11.68	47.7	24.3	
Metcalfe	78.0	51.7	12.39	46.3	23.9	
Valier	80.0	45.0	12.79	46.5	23.8	
MT960228	79.7	45.7	12.80	45.3	22.8	
Copeland	79.7	50.3	11.29	44.0	22.3	
Harrington	80.3	46.3	12.75	44.2	19.2	
mean	78.1	48.2	11.99	46.5	26.6	
probability	<0.001	0.023	0.047	<0.001	0.005	
CV (S/mean)	2.2	8.8	7.6	2.9	14.9	
CV (SE/mean)	1.3	5.1	4.4	1.7	8.6	
$LSD_{0.05}$	2.9	7.1	1.52	2.3	6.6	

Check variety is Gallatin with an average yield of 24.3 bu/acre.
a indicates significantly greater yield than check variety, Gallatin, at probability of <0.05

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

Cultivar	2000	2001	2002	2003	2004	Ave	as % of Gallatin
Lacey	--	--	--	--	32.1	32.1	132.1
Tradition	--	--	--	--	28.1	28.1	115.6
MT910189	--	--	--	--	27.9	27.9	114.8
Haybet	--	--	--	52.5	32.2	42.4	112.0
Haxby	26.0	63.3	35.4	51.8	31.8	41.7	106.2
Baronesse	26.4	72.0	26.1	52.9	24.9	40.5	103.2
MT970116	--	62.9	29.5	52.2	27.5	43.0	101.1
Gallatin	25.8	67.1	27.6	51.3	24.3	39.2	100.0
MT960228	25.9	71.8	28.9	46.6	22.8	39.2	99.9
Metcalfe	--	--	--	--	23.9	23.9	98.4
MT970229	--	--	27.6	48.6	25.2	33.8	98.3
Conlon	--	62.9	25.1	46.5	31.6	41.5	97.5
Valier	25.2	65.9	26.5	48.8	23.8	38.0	97.0
Hays	--	--	--	45.8	27.2	36.5	96.6
Copeland	--	--	--	--	22.3	22.3	91.8
Harrington	21.8	60.8	27.1	44.1	19.2	34.6	88.2

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	2000	2001	2002	2003	2004	Ave	as % of Gallatin
Haxby	52.8	49.8	47.3	49.5	50.5	50.0	102.4
MT970229	--	--	46.8	51.0	47.0	48.3	102.1
MT970116	--	48.7	47.8	47.8	47.3	47.9	100.4
Gallatin	53.3	49.0	46.3	47.8	47.7	48.8	100.0
Conlon	--	46.8	44.2	49.8	49.3	47.5	99.6
Valier	52.0	49.7	46.5	48.0	46.5	48.5	99.4
Tradition	--	--	--	--	47.0	47.0	98.5
Baronesse	52.2	48.5	45.2	47.7	46.3	48.0	98.3
MT910189	--	--	--	--	46.8	46.8	98.1
MT960228	52.3	47.8	45.2	46.7	45.3	47.5	97.2
Lacey	--	--	--	--	46.3	46.3	97.1
Metcalfe	--	--	--	--	46.3	46.3	97.1
Haybet	--	--	--	46.3	45.3	45.8	95.9
Harrington	51.5	47.0	43.8	45.5	44.2	46.4	95.0
Hays	--	--	--	46.2	44.3	45.3	94.8
Copeland	--	--	--	--	44.0	44.0	92.2

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	2000	2001	2002	2003	2004	Ave	as % of Gallatin
Tradition	--	--	--	--	20	20.0	105.3
Metcalfe	--	--	--	--	20	20.0	105.3
Copeland	--	--	--	--	20	20.0	105.3
MT970116	--	28	22	26	20	24.0	103.2
Haybet	--	--	--	25	21	23.0	102.2
Gallatin	18	28	20	26	19	22.2	100.0
Conlon	--	26	19	26	22	23.3	100.0
Lacey	--	--	--	--	19	19.0	100.0
Haxby	17	25	20	25	18	21.0	94.6
MT970229	--	--	19	23	18	20.0	92.3
Valier	15	26	19	24	18	20.4	91.9
MT960228	16	25	19	23	18	20.2	91.0
Harrington	15	25	18	25	18	20.2	91.0
MT910189	--	--	--	--	17	17.0	89.5
Baronesse	15	23	17	23	18	19.2	86.5
Hays	--	--	--	21	17	19.0	84.4

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	2000	2001	2002	2003	2004	Ave	as % of Gallatin
Tradition	--	--	--	--	12.8	12.8	109.4
MT970229	--	--	16.6	12.1	11.4	13.4	108.1
MT970116	--	9.7	15.7	12.2	13.5	12.8	106.2
Metcalfe	--	--	--	--	12.4	12.4	106.0
Valier	12.2	10.2	13.9	13.2	12.8	12.5	104.7
Harrington	12.4	9.8	13.8	12.5	12.8	12.3	103.0
Baronesse	12.2	10.0	13.8	13.0	11.8	12.2	102.2
Haybet	--	--	--	12.0	11.8	11.9	100.4
Gallatin	11.4	11.0	13.4	12.0	11.7	11.9	100.0
Hays	--	--	--	12.6	11.0	11.8	99.6
MT960228	10.7	8.5	14.5	12.3	12.8	11.8	98.8
Lacey	--	--	--	--	11.3	11.3	96.6
MT910189	--	--	--	--	11.3	11.3	96.6
Copeland	--	--	--	--	11.3	11.3	96.6
Conlon	--	9.3	13.2	11.8	11.9	11.6	96.0
Haxby	10.4	8.8	12.5	12.2	11.4	11.1	92.9

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.