PROJECT TITLE: Evaluation of small grain varieties under minimum-till, continuous cropping conditions - 1996

PROJECT LEADER:

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OBJECTIVES:

To determine the best adapted varieties of spring wheat, durum, barley, and oats for production under dryland continuous cropping conditions in eastern Montana and western North Dakota.

PROCEDURE:

Previous crops were spring wheat in 1995, safflower in 1994, and small grain plots in 1993. Soil type is Williams clay loam. Residual soil N to three feet was 55 lb N/acre, and residual soil P to 6 inches was 39 lb P/acre. Fertilizer N was applied in the spring of 1996 at a rate of 30 lb N/acre, in the form of liquid N, 28-0-0. Recrop barley and oat trials were planted on 24 April and harvested on 2 August. Recrop durum and spring wheat trials were planted on 26 April and harvested on 5 August. Plots were 20 feet long and 3 feet wide. Each variety was replicated three times. The entire plot was harvested for yield determinations.

RESULTS:

Spring wheat: Twenty-six lines and varieties of hard red spring wheat were tested under dryland recrop conditions (Table 1). Pioneer 2375 and Pioneer 2398 yielded the most. Average yield was 12.4 bu/acre. Five-year summaries for yield, test weight, height, and protein content are shown in Tables 2 through 5.

Durum: Sixteen durum lines and varieties were tested under dryland recrop conditions (Table 6). Samples were sent to the cereal quality lab in Fargo for quality evaluation. Kyle and Laker yielded the most. Average yield was 13.6 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). Bowman and Montana line H1851195 yielded the most. Average yield was 17.7 bu/acre. Five-year summaries for yield, test weight, height, and protein content are shown in Tables 12 through 15.

Oats: Seventeen oat lines and varieties were tested under dryland recrop conditions (Table 16). Otana and Border yielded the most. Average yield was 34.2 bu/acre. Five-year summaries for yield, test weight, height, and protein content are shown in Tables 17 through 20.

SUMMARY:

The experiments reported under this project are all of the replicated small plot type. The three-year crop rotation is 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 1996.

Precipitation from April to August in 1996 was 8.2 inches. Average precipitation for this time is 9.42 inches. Soil moisture was good at planting, with cool wet weather during April and May, and timely, if sparse, rain in June. Weather was hot and dry during grain fill.

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 characters of spring wheat varieties grown under dryland recrop conditions at the Eastern Agricultural Research Center, Sidney, MT.

Planted: 26 April 1996 Harvested: 5 August 1996 Plot size: 60 ft^2

Cultivar	Heading date *	Height, inches	Grain protein	Test weight	Yield bu/acre
Pioneer 2375	176	23	16.3	58.4	16.2
Pioneer 2398	178	21	17.5	59.0	15.8
MT 9565	176	25	17.0	58.2	14.3
Sonja	178	22	17.3	55.4	14.0
MT 9433	178	22	17.3	60.3	14.0
Westbred 936	175	21	17.8	58.3	13.8
Kulm	177	25	17.4	61.2	13.4
Westbred 926	173	21	18.1	58.5	13.2
Amidon	178	27	16.6	59.4	13.1
MT 9420	175	23	17.2	56.0	13.0
Hamer	177	23	16.7	57.7	12.8
Newana	179	24	17.0	59.4	12.5
Express	177	21	17.0	56.8	12.2
Ernest	177	23	18.1	59.8	12.1
MT 9503	174	23	17.3	55.7	12.1
MT 9311	180	21	17.4	61.9	12.1
McNeal	178	21	17.8	55.6	11.8
Keene	178	23	18.0	58.0	11.3
MT 9410	176	22	17.4	59.1	11.3
Stoa	177	22	17.9	56.6	10.9
Hi-Line	177	23	18.4	56.8	10.9
Norlander	176	22	17.3	58.8	10.9
Trenton	177	24	17.5	57.2	10.8
Lars	178	22	17.8	57.1	10.8
Grandin	177	25	17.0	57.0	9.7
Lew	178	23	18.7	57.9	8.8
average	177.0	22.9	17.45	58.1	12.4
p-value	0.00	NS	0.00	0.00	0.01
CV (s/mean)	0.4	9.7	2.8	1.6	16.7
CV (se/mean)	0.2	5.6	1.6	0.9	9.6
$LSD_{0.05}$	1.0	--	0.8	1.5	3.4

*days from 1 January

Table 2. Relative yields of spring wheat varieties as compared to Newana when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Newana
Pioneer 2398	1	--	--	--	--	17.5	17.5	140.0
MT9565	1	--	--	--	--	14.3	14.3	114.4
McNeal	5	93.6	38.2	36.3	32.8	11.8	42.5	112.7
Sonja	1	--	--	--	--	14.0	14.0	112.0
MT9433	1	--	--	--	--	14.0	14.0	112.0
MT9420	1	--	--	--	--	13.0	13.0	104.0
Hamer	1	--	--	--	--	12.8	12.8	102.4
Newana	5	79.2	30.3	31.7	35.1	12.5	37.8	100.0
Lew	5	84.3	30.0	33.2	26.4	8.8	36.5	96.8
MT9503	1	--	--	--	--	12.1	12.1	96.8
MT9311	1	--	--	--	--	12.1	12.1	96.8
Stoa	5	81.1	27.9	31.1	30.4	10.9	36.6	96.1
Grandin	5	80.7	29.1	31.2	29.0	9.7	35.9	95.2
Hi-Line	5	75.2	30.8	32.7	28.0	10.9	35.5	94.1
Amidon	5	77.6	33.6	28.3	23.4	13.1	35.2	93.2
Westbred 926	5	71.5	24.2	33.1	29.2	13.2	34.2	90.7
Keene	1	--	--	--	--	11.3	11.3	90.4
MT9410	1	--	--	--	--	11.3	11.3	90.4
Kulm	3	--	--	36.1	20.4	13.4	23.3	88.1
Norlander	1	--	--	--	--	10.9	10.9	87.2
Pioneer 2375	2	--	--	--	25.1	16.2	20.6	86.8
Ernest	3	--	--	32.3	24.2	12.1	22.9	86.5
Lars	1	--	--	--	--	10.8	10.8	86.4
Westbred 936	2	--	--	--	23.2	13.8	18.5	77.7
Express	2	--	--	--	23.0	12.2	17.6	73.9
Trenton	2	--	--	--	23.8	10.8	17.3	72.7

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, Newana.

Table 3. Relative test weights of spring wheat varieties as compared to Newana when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Newana
MT9311	1	--	--	--	--	61.9	61.9	104.2
Kulm	3	--	--	60.7	63.0	61.2	61.6	103.0
MT9433	1	--	--	--	--	60.3	60.3	101.5
Ernest	3	--	--	60.5	61.2	59.8	60.5	101.1
Hi-Line	5	63.5	56.5	60.3	60.8	56.8	59.6	100.2
Newana	5	63.0	54.7	58.8	61.3	59.4	59.4	100.0
Lew	5	63.2	55.3	58.3	61.8	57.9	59.3	99.8
Grandin	5	63.3	56.0	58.2	61.5	57.0	59.2	99.6
Pioneer 2375	3	--	--	--	61.8	58.4	60.1	99.6
MT9410	1	--	--	--	--	59.1	59.1	99.5
Westbred 926	5	62.8	54.0	59.2	60.7	58.5	59.0	99.3
Trenton	2	--	--	--	62.6	57.2	59.9	99.3
Westbred 936	2	--	--	--	61.5	58.3	59.9	99.3
Pioneer 2398	1	--	--	--	--	59.0	59.0	99.3
Norlander	1	--	--	--	--	58.8	58.8	99.0
McNeal	5	61.5	56.5	58.5	60.3	55.6	58.5	98.4
Amidon	5	60.5	53.7	58.3	59.8	59.4	58.3	98.1
Stoa	5	62.3	53.2	58.8	60.5	56.6	58.3	98.0
MT9565	1	--	--	--	--	58.2	58.2	98.0
Keene	1	--	--	--	--	58.0	58.0	97.6
Express	2	--	--	--	60.6	56.8	58.7	97.3
Hamer	1	--	--	--	--	57.7	57.7	97.1
Lars	1	--	--	--	--	57.1	57.1	96.1
MT9420	1	--	--	--	--	56.0	56.0	94.3
MT9503	1	--	--	--	--	55.7	55.7	93.8
Sonja	1	--	--	--	--	55.4	55.4	93.3

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, Newana.

Table 4. Relative heights of spring wheat varieties as compared to Newana when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Newana
Lew	5	33	29	31	21	23	27.4	111.4
Amidon	5	33	28	30	19	27	27.4	111.4
Ernest	3	--	--	31	21	23	25.0	108.7
Stoa	5	31	29	29	21	22	26.4	107.3
Grandin	5	31	28	26	20	25	26.0	105.7
Kulm	3	--	--	28	19	25	24.0	104.3
MT9565	1	--	--	--	--	25	25.0	104.2
McNeal	5	30	28	28	19	21	25.2	102.4
Newana	5	29	25	25	20	24	24.6	100.0
Trenton	2	--	--	--	20	24	22.0	100.0
Hi-Line	5	28	25	27	17	23	24.0	97.6
MT9420	1	--	--	--	--	23	23.0	95.8
Hamer	1	--	--	--	--	23	23.0	95.8
MT9503	1	--	--	--	--	23	23.0	95.8
Keene	1	--	--	--	--	23	23.0	95.8
Pioneer 2375	2	--	--	--	19	23	21.0	95.5
Westbred 926	5	27	25	25	18	21	23.2	94.3
Sonja	1	--	--	--	--	22	22.0	91.7
MT9433	1	--	--	--	--	22	22.0	91.7
MT9410	1	--	--	--	--	22	22.0	91.7
Norlander	1	--	--	--	--	22	22.0	91.7
Lars	1	--	--	--	--	22	22.0	91.7
Westbred 936	2	--	--	--	18	21	19.5	88.6
Pioneer 2398	1	--	--	--	--	21	21.0	87.5
MT9311	1	--	--	--	--	21	21.0	87.5
Express	2	--	--	--	15	21	18.0	81.8

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, Newana.

Table 5. Relative proteins of spring wheat varieties as compared to Newana when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Newana
Kulm	3	--	--	15.6	17.4	17.4	16.80	110.8
Hi-Line	5	15.9	16.7	14.2	16.9	18.4	16.42	109.2
Ernest	3	--	--	14.7	16.9	18.1	16.57	109.2
Stoa	5	16.0	17.3	14.5	16.1	17.9	16.36	108.8
Westbred 936	2	--	--	--	17.5	17.8	17.65	108.0
Grandin	5	16.2	16.9	14.8	16.2	17.0	16.22	107.8
Lew	5	15.4	17.2	14.1	15.6	18.7	16.20	107.7
Westbred 926	5	15.2	16.6	13.7	16.6	18.1	16.04	106.6
McNeal	5	15.2	16.7	13.6	16.7	17.8	16.00	106.4
Keene	1	--	--	--	--	18.0	18.00	105.9
Amidon	5	15.4	16.6	14.2	16.4	16.6	15.84	105.3
Express	2	--	--	--	17.4	17.0	17.20	105.2
Lars	1	--	--	--	--	17.8	17.80	104.7
Trenton	2	--	--	--	16.4	17.5	16.95	103.7
Pioneer 2398	1	--	--	--	--	17.5	17.50	102.9
MT9311	1	--	--	--	--	17.4	17.40	102.4
MT9410	1	--	--	--	--	17.4	17.40	102.4
Sonja	1	--	--	--	--	17.3	17.30	101.8
MT9433	1	--	--	--	--	17.3	17.30	101.8
MT9503	1	--	--	--	--	17.3	17.30	101.8
Norlander	1	--	--	--	--	17.3	17.30	101.8
MT9420	1	--	--	--	--	17.2	17.20	101.2
Newana	5	14.0	15.7	12.8	15.7	17.0	15.04	100.0
Pioneer 2375	2	--	--	--	16.4	16.3	16.35	100.0
MT9565	1	--	--	--	--	17.0	17.00	100.0
Hamer	1	--	--	--	--	16.7	16.70	98.2

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, Newana.

Table 6. Agronomic characters of durum varieties grown under dryland recrop conditions at the Eastern Agricultural Research Center, Sidney, MT.

Planted: 26 April 1996 Harvested: 5 August 1996 Plot size: 60 ft^2

Cultivar	Heading date *	Height, inches	Grain protein	Test weight	Yield bu/acre
Kyle	178	24	19.7	60.6	15.5
Laker	179	23	18.2	61.2	15.1
Ben	177	23	19.1	61.7	14.6
Ward	177	24	18.4	60.8	14.5
Monroe	176	24	17.8	59.7	14.2
Munich	177	21	19.5	59.7	13.8
Renville	177	24	19.7	60.0	13.8
Plenty	178	28	18.8	59.7	13.7
Dressler	177	24	19.7	60.8	13.6
Lloyd	178	19	18.8	59.7	13.5
Medora	178	25	19.5	61.1	13.5
Voss	177	20	18.3	61.5	13.1
Crosby	179	19	19.0	58.7	13.0
Vic	178	26	19.7	59.4	12.6
Cortez	173	19	19.5	59.6	11.8
D87450	178	22	17.6	58.3	11.5
average	177.3	22.8	18.95	60.2	13.6
p-value	0.00	0.00	0.00	0.00	NS
CV (s/mean)	0.2	6.2	4.0	0.8	10.8
CV (se/mean)	0.1	3.6	2.3	0.4	6.2
$LSD_{0.05}$	0.7	2.4	1.3	0.8	--

* days from 1 January

Table 7. Relative yields of durum varieties compared to Renville when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Renville
Ben	1	--	--	--	--	14.6	14.6	105.8
Plenty	4	--	27.7	36.0	30.2	13.7	26.9	105.2
Renville	5	92.0	22.1	31.0	35.4	13.8	38.9	100.0
Kyle	3	--	--	35.1	28.6	15.5	26.4	98.8
Dressler	1	--	--	--	--	13.6	13.6	98.6
Lloyd	5	97.2	20.7	23.1	33.2	13.5	37.5	96.6
Laker	5	93.4	19.0	28.2	31.5	15.1	37.4	96.3
Crosby	5	80.9	23.3	30.4	37.4	13.0	37.0	95.2
Voss	2	--	--	--	33.4	13.1	23.2	94.5
Munich	2	--	--	--	32.3	13.8	23.0	93.7
Vic	5	79.7	21.9	31.9	35.8	12.6	36.4	93.6
Medora	5	80.1	20.2	32.6	29.7	13.5	35.2	90.6
Monroe	5	73.0	24.4	28.9	34.3	14.2	35.0	90.0
Ward	5	76.6	23.0	31.3	28.9	14.5	34.9	89.7
Cortez	1	--	--	--	--	11.8	11.8	85.5
D87450	1	--	--	--	--	11.5	11.5	83.3

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, Renville.

Table 8. Relative test weights of durum varieties as compared to Renville when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Renville
Ben	1	--	--	--	--	61.7	61.7	102.8
Voss	2	--	--	--	62.3	61.5	61.9	102.1
Dressler	1	--	--	--	--	60.8	60.8	101.3
Medora	5	63.3	54.1	60.3	61.5	61.1	60.1	101.1
Ward	5	63.0	54.3	60.2	60.5	60.8	59.8	100.6
Kyle	3	--	--	58.5	61.0	60.6	60.0	100.6
Renville	5	62.5	55.4	57.8	61.3	60.0	59.4	100.0
Monroe	5	62.8	55.3	58.8	60.3	59.7	59.4	100.0
Vic	5	62.8	53.8	59.5	61.2	59.4	59.3	99.9
Laker	5	62.8	52.9	57.5	61.7	61.2	59.2	99.7
Plenty	4	--	54.5	58.3	61.2	59.7	58.4	99.7
Munich	3	--	--	--	61.2	59.7	60.4	99.7
Cortez	1	--	--	--	--	59.6	59.6	99.3
Crosby	5	63.2	54.2	57.3	61.2	58.7	58.9	99.2
Lloyd	5	62.3	53.7	54.3	62.0	59.7	58.4	98.3
D87450	1	--	--	--	--	58.3	58.3	97.2

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, Renville.

Table 9. Relative heights of durum varieties as compared to Renville when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Renville
Kyle	3	--	--	35	31	24	30.0	109.8
Plenty	4	--	29	32	27	28	29.0	104.5
Medora	5	33	30	31	28	25	29.4	102.8
Vic	5	33	29	30	28	26	29.2	102.1
Renville	5	32	29	30	28	24	28.6	100.0
Dressler	1	--	--	--	--	24	24.0	100.0
Ward	5	32	29	29	27	24	28.2	98.6
Monroe	5	31	29	27	26	24	27.4	95.8
Ben	1	--	--	--	--	23	23.0	95.8
Laker	5	29	27	29	26	23	26.8	93.7
Crosby	5	33	28	30	22	19	26.4	92.3
D87450	1	--	--	--	--	22	22.0	91.7
Munich	2	--	--	--	25	21	23.0	88.5
Voss	2	--	--	--	24	20	22.0	84.6
Lloyd	5	26	25	25	22	19	23.4	81.8
Cortez	1	--	--	--	--	19	19.0	79.2

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, Renville.

Table 10. Relative protein contents of durum varieties as compared to Renville when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Renville
Kyle	3	--	--	15.5	19.5	19.7	18.23	105.8
Renville	5	16.2	16.0	14.9	17.1	19.7	16.78	100.0
Dressler	1	--	--	--	--	19.7	19.70	100.0
Medora	5	16.4	16.1	15.0	16.8	19.5	16.76	99.9
Vic	5	15.5	15.5	15.8	16.6	19.7	16.62	99.0
Cortez	1	--	--	--	--	19.5	19.50	99.0
Ward	5	15.5	16.0	15.8	17.2	18.4	16.58	98.8
Plenty	4	--	15.4	15.5	17.1	18.8	16.70	98.7
Munich	2	--	--	--	16.5	19.5	18.00	97.8
Crosby	5	16.3	16.6	15.4	14.7	19.0	16.40	97.7
Monroe	5	16.3	16.6	14.8	16.2	17.8	16.34	97.4
Ben	1	--	--	--	--	19.1	19.10	97.0
Laker	5	15.0	15.5	13.8	15.2	18.2	15.54	92.9
Voss	2	--	--	--	15.8	18.3	17.05	92.7
Lloyd	5	13.2	14.6	15.0	15.3	18.8	15.38	91.7
D87450	1	--	--	--	--	17.6	17.60	89.3

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, Renville.

Table 11. Agronomic characters of barley varieties grown under dryland recrop conditions at the Eastern Agricultural Research Center, Sidney, MT.

Planted: 24 April 1996 Harvested: 2 August 1996 Plot size: 60 ft^2

Cultivar	Heading date *	Height, inches	Grain protein	Test weight	Yield bu/acre
Bowman	179	19	12.9	49.8	23.2
H1851195	178	19	15.5	46.9	20.4
Stark	178	19	13.1	48.1	19.6
Piroline	178	20	15.5	47.2	19.4
Hector	179	20	14.8	46.5	18.8
Baronesse	178	17	15.4	47.4	18.5
Chinook	179	17	15.3	47.1	17.2
MT886610	178	19	15.6	46.4	17.0
Stander	177	16	14.7	43.0	16.7
Lewis	179	18	14.9	48.2	16.4
Logan	178	18	13.8	48.5	16.4
H3860224	178	18	16.0	46.4	16.3
Gallatin	177	19	15.1	46.2	15.9
Steptoe	177	17	12.7	43.9	15.8
Harrington	178	18	15.1	46.2	15.8
Targhee	179	18	15.4	45.0	15.3
average	178.1	18.3	14.75	46.7	17.7
p-value	0.00	0.05	0.00	0.00	0.05
CV (s/mean)	0.3	7.2	4.1	2.7	13.4
CV (se/mean)	0.2	4.1	2.4	1.5	7.7
$LSD_{0.05}$	0.9	2.2	1.0	2.1	3.9

* days from 1 January

Table 12. Relative yields of barley varieties compared to Gallatin when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Gallatin
H1851195	1	--	--	--	--	20.4	20.4	128.3
MT886610	1	--	--	--	--	17.0	17.0	106.9
Stander	1	--	--	--	--	16.7	16.7	105.0
Targhee	2	--	--	--	67.2	15.3	41.2	104.7
Baronesse	5	87.3	52.6	39.0	55.0	18.5	50.5	104.5
Lewis	5	93.3	41.1	40.7	59.9	16.4	50.3	104.1
Logan	1	--	--	--	--	16.4	16.4	103.1
H3860224	1	--	--	--	--	16.3	16.3	102.5
Hector	5	89.1	40.0	41.5	57.7	18.8	49.4	102.3
Gallatin	5	86.0	39.9	36.9	62.9	15.9	48.3	100.0
Stark	5	95.3	23.7	42.0	61.0	19.6	48.3	100.0
Piroline	5	82.3	42.4	36.7	57.5	19.4	47.7	98.6
Chinook	5	86.2	39.8	35.3	57.5	17.2	47.2	97.7
Harrington	5	84.5	42.9	31.7	57.2	15.8	46.4	96.1
Steptoe	5	82.5	36.0	36.9	56.0	15.8	45.4	94.0
Bowman	5	81.2	21.7	38.8	57.9	23.2	44.6	92.2
Colter	3	--	31.9	28.9	54.7	--	38.5	82.7

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 Gallatin.

Table 13. Relative test weights of barley varieties compared to Gallatin when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Gallatin
Logan	1	--	--	--	--	48.5	48.5	105.0
Piroline	5	53.7	47.5	49.0	51.7	47.2	49.8	101.9
Stark	5	53.2	47.0	50.2	50.2	48.1	49.7	101.7
Bowman	5	52.8	45.7	49.3	50.5	49.8	49.6	101.5
H1851195	1	--	--	--	--	46.9	46.9	101.5
Lewis	5	53.5	47.7	48.3	50.2	48.2	49.6	101.4
MT886610	1	--	--	--	--	46.4	46.4	100.4
H3860224	1	--	--	--	--	46.4	46.4	100.4
Chinook	5	53.8	46.3	48.1	50.0	47.1	49.1	100.3
Baronesse	5	53.5	47.0	48.0	49.3	47.4	49.0	100.3
Gallatin	5	53.3	46.7	48.0	50.3	46.2	48.9	100.0
Hector	5	53.0	46.3	48.2	50.0	46.5	48.8	99.8
Harrington	5	52.5	45.7	47.0	49.2	46.2	48.1	98.4
Targhee	2	--	--	--	49.7	45.0	47.4	98.1
Stander	1	--	--	--	--	43.0	43.0	93.1
Steptoe	5	48.2	42.8	41.5	46.7	43.9	44.6	91.2
Colter	3	--	40.7	42.2	46.7	--	43.2	89.4

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 Gallatin.

Table 14. Relative heights of barley varieties compared to Gallatin when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Gallatin
Piroline	5	28	28	22	20	20	23.6	100.9
Gallatin	5	28	26	22	22	19	23.4	100.0
Hector	5	28	26	23	20	20	23.4	100.0
H1851195	1	--	--	--	--	19	19.0	100.0
MT886610	1	--	--	--	--	19	19.0	100.0
Stark	5	27	25	23	20	19	22.8	97.4
Bowman	5	28	24	22	19	19	22.4	95.7
Logan	1	--	--	--	--	18	18.0	94.7
H3860224	1	--	--	--	--	18	18.0	94.7
Chinook	5	28	24	22	19	17	22.0	94.0
Harrington	5	26	24	21	19	18	21.6	92.3
Lewis	5	26	24	22	17	18	21.4	91.5
Steptoe	5	26	25	21	17	17	21.2	90.6
Colter	3	--	25	21	16	--	20.7	88.6
Targhee	2	--	--	--	18	18	18.0	87.8
Baronesse	5	24	23	20	17	17	20.2	86.3
Stander	1	--	--	--	--	16	16.0	84.2

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 Gallatin.

Table 15. Relative protein contents of barley varieties compared to Gallatin when grown under dryland continuous cropping conditions at EARC, Sidney, Montana, from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Gallatin
Piroline	5	13.3	14.8	13.3	14.0	15.5	14.18	106.9
H3860224	1	--	--	--	--	16.0	16.00	106.0
MT886610	1	--	--	--	--	15.6	15.60	103.3
Targhee	2	--	--	--	13.3	15.4	14.35	103.2
Baronesse	5	12.7	13.1	13.3	13.6	15.4	13.62	102.7
H1851195	1	--	--	--	--	15.5	15.50	102.6
Chinook	5	12.5	14.0	12.6	12.9	15.3	13.46	101.5
Harrington	5	12.4	13.5	12.5	13.0	15.1	13.30	100.3
Hector	5	12.4	13.6	12.6	13.0	14.8	13.28	100.2
Gallatin	5	12.5	13.8	12.2	12.7	15.1	13.26	100.0
Lewis	5	12.3	13.6	12.5	12.8	14.9	13.22	99.7
Stander	1	--	--	--	--	14.7	14.70	97.4
Bowman	5	13.0	13.8	12.0	12.6	12.9	12.86	97.0
Stark	5	12.6	13.4	11.0	12.4	13.1	12.50	94.3
Steptoe	5	12.4	12.9	11.4	12.4	12.7	12.36	93.2
Logan	1	--	--	--	--	13.8	13.80	91.4
Colter	3	--	12.3	11.2	10.7	--	11.40	88.4

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 Gallatin.

Table 16. Agronomic characters of oat varieties grown under dryland recrop conditions at the Eastern Agricultural Research Center, Sidney, MT.

Planted: 24 April 1996 Harvested: 2 August 1996 Plot size: 60 ft^2

Cultivar	Heading date *	Height, inches	Grain protein	Test weight	Yield bu/acre
Otana	178	27	9.3	33.6	44.3
Border	179	22	9.9	27.8	42.5
83AB3250	179	18	10.5	27.1	41.8
Rio Grande	175	20	10.9	29.5	41.0
Cayuse	177	20	9.6	27.0	41.0
Ajay	177	14	10.7	31.3	38.5
Monida	179	20	9.4	30.2	37.2
Appaloosa	178	21	10.1	26.1	34.5
86AB4582	176	23	10.7	29.4	34.3
Newdak	173	22	10.2	32.3	33.6
Whitestone	178	21	9.9	29.8	31.5
90AB1322	177	18	10.3	28.4	30.3
ND860416	177	24	9.6	31.3	29.8
Rodney	175	25	11.5	30.9	29.5
86AB1616	179	18	14.9	39.0	25.9
Paul	178	22	16.7	43.7	23.2
88AB3073	179	19	15.2	44.6	22.3
average	177.2	20.9	11.14	31.9	34.2
p-value	0.00	0.00	0.00	0.00	0.00
CV (s/mean)	0.3	10.1	8.3	4.8	17.7
CV (se/mean)	0.2	5.8	4.8	2.8	10.2
$LSD_{0.05}$	1.0	3.5	1.5	2.6	10.0

* days from 1 January

Table 17. Relative yields of oat varieties compared to Otana when grown under dryland continuous cropping conditions at EARC from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Otana
Monida	5	159.8	126.0	64.4	91.6	37.2	95.8	108.5
Cayuse	5	142.6	139.8	61.6	88.6	41.0	94.7	107.2
Border	5	151.0	121.8	63.3	93.5	42.5	94.4	106.9
Appaloosa	5	155.6	128.6	60.2	87.0	34.5	93.2	105.5
Rio Grande	5	140.8	124.8	78.1	80.6	41.0	93.1	105.4
Ogle	4	140.9	109.2	72.1	78.7	--	100.2	100.9
Otana	5	151.4	96.3	62.9	86.7	44.3	88.3	100.0
Newdak	5	151.0	99.0	71.5	86.2	33.6	88.3	99.9
Ajay	5	131.6	119.9	62.6	80.1	38.5	86.5	98.0
Whitestone	3	--	--	66.1	91.3	31.5	63.0	97.4
Robert	4	146.3	98.6	69.1	70.8	--	96.2	96.9
Park	4	132.9	95.0	66.3	78.9	--	93.3	93.9
Valley	4	122.5	110.0	57.2	80.0	--	92.4	93.1
Rodney	3	--	--	57.2	77.6	29.5	54.8	84.7
Paul	3	--	--	49.5	48.0	23.2	40.2	62.2

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 Otana.

Table 18. Relative test weights of oat varieties as compared to Otana when grown under dryland continuous cropping conditions at EARC from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Otana
Paul	3	--	--	45.5	45.3	43.7	44.8	118.3
Valley	4	38.0	35.3	41.5	39.5	--	38.6	100.5
Otana	5	37.2	36.2	41.3	38.8	33.6	37.4	100.0
Newdak	5	35.3	34.3	39.1	37.8	32.3	35.8	95.6
Rodney	3	--	--	39.4	37.7	30.9	36.0	95.0
Robert	4	35.3	35.3	38.6	35.7	--	36.2	94.4
Whitestone	3	--	--	40.2	37.0	29.8	35.7	94.1
Ogle	4	33.3	33.5	39.7	37.3	--	36.0	93.7
Ajay	5	32.3	33.3	36.3	38.3	31.3	34.3	93.3
Monida	5	34.5	35.0	35.7	38.5	30.2	34.8	92.9
Rio Grande	5	34.2	35.3	35.8	38.3	29.5	34.6	92.5
Park	4	33.8	31.7	38.0	37.2	--	35.2	91.7
Cayuse	5	34.5	34.0	36.0	37.2	27.0	33.7	90.2
Border	5	32.2	32.7	35.7	36.7	27.8	33.0	88.2
Appaloosa	5	33.2	31.8	34.9	36.0	26.1	32.4	86.6

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 Otana.

Table 19. Relative heights of oat varieties as compared to Otana when grown under dryland continuous cropping conditions at EARC from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Otana
Otana	5	38	37	34	30	27	33.2	100.0
Rodney	3	--	--	33	29	25	29.0	95.6
Park	4	37	36	32	27	--	33.0	95.0
Paul	3	--	--	32	28	22	27.3	90.1
Monida	5	36	35	31	26	20	29.6	89.2
Robert	4	35	34	29	25	--	30.8	88.5
Newdak	5	32	34	28	26	22	28.4	85.5
Border	5	33	33	28	24	22	28.0	84.3
Valley	4	31	31	29	25	--	29.0	83.5
Ogle	4	30	31	28	26	--	28.8	82.7
Cayuse	5	33	33	27	24	20	27.4	82.5
Whitestone	3	--	--	30	24	21	25.0	82.4
Appaloosa	5	32	32	27	24	21	27.2	81.9
Rio Grande	5	28	30	26	23	20	25.4	76.5
Ajay	5	24	26	23	18	14	21.0	63.3

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 Otana.

Table 20. Relative protein contents of oat varieties as compared to Otana when grown under dryland continuous cropping conditions at EARC from 1992-1996.

Cultivar	# of years	1992	1993	1994	1995	1996	Ave	as % of Otana
Paul	3	--	--	15.4	17.6	16.7	16.57	142.0
Rodney	3	--	--	13.9	12.9	11.5	12.77	109.4
Ajay	5	12.9	13.6	13.4	13.8	10.7	12.88	106.6
Park	4	13.0	13.6	13.7	13.4	--	13.42	105.1
Valley	4	12.7	13.9	13.5	12.9	--	11.50	103.7
Rio Grande	5	13.0	12.8	12.9	13.0	10.9	12.52	103.6
Newdak	5	12.4	13.7	13.0	12.6	10.2	12.38	102.5
Robert	4	13.0	12.9	12.6	13.3	--	12.95	101.4
Border	5	12.7	12.9	13.2	12.3	9.9	12.20	101.0
Otana	5	12.2	13.2	12.9	12.8	9.3	12.08	100.0
Ogle	4	12.2	13.0	12.8	13.0	--	12.75	99.8
Appaloosa	5	12.1	12.3	13.3	12.0	10.1	11.96	99.0
Whitestone	3	--	--	12.2	12.3	9.9	11.47	98.3
Monida	5	11.9	12.2	12.6	12.6	9.4	11.74	97.2
Cayuse	5	11.8	12.4	12.5	12.2	9.6	11.70	96.9

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 Otana.