

Project Title: Small grain variety testing under continuous cropping conditions.

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Objective: To determine the best adapted varieties of spring wheat, durum, barley and oats for production under continuous cropping conditions.

Materials and Methods: The experiments reported under this project are all of the replicated small plot type. The three-year crop rotation is small grain, small grain nursery plots, and safflower. Bromoxynil at a rate of 1 pt/acre with 2,4-D at a rate of .5 pt/acre is used for broadleaf weed control in the spring wheat 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 nursery plots. However, volunteer small grain has been a problem in nursery plots.

Soil tests in the fall of 1990 indicated sufficient residual N, so that no N fertilizer was applied. The small grain plots were planted on April 24. Total moisture received during the crop year (September 1, 1990 through August 1991) was 15.18 inches. Stored soil moisture just prior to planting was 20 inches. Precipitation during the growing season (April 1 to July 31) was 11.49 inches.

Results: Agronomic data for continuous cropped spring wheat, durum, barley, and oats are in Tables 1, 6, 11, and 16 respectively. Average yields were 17.2 bu/acre for spring wheat, 11.7 bu/acre for durum, 24.5 bu/acre for barley, and 30.3 bu/acre for oats. Bread wheat outyielded durum under continuous cropping conditions, as reported in previous years.

There were no significant differences in yield among the spring wheat varieties tested (Table 1). Five-year summaries for yield, test weight, plant height, and protein content are shown in Tables 2 through 5. The highest yielding spring wheats cultivar under continuous cropping with at least three years of testing are Westbred Rambo, Glenman, and HiLine (Table 2).

There were no significant differences in yield among the twelve durum varieties tested (Table 6). Five-year summaries for yield, test weight, plant height, and protein content are shown in Tables 7 through 10. The highest yielding durum cultivars under continuous cropping with at least three years of testing are Sceptre, Westbred Laker, and Ward (Table 7).

No spring barley varieties yielded significantly more than the check cultivar, Hector, but Clark, Bearpaw, Excel, Harrington, Stark, and Shonkin yielded significantly less than Hector (Table 11). Five-year summaries for yield, test weight, plant height, and protein content are shown in Tables 12 through 15. The highest yielding barley cultivars under continuous cropping with at least three years of testing are Steptoe and Hector (Table 12).

There were no significant differences in yield among the twelve oat cultivars tested (Table 16). Five-year summaries for yield, test weight, plant height, and protein content are shown in Tables 17 through 20. The highest yielding oat cultivars under continuous cropping with at least three years of testing are Otana and Appaloosa (Table 17).

Table 1. Agronomic data obtained from a dryland spring wheat variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1991.

Date seeded: April 24, 1991

Date harvested: August 2, 1991

Plot size: 80 sq. ft.¹

CI or Sel. #	Variety	heading date ²	height inches	grain protein percent	test weight lb/bu	Yield bu/ac
WA 6920	Penawawa	170	22	15.9	58.8	19.5
CI 17790	Len	169	24	17.4	58.4	19.2
PI 483235	Glenman	171	24	17.3	57.4	18.5
C982-324	Westbred Rambo	172	22	17.5	59.4	18.4
ND 626	Grandin	169	24	17.0	59.7	18.4
CI 17904	Owens	170	22	16.1	58.6	18.2
ND 582	Stoa	170	26	17.5	58.0	18.1
CI 13596	Fortuna	170	23	17.4	58.3	18.0
CI 17429	Lew	172	25	17.5	57.8	17.7
CANLANCER	Lancer	171	29	18.2	57.7	17.5
MT 8402	HiLine	170	24	18.1	58.9	17.3
CI 17430	Newana	172	22	17.7	58.9	17.1
ND 618	Gus	171	22	17.8	58.8	16.8
ND 606	Amidon	170	25	17.3	57.1	16.6
CI 17828	Pondera	169	23	18.2	59.3	16.3
	Nordic	171	25	17.1	59.8	15.9
CI 15930	Olaf	171	25	17.7	59.1	15.6
	PN 2375	170	23	17.2	60.1	15.2
NDCUT	Cutless	169	21	17.9	59.2	15.1
WPB 926	Westbred 926	168	24	17.7	59.0	14.5

Table 1. Agronomic data obtained from a dryland spring wheat variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1991. (continued).

Mean grain yield for experiment = 17.2 bu/acre

F-value for variety comparisons = 1.23 (not significant at any level)

SE_x = 1.28 bu/acre

CV (SE/mean) = 7.44%

CV (S/mean) = 12.89%

¹Four-row plots, rows 20 feet long and one foot apart. Harvested plot size was 32 sq. ft., two 16 foot rows harvested from the two center rows for yield, test weight, and protein determinations.

²Heading dates are number of days from January 1. 170 = June 19.

Newana is the check variety for this nursery, with an average yield of 17.1 bu/acre.

Previous crop: spring wheat

Soil type: Williams loam

Fertilizer: No fertilizer was applied to this nursery due to residual fertilizer left from previous applications.

Herbicide: 1.5 pt per acre Bronate applied May 29, 1991

Precipitation for average crop year = 13.50 inches. Precipitation for 1991 crop year = 15.18 inches. Crop year considered to be from September 1, 1990, through harvest 1991.

Precipitation from April 1 - July 31 in 1991 = 11.49 inches. Average precipitation for same period = 7.74 inches.

Table 2. Relative yielding abilities of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average yield bu/acre	yield as % of Newana
Westbred Rambo	4	--	28.2	4.1	21.6	18.4	18.1	117.0
Glenman	5	39.7	24.4	6.8	24.4	18.5	22.8	115.5
HiLine	3	--	--	7.6	21.2	17.3	15.4	112.4
Stoa	5	42.2	21.0	6.7	22.1	18.1	22.0	111.8
Grandin	4	--	17.7	11.2	21.3	18.4	17.2	111.0
Lew	5	39.0	23.3	5.6	22.9	17.7	21.7	110.2
Olaf	3	--	--	6.4	22.9	15.6	15.0	109.5
Gus	3	--	--	9.2	18.7	16.8	14.9	109.0
Amidon	4	--	17.2	8.0	24.6	16.6	16.6	107.4
Lancer	4	--	20.1	6.6	21.7	17.5	16.5	106.6
Westbred 926	2	--	--	--	22.5	14.5	18.5	106.3
Cutless	3	--	--	5.8	21.9	15.1	14.3	104.4
Pondera	5	31.9	20.5	7.3	25.8	16.3	20.4	103.4
Len	5	29.8	20.1	8.8	23.4	19.2	20.3	102.8
Newana	5	36.7	20.8	6.2	17.7	17.1	19.7	100.0
Fortuna	5	35.2	10.3	7.3	23.7	18.0	18.9	95.9
Nordic	1	--	--	--	--	15.9	15.9	93.0
PN 2375	1	--	--	--	--	15.2	15.2	88.9

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.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 3. Relative test weights of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average test weight lb/bu	test weight as % of Newana
PN 2375	1	--	--	--	--	60.1	60.1	102.0
Nordic	1	--	--	--	--	59.8	59.8	101.5
Westbred 926	2	--	--	--	58.8	59.0	58.9	100.3
Newana	5	62.5	62.5	59.1	58.6	58.9	60.3	100.0
Westbred Rambo	4	--	62.5	57.4	59.9	59.4	59.8	100.0
Pondera	5	62.5	61.5	58.4	59.9	59.3	60.3	100.0
Olaf	3	--	--	58.1	58.6	59.1	58.6	99.5
Cutless	3	--	--	57.1	59.6	59.1	58.6	99.5
Lancer	4	--	61.5	58.9	59.0	57.7	59.3	99.2
Lew	5	63.0	61.0	57.2	59.9	57.8	59.8	99.1
Fortuna	5	62.0	60.6	58.3	59.3	58.3	59.7	99.0
Grandin	4	--	63.5	55.8	57.7	59.7	59.2	99.0
HiLine	3	--	--	57.4	58.3	58.9	58.2	98.9
Stoa	5	62.0	61.5	57.8	58.9	58.0	59.6	98.9
Amidon	4	--	61.5	58.5	59.0	57.1	59.0	98.7
Gus	3	--	--	55.6	58.6	58.8	57.7	98.0
Glenman	5	61.0	60.0	55.3	59.0	57.4	58.5	97.0
Len	5	60.0	60.5	54.4	58.0	58.4	58.3	96.6

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, Newana.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 4. Relative heights of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average height inches	height as % of Newana
Lancer	4	--	24	15	25	29	23.2	114.8
Nordic	1	--	--	--	--	25	25.0	113.6
Grandin	4	--	20	19	26	24	22.2	109.9
Lew	5	25	24	16	24	25	23.2	109.4
Amidon	4	--	20	16	24	25	21.2	104.9
Stoa	5	26	21	15	23	26	22.2	104.7
PN 2375	1	--	--	--	--	23	23.0	104.5
Fortuna	5	27	20	16	24	23	22.0	103.8
Glenman	5	25	21	15	23	24	21.6	101.9
Newana	5	25	20	15	24	22	21.2	100.0
HiLine	3	--	--	15	21	24	20.0	98.4
Olaf	3	--	--	13	22	25	20.0	98.4
Pondera	5	23	18	16	24	23	20.8	98.1
Westbred 926	2	--	--	--	21	24	22.5	97.8
Len	5	24	19	15	24	24	20.6	97.2
Cutless	3	--	--	14	24	21	19.7	96.7
Gus	3	--	--	15	20	22	19.0	93.4
Westbred Rambo	4	--	17	12	22	22	18.2	90.1

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, Newana.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 5. Relative protein contents of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average protein percent	protein as % of Newana
Gus	3	--	--	20.5	17.8	17.8	18.7	106.5
HiLine	3	--	--	20.1	17.6	18.1	18.6	105.9
Westbred 926	2	--	--	--	18.0	17.7	17.8	104.7
Cutless	3	--	--	20.0	17.2	17.9	18.4	104.6
Pondera	5	14.4	17.6	20.4	17.4	18.2	17.6	104.6
Stoa	5	15.6	17.6	19.4	17.4	17.5	17.5	104.0
Fortuna	5	16.1	18.2	18.9	16.1	17.4	17.3	103.1
Grandin	4	--	17.6	19.7	17.7	17.0	18.0	102.7
Lancer	4	--	17.4	19.0	17.3	18.2	18.0	102.6
Olaf	3	--	--	19.0	17.2	17.7	18.0	102.3
Lew	5	14.9	16.3	20.0	17.0	17.5	17.1	101.9
Len	5	13.7	17.2	20.5	16.9	17.4	17.1	101.9
Amidon	4	--	18.3	19.0	16.4	17.3	17.8	101.3
Newana	5	14.0	17.4	18.6	16.4	17.7	16.8	100.0
Westbred Rambo	4	--	17.2	18.5	16.7	17.5	17.5	99.7
Glenman	5	13.6	15.9	19.7	16.5	17.3	16.6	98.7
PN 2375	1	--	--	--	--	17.2	17.2	97.2
Nordic	1	--	--	--	--	17.1	17.1	96.6

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

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 6. Agronomic data obtained from a dryland durum variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1991.

Date seeded: April 24, 1991

Date harvested: August 1, 1991

Plot size: 80 sq. ft.¹

CI or Sel. #	Variety	heading date ²	height inches	grain protein percent	test weight lb/bu	Yield bu/ac
DT 433	Medora	170	22	20.1	57.8	13.8
DT 380	Sceptre	171	21	20.1	57.9	13.3
CI 17282	Crosby	170	22	19.9	57.8	13.3
PI 510696	Renville	171	24	21.2	59.3	12.7
PI 478289	Monroe	169	23	19.2	57.8	12.7
PI 15892	Ward	171	24	19.8	57.9	12.6
PI 476211	Lloyd	172	21	20.4	55.9	11.5
CI 17789	Vic	171	23	19.7	58.9	10.3
PI 15326	Rolette	169	23	20.2	59.8	10.2
WPBLAKER	Westbred Laker	173	22	19.6	59.8	8.9
CI 17438	Cando	171	21	20.6	58.6	8.9

Mean grain yield for experiment = 11.7 bu/acre

F-value for variety comparisons = 1.82 (not significant at any level)

SEX = 1.33 bu/acre

CV (SE/mean) = 11.44%

CV (S/mean) = 19.82%

¹Four-row plots, rows 20 feet long and one foot apart. Harvested plot size was 32 sq. ft., two 16 foot rows harvested from the two center rows for yield, test weight, and protein determinations.

²Heading dates are number of days from January 1. 171 = June 20.

Ward is the check variety for this nursery, with an average yield of 12.6 bu/acre.

Previous crop: spring wheat

Soil type: Williams loam

Fertilizer: No fertilizer was applied to this nursery due to residual fertilizer left from previous applications.

Herbicide: 1.5 pt per acre Bronate applied May 29, 1991

Precipitation for average crop year = 13.50 inches. Precipitation for 1991 crop year = 15.18 inches. Crop year considered to be from September 1, 1990, through harvest 1991.

Precipitation from April 1 - July 31 in 1991 = 11.49 inches. Average precipitation for same period = 7.74 inches.

Table 7. Relative yielding abilities of durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average yield bu/acre	yield as % of Ward
Sceptre	4	--	28.2	5.4	12.0	13.3	14.7	104.4
Westbred Laker	4	--	35.6	3.5	9.4	8.9	14.4	101.8
Ward	5	2.8	25.2	4.4	14.2	12.6	11.8	100.0
Vic	4	--	28.8	5.2	10.8	10.3	13.8	97.7
Renville	3	--	--	3.7	12.1	12.7	9.5	91.3
Monroe	4	--	20.4	6.5	11.7	12.7	12.8	91.0
Stockholm	3	--	20.3	4.4	14.3	--	13.0	89.0
Lloyd	5	3.2	23.2	5.0	8.0	11.5	10.2	86.0
Crosby	4	--	19.7	6.2	8.3	13.3	11.9	84.2
Medora	4	--	18.8	4.0	8.8	13.8	11.4	80.5
Rolette	4	--	10.0	5.7	7.6	10.2	8.4	59.4
Cando	5	2.3	9.3	0.9	4.7	8.9	5.2	46.3

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, Ward.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 8.: Relative test weights of durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average test weight lb/bu	test weight as % of Ward
Westbred Laker	4	--	62.5	56.7	61.7	59.8	60.2	101.9
Vic	4	--	63.6	58.4	59.9	58.9	60.2	101.9
Stockholm	3	--	63.3	57.9	60.3	--	60.5	101.8
Rolette	4	--	61.4	59.3	59.9	59.8	60.1	101.8
Medora	4	--	62.4	57.7	59.2	57.8	59.3	100.4
Sceptre	4	--	62.7	57.3	59.2	57.9	59.3	100.4
Cando	4	56.3	63.0	--	58.5	58.6	59.1	100.1
Ward	5	56.9	62.8	57.0	58.5	57.9	58.6	100.0
Crosby	4	--	62.5	56.6	58.7	57.8	58.9	99.7
Monroe	4	--	61.5	57.1	57.1	57.8	58.4	98.9
Lloyd	5	55.7	62.6	56.5	59.0	55.9	57.9	98.7
Renville	3	--	--	54.7	59.6	59.3	57.9	96.9

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, Ward.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 9. Relative heights of durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average height inches	height as % of Ward
Ward	5	17	20	17	23	24	20.2	100.0
Rolette	4	--	19	18	22	23	20.5	97.6
Medora	4	--	20	18	21	22	20.3	96.4
Crosby	4	--	19	17	23	22	20.3	96.4
Renville	3	--	--	15	22	24	20.3	95.3
Vic	4	--	19	16	22	23	20.0	95.2
Westbred Laker	4	--	20	16	21	22	19.8	94.0
Monroe	4	--	18	16	22	23	19.8	94.0
Sceptre	4	--	18	15	21	21	18.8	89.3
Stockholm	3	--	17	14	21	--	17.3	86.7
Lloyd	5	13	16	14	20	21	16.8	83.2
Cando	5	13	17	11	19	21	16.2	80.2

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, Ward.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 10. Relative protein contents of durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average protein percent	protein as % of Ward
Renville	3	--	--	22.1	20.4	21.2	21.2	106.0
Sceptre	4	--	21.0	21.6	20.3	20.1	20.8	103.4
Medora	4	--	20.8	20.9	20.7	20.1	20.6	102.7
Rolette	4	--	20.5	21.1	20.6	20.2	20.6	102.6
Crosby	4	--	19.7	21.6	20.4	19.9	20.4	101.6
Cando	5	20.6	20.4	19.6	18.9	20.6	20.0	100.2
Ward	5	19.6	20.2	20.8	19.5	19.8	20.0	100.0
Lloyd	5	20.6	19.4	20.4	19.0	20.4	20.0	99.0
Monroe	4	--	19.1	21.3	20.5	19.2	20.0	99.0
Vic	4	--	19.7	20.1	19.1	19.7	19.7	97.9
Stockholm	3	--	19.2	20.2	17.9	--	19.1	94.7
Westbred Laker	4	--	17.6	20.0	18.4	19.6	18.9	94.1

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

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 11. Agronomic data obtained from a dryland spring barley variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1991.

Date seeded: April 24, 1991

Date harvested: July 31, 1991

Plot size: 80 sq. ft.¹

CI or Sel. #	Variety	heading date ²	height inches	grain protein percent	test weight lb/bu	Yield bu/ac
CI 15856	Lewis	170	22	14.6	50.4	30.5
CI 15514	Hector	170	24	14.8	51.3	28.6
NS 78054	Baronesse	171	19	15.5	47.5	27.6
CI 15229	Steptoe	168	19	13.3	47.1	27.3
Pi 483237	Bowman	168	20	14.2	50.2	26.6
MT 140523	MT 140523	172	20	15.2	50.4	25.8
PI 491534	Gallatin	170	21	15.1	50.1	25.7
CI 9558	Piroline	169	22	15.8	48.1	25.2
CI 15857	Clark	171	19	15.1	50.2	23.1x
PI 531228	Bearpaw	172	21	15.1	46.1	22.9x
MN 52	Excel	169	18	14.5	47.8	22.3x
SK 76333	Harrington	172	22	15.2	46.0	20.3xx
ND 9866	Stark	170	23	14.4	50.9	20.2xx
MTSU 247	Shonkin	172	23	16.9	53.4	16.9xx

Mean grain yield for experiment = 24.5 bu/acre

F-value for variety comparisons = 4.31. (significant at p=0.05 and 0.01)

SE_x = 1.80 bu/acre

CV (SE/mean) = 7.36%

CV (S/mean) = 12.74%

¹Four-row plots, rows 20 feet long and one foot apart. Harvested plot size was 32 sq. ft., two 16 foot rows harvested from the two center rows for yield, test weight, and protein determinations.

²Heading dates are number of days from January 1. 173 = June 22.

Hector is the check variety for this nursery, with an average yield of 28.6 bu/acre.

Previous crop: spring wheat

Soil type: Williams loam

Fertilizer: No fertilizer was applied to this nursery due to residual fertilizer left from previous applications.

Herbicide: 1.5 pt per acre Bronate applied May 29, 1991

Precipitation for average crop year = 13.50 inches. Precipitation for 1991 crop year = 15.18 inches. Crop year considered to be from September 1, 1990, through harvest 1991.

Precipitation from April 1 - July 31 in 1991 = 11.49 inches. Average precipitation for same period = 7.74 inches.

x Indicates significantly lower yield than check variety, Hector, at probability of 0.05.

xx Indicates significantly lower yield than check variety, Hector, at probability of 0.01.

Table 12. Relative yielding abilities of barley varieties as compared to Hector when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average yield bu/acre	yield as % of Hector
Steptoe	5	62.7	27.2	24.2	22.5	27.3	32.8	101.3
Hector	5	61.2	30.2	20.2	21.6	28.6	32.4	100.0
MT 140523	3	--	--	19.0	24.4	25.8	23.1	98.3
Baronesse	1	--	--	--	--	27.6	27.6	96.5
Bowman	5	57.7	25.3	2.8	21.4	26.6	30.4	93.8
Lewis	5	55.3	20.8	18.3	26.1	30.5	30.2	93.3
Gallatin	5	53.9	27.0	17.8	24.3	25.7	29.7	91.9
Clark	5	53.9	23.0	17.9	27.7	23.1	29.1	90.0
Piroline	5	50.6	23.5	17.2	22.9	25.2	27.9	86.2
Stark	2	--	--	--	22.2	20.2	21.2	84.5
Excel	1	--	--	--	--	22.3	22.3	78.0
Bearpaw	4	--	23.1	8.7	18.0	22.9	18.2	72.3
Harrington	5	60.4	21.3	7.5	15.1	20.3	22.1	68.4

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, Hector.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 13. Relative test weights of barley varieties as compared to Hector when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average test weight lb/bu	test weight as % of Hector
Stark	2	--	--	--	50.2	50.9	50.6	101.8
Lewis	5	51.5	51.5	47.5	49.1	50.4	50.0	100.5
Hector	5	52.5	51.5	45.5	48.0	51.3	49.8	100.0
Gallatin	5	51.5	52.0	46.0	48.6	50.1	49.6	99.8
MT 140523	3	--	--	44.5	47.7	50.4	47.5	98.5
Clark	5	50.5	50.5	44.0	47.2	50.2	48.5	97.4
Bowman	5	53.0	42.0	48.0	49.0	50.2	48.4	97.3
Pirolina	5	51.0	50.5	43.0	48.2	48.1	48.2	96.8
Bearpaw	4	--	49.5	45.5	47.7	46.1	47.2	96.2
Harrington	5	50.5	50.0	45.2	46.9	46.0	47.4	95.9
Excel	1	--	--	--	--	47.8	47.8	93.2
Baronesse	1	--	--	--	--	47.5	47.5	92.6
Stephoe	5	47.5	48.5	39.0	41.9	47.1	44.8	90.0

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, Hector.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 14. Relative heights of barley varieties as compared to Hector when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average height inches	height as % of Hector
Stark	2	--	--	--	20	23	21.5	102.4
Hector	5	25	18	20	18	24	21.0	100.0
Bowman	5	24	17	19	19	20	19.8	94.3
Gallatin	5	24	18	17	18	21	19.6	93.3
Lewis	5	23	17	17	18	22	19.4	92.4
Piroline	5	24	17	17	17	22	19.4	92.4
Clark	5	23	16	17	17	19	18.4	87.6
MT 140523	3	--	--	16	18	20	18.0	87.1
Harrington	5	23	15	15	16	22	18.2	86.7
Bearpaw	4	--	17	15	16	21	17.2	86.2
Steptoe	5	19	15	19	18	19	18.0	85.7
Baronesse	1	--	--	--	--	19	19.0	79.2
Excel	1	--	--	--	--	18	18.0	75.0

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, Hector.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 15. Relative protein contents of barley varieties as compared to Hector when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average protein percent	protein as % of Hector
Piroline	5	13.0	17.3	20.6	17.0	15.8	16.7	105.3
Baronesse	1	--	--	--	--	15.5	15.5	104.7
Harrington	5	12.7	16.1	20.5	17.5	15.2	16.4	103.1
Bearpaw	4	--	15.8	21.4	16.7	15.1	17.3	102.8
MT 140523	3	--	--	20.6	17.6	15.2	17.8	102.7
Lewis	5	12.6	16.1	20.4	17.1	14.6	16.2	101.6
Gallatin	5	13.3	16.1	20.5	15.1	15.1	16.0	100.8
Clark	5	12.3	16.1	20.5	16.0	15.1	16.0	100.6
Hector	5	12.4	15.1	20.1	17.1	14.8	15.9	100.0
Excel	1	--	--	--	--	14.5	14.5	98.0
Stark	2	--	--	--	16.1	14.4	15.3	95.6
Bowman	5	12.1	14.4	17.6	17.3	14.2	15.1	95.1
Steptoe	5	11.1	12.5	14.2	15.9	13.3	13.4	84.3

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

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 16. Agronomic data obtained from a dryland oat variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1991.

Date seeded: April 24, 1991

Date harvested: July 30, 1991

Plot size: 80 sq. ft.¹

CI or Sel. #	Variety	heading date ²	height inches	grain protein percent	test weight lb/bu	Yield bu/ac
CI 8263	Cayuse	173	26	14.1	29.8	38.5
CI 467882	Border	174	22	14.5	30.9	32.7
CI 483126	Monida	176	24	14.3	30.1	32.1
CI 9297	Appaloosa	174	23	14.4	30.2	31.3
CI 9252	Otana	174	25	14.6	36.4	31.3
W 80474	Riel	173	26	14.6	35.7	30.4
OT 308	Calibre	175	26	14.3	31.7	30.0
ND 820603	Valley	173	24	14.6	34.4	29.9
W 82056	Robert	174	27	14.7	34.4	29.1
CI 9401	Ogle	168	23	14.1	34.0	27.3
CI 6611	Park	173	26	15.3	30.4	26.6
SD 810109	Trucker	170	25	15.6	37.8	24.3

Mean grain yield for experiment = 30.3 bu/acre

F-value for variety comparisons = 1.75 (not significant at any level)

SE_x = 2.68 bu/acre

CV (SE/mean) = 8.84%

CV (S/mean) = 15.31%

¹Four-row plots, rows 20 feet long and one foot apart. Harvested plot size was 32 sq. ft., two 16 foot rows harvested from the two center rows for yield, test weight, and protein determinations.

²Heading dates are number of days from January 1. 173 = June 22.

Otana is the check variety for this nursery, with an average yield of 31.3 bu/acre.

Previous crop: spring wheat

Soil type: Williams loam

Fertilizer: No fertilizer was applied to this nursery due to residual fertilizer left from previous applications.

Herbicide: 1.5 pt per acre Bronate applied May 29, 1991

Insecticide: None

Precipitation for average crop year = 13.50 inches. Precipitation for 1991 crop year = 15.18 inches. Crop year considered to be from September 1, 1990, through harvest 1991.

Precipitation from April 1 - July 31 in 1991 = 11.49 inches. Average precipitation for same period = 7.74 inches.

Table 17. Relative yielding abilities of oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average yield bu/acre	yield as % of Otana
Otana	5	89.6	59.8	24.8	27.9	31.3	46.7	100.0
Appaloosa	5	91.9	58.4	26.2	23.6	31.3	46.3	99.1
Cayuse	5	80.0	67.7	25.8	18.3	38.5	46.1	98.7
Monida	5	90.6	59.3	21.5	23.2	32.1	45.3	97.1
Border	5	88.3	55.2	23.6	25.9	32.7	45.1	96.7
Valley	4	79.2	53.9	22.4	--	29.9	46.4	90.2
Ogle	5	70.0	50.9	27.2	26.9	27.3	40.5	86.7
Calibre	5	88.2	53.3	11.0	17.0	30.0	39.9	85.5
Park	5	78.1	54.6	16.3	17.8	26.6	38.7	82.9
Riel	5	74.2	40.1	21.7	21.6	30.4	37.6	80.5
Trucker	3	--	--	24.7	16.2	24.3	21.7	77.6
Robert	3	--	--	19.9	15.1	29.1	21.4	76.3

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, Otana.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 18. Relative test weights of oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average test weight lb/bu	test weight as % of Otana
Trucker	3	--	--	35.0	35.6	37.8	36.1	110.2
Riel	5	39.0	38.5	33.5	35.0	35.7	36.3	103.6
Otana	5	40.0	37.0	28.0	34.0	36.4	35.1	100.0
Valley	4	40.0	37.0	30.0	--	34.4	35.4	100.0
Ogle	5	36.5	34.0	29.0	31.5	34.0	33.0	94.1
Robert	3	--	--	26.5	29.0	34.4	30.0	91.4
Calibre	5	37.5	39.0	21.0	29.5	31.7	31.7	90.5
Monida	5	38.0	36.0	25.5	29.0	30.1	31.7	90.4
Border	5	37.5	34.5	24.0	29.0	30.9	31.2	88.9
Park	5	38.0	34.0	24.5	28.0	30.4	31.0	88.3
Cayuse	5	36.0	34.0	24.5	28.5	29.8	30.6	87.1
Appaloosa	5	36.0	31.0	24.5	27.5	30.2	29.8	85.1

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.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 19. Relative heights of oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average height inches	height as % of Otana
Trucker	3	--	--	35	21	25	27.0	122.7
Otana	5	34	26	20	21	25	25.2	100.0
Calibre	5	31	27	19	20	26	24.6	97.6
Robert	3	--	--	18	19	27	21.3	97.0
Riel	5	33	24	20	19	26	24.4	96.8
Park	5	30	24	18	19	26	23.4	92.9
Monida	5	29	23	17	19	24	22.4	88.9
Cayuse	5	26	24	16	17	26	21.8	86.5
Appaloosa	5	27	22	17	18	23	21.4	84.9
Valley	4	26	21	17	--	24	22.0	83.8
Ogle	5	24	21	18	19	23	21.0	83.3
Border	5	27	21	16	17	22	20.6	81.7

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.

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.

Table 20. Relative protein contents of oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1986-1991 period.

Variety	number of years	1986	1987	1989	1990	1991	average protein percent	protein as % of Otana
Trucker	3	--	--	17.4	15.1	15.6	16.0	108.6
Park	5	14.6	15.5	16.2	14.4	15.3	15.2	103.4
Riel	5	14.7	15.3	16.1	14.4	14.6	15.0	102.2
Otana	5	13.9	15.3	15.5	14.2	14.6	14.7	100.0
Valley	3	--	14.8	15.8	--	14.6	15.1	99.6
Border	5	13.5	15.5	15.6	14.0	14.5	14.6	99.5
Robert	3	--	--	15.4	13.8	14.7	14.6	99.1
Ogle	5	13.4	14.7	15.6	13.9	14.1	14.3	97.6
Appaloosa	5	12.3	14.6	15.9	14.0	14.4	14.2	96.9
Cayuse	5	12.8	14.1	15.4	13.8	14.1	14.0	95.5
Monida	5	12.7	14.3	14.6	13.5	14.3	13.9	94.4
Calibre	5	12.9	14.2	13.8	14.1	14.3	13.9	94.3

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

NOTE: No continuous cropped nurseries were harvested in 1988 because of severe drought.