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

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Objective: To determine which varieties of spring wheat, durum, barley and oats are most adapted 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 spring wheat or barley, small grain nursery plots, and safflower. Bromoxynil at a rate of 1 pt/ac with 2,4-D at a rate of .5 pt/ac is used for broadleaf weed control in the spring wheat and trifluralin at a rate of 1.5 pt/ac is used in the safflower. This weed control and crop rotation have been effective in controlling weeds in the nursery plots. However, volunteer spring wheat has been a problem in nursery plots during drier seasons.

Soil tests in the fall of 1989 indicated sufficient residual N, so that no N fertilizer was applied. The small grain plots were planted on April 5.

Total moisture received during the crop year (September 1, 1989 through August 1990) was 11.74 inches. Stored soil moisture just prior to planting was 20 inches. Precipitation during the growing season was 6.41 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 22.7 bu/ac for spring wheat, 10.2 bu/ac for durum, 21.8 bu/ac for barley, and 20.8 bu/ac for oats. As reported in previous years, bread wheat outyielded durum under continuous cropping conditions.

Bread wheats Pondera, Amidon, and Glenman, and soft white wheat Penewawa yielded significantly more than the check cultivar, Newana (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 Glenman and Westbred Rambo (Table 2).

Stockholm was the highest yielding durum cultivar with 14.3 bu/ac (Table 6). Six cultivars, Westbred Laker, Medora, Crosby, Lloyd, Rolette, and Cando, yielded significantly less than the check cultivar, Ward. 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 Westbred Laker and Sceptre (Table 7).

Lewis and Clark were the only barley cultivars that yielded significantly higher than the check cultivar of Hector, with yields of 27.7 bu/ac and 26.1 bu/ac respectively. Bearpaw, Crystal, and Harrington yielded significantly less (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.

Otana, the check cultivar, was the highest yielding oat cultivar (Table 16). Monida, Riel, Cayuse, Park, Calibre, Dumont, Trucker, and Robert yielded significantly less than Otana. Five-year summaries for yield, test weight, and plant height, and and a four-year summary for 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 1 Agronomic data obtained from a dryland spring wheat variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1990.

Date Seeded: April 5, 1990 Date Harvested: July 18, 1990 Size of Plot: 72 Sq. Ft.1/

C.I. or Sel. No.	Variety	Average Heading Date 2/	Average Height Inches	Average Protein Content Percent	Average Test Weight Lbs/Bu	Average Yield Bu/Acre
WA 6920	Penawawa	167.7	21.1	16.1	58.3	29.0
CI 17828	Pondera	165.7	23.6	17.4	59.9	25.8
ND 606	Amidon	167.3	23.8	16.4	59.0	24.6
PI483235	Glenman	168.3	22.5	16.5	59.0	24.5
CI 13596	Fortuna	166.3	24.3	16.1	59.3	23.7
CI 17910	Alex	169.3	25.9	17.3	60.9	23.6
CI 17790	Len	164.0	20.9	16.9	58.0	23.4
CI 17904	Owens	166.7	21.9	16.6	58.7	23.2
CI 15930	Olaf	167.0	21.5	17.2	58.6	22.9
CI 17429	Lew	168.0	23.9	17.0	59.9	22.9
WPB 926R	Westbred 926R	163.3	21.0	18.0	58.8	22.5
ND 582	Stoa	167.0	23.0	17.4	58.9	22.1
WPB 906R	Westbred 906R	164.0	21.5	18.0	58.7	22.1
NDCUT	Cutless	169.0	24.0	17.2	59.6	21.9
CANLANC	Lancer	167.3	24.6	17.3	59.0	21.7
C982-324	Rambo	168.0	22.1	16.7	59.4	21.6
ND 626	Grandin	166.3	25.9	17.7	57.7	21.3
MT 8402	MT7336/Shortana	165.0	21.4	17.6	58.3	21.2
ND 618	Gus	167.3	20.4	17.8	58.6	18.7
CI 17430	Newana	169.3	24.2	16.4	60.7	17.7

(continued)

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, 1990. (continued)

Mean grain yield for experiment = 2.27 bushels per acre
F-Value for variety comparisons = 1.20 (not significant at any level)
S.E.x. = 2.17 bushels per acre
C.V. (SE/Mean) = 9.56%
C.V. (S/Mean) = 16.55%

1/ 4 row plots, rows 18 feet long and 1.0 ft. apart. At harvest, two 16 ft. rows were harvested from the two center rows for yield, test weight, and protein determinations.

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

NOTE: Newana is considered to be the check variety for this nursery with an average yield of 17.7 bushels/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 pint per acre Bronate applied May 31, 1990.

Insecticide: None

Precipitation for average crop year = 13.50 inches. Precipitation for 1990 crop year = 11.74 inches. Crop year considered to be from September 1, 1989 through harvest 1990.

Precipitation for April 1 - July 31 period during 1990 = 6.41 inches. Average precipitation for same period = 7.69 inches.

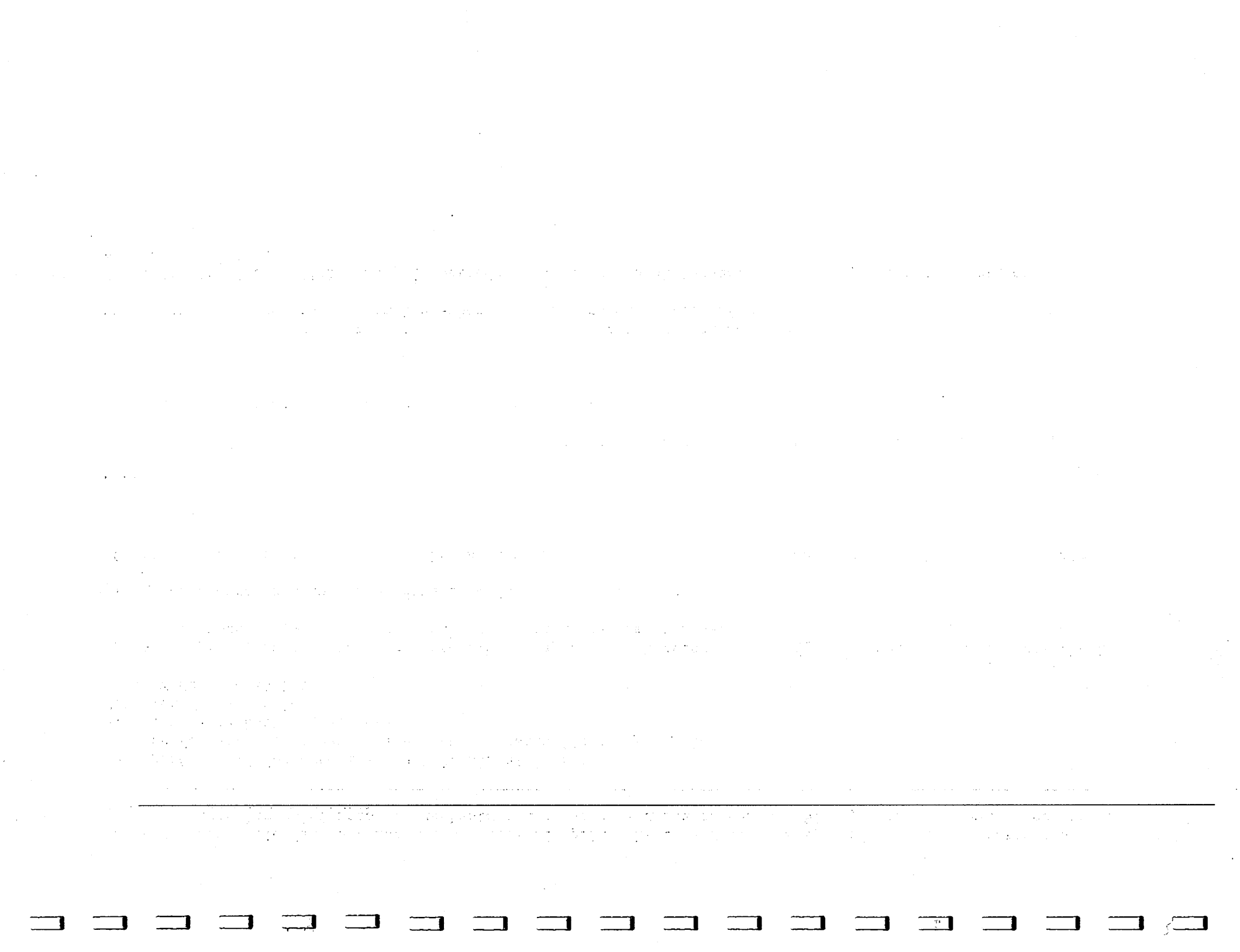

Table 2 Relative yielding ability of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1985 - 1990 period.

Variety	Number of Years	Year Grown					Average Yield Bu/Acre	Yield in % of Newana Same Trials
		1985	1986	1987	1989	1990		
Westbred 926	1	--	--	--	--	22.5	22.5	127.1
Westbred 906R	2	--	--	--	7.7	22.1	14.9	124.7
Olaf	2	--	--	--	6.4	22.9	14.7	122.6
Glenman	5	7.7	39.7	24.4	6.8	24.4	20.6	122.5
Westbred Rambo	3	--	--	28.2	4.1	21.6	18.0	120.6
MT 8402	2	--	--	--	7.6	21.2	14.4	120.5
Gus	2	--	--	--	9.2	18.7	14.0	116.7
Cutless	2	--	--	--	5.8	21.9	13.9	115.9
Stoa	5	3.1	42.2	21.0	6.7	22.1	19.0	113.1
Grandin	3	--	--	17.7	11.2	21.3	16.7	112.3
Amidon	3	--	--	17.2	8.0	24.6	16.6	111.4
Lew	5	2.8	39.0	23.3	5.6	22.9	18.7	111.3
Lancer	3	--	--	20.1	6.6	21.7	16.1	108.3
Alex	4	2.7	38.5	18.9	6.3	23.6	18.0	107.0
Pondera	5	2.6	31.9	20.5	7.3	25.8	17.6	104.8
Len	4	--	29.8	20.1	8.8	23.4	20.5	100.9
Newana	5	2.7	36.7	20.8	6.2	17.7	16.8	100.0
Fortuna	5	3.1	35.2	10.3	7.3	23.7	15.9	94.6

NOTE: Varieties in this summary should not be compared to each other since they are not grown in the same years at the same locations. Compare yield only to the check variety Newana.

NOTE: No recrop nurseries were harvested in 1988.

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 1985 - 1990 period.

Variety	Number of Years	Year Grown 1985	1986	1987	1989	1990	Average Test Wt. Lbs/Bu.	Test Wt. in % of Newana Same Trials
Newana	5	58.7	62.5	62.5	59.1	58.6	58.4	97.4
Alex	5	57.4	63.0	62.0	58.8	60.9	60.4	99.5
Westbred Rambo	3	--	--	62.5	57.4	59.9	59.9	98.6
Lancer	3	--	--	61.5	58.9	59.0	59.8	98.4
Amidon	3	--	--	61.5	58.5	59.0	59.7	98.2
Lew	5	56.6	63.0	61.0	57.2	59.9	59.5	98.1
Pondera	5	54.6	62.5	61.5	58.4	59.9	59.4	97.8
Fortuna	5	55.6	62.0	60.6	58.3	59.3	59.2	97.5
Olaf	2	--	--	--	58.1	58.6	58.4	97.4
Cutless	2	--	--	--	57.1	59.6	58.4	97.4
Grandin	3	--	--	63.5	55.8	57.7	59.0	97.1
Stoa	5	54.6	62.0	61.5	57.8	58.9	59.0	97.1
Westbred	1	--	--	--	--	58.8	58.8	96.9
MT 8402	2	--	--	--	57.4	58.3	57.9	96.6
Westbred 906R	2	--	--	--	56.6	58.7	57.7	96.2
Gus	2	--	--	--	55.6	58.6	57.1	95.3
Glenman	5	53.4	61.0	60.0	55.3	59.0	57.7	95.1
Len	4	--	60.0	60.5	54.4	58.0	58.2	95.1

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

NOTE: No recrop nurseries were harvested in 1988.

Table 4 Relative heights (inches) of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1985 - 1990 period.

Variety	Number of Years	Year Grown 1985	1986	1987	1989	1990	Average Height Inches	Height in % of Newana Same Trials
Grandin	3	--	--	20	19	26	21.7	110.2
Lancer	3	--	--	24	15	25	21.3	108.5
Alex	5	17	29	21	14	26	21.4	108.1
Lew	5	15	25	24	16	24	20.8	105.1
Fortuna	5	16	27	20	16	24	20.6	104.0
Amidon	3	--	--	20	16	24	20.0	101.7
Stoa	5	15	26	21	15	23	20.0	101.0
Newana	5	15	25	20	15	24	19.8	100.0
Glenman	5	15	25	21	15	23	19.8	100.0
Cutless	2	--	--	--	14	24	19.0	97.4
Pondera	5	15	23	18	16	24	19.2	97.0
Westbred 906R	2	--	--	--	15	22	18.5	94.9
Len	4	--	24	19	15	21	19.8	94.0
MT 8402	2	--	--	--	15	21	18.0	92.3
Olaf	2	--	--	--	13	22	17.5	89.7
Gus	2	--	--	--	15	20	17.5	89.7
Westbred 926	1	--	--	--	--	21	21.0	87.5
Westbred Rambo	3	--	--	17	12	22	17.0	86.4

NOTE: Varieties in this summary should not be compared to each other since they are not grown in the same yers at the same locations. Compare heights only to the check variety Newana.

NOTE: No recrop nurseries were harvested in 1988.

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 1985-1990 period.

Variety	Number of Years	Year Grown					Average Protein Content Percent	Protein in % of Newana Same Trials
		1985	1986	1987	1989	1990		
Westbred 926	1	--	--	--	--	18.0	18.0	109.8
Gus	2	--	--	--	20.5	17.8	19.2	109.4
Westbred 906R	2	--	--	--	20.2	18.0	19.1	109.1
MT 8402	2	--	--	--	20.1	17.6	18.9	107.1
Alex	5	19.5	15.2	18.3	19.9	17.3	18.0	106.5
Cutless	2	--	--	--	20.0	17.2	18.6	106.3
Pondera	5	19.5	14.4	17.6	20.4	17.4	17.9	105.4
Stoa	5	19.0	15.6	17.6	19.4	17.4	17.8	105.1
Grandin	3	--	--	17.6	19.7	17.7	18.3	105.0
Lew	5	19.5	14.9	16.3	20.0	17.0	17.5	103.5
Olaf	2	--	--	--	19.0	17.2	18.1	103.4
Fortuna	5	18.2	16.1	18.2	18.9	16.1	17.5	103.3
Len	4	--	13.7	17.2	20.5	16.9	17.1	102.9
Amidon	3	--	--	18.3	19.0	16.4	17.9	102.5
Lancer	3	--	--	17.4	19.0	17.3	17.9	102.5
Newana	5	18.3	14.0	17.4	18.6	16.4	16.9	100.0
Westbred Rambo	3	--	--	17.2	18.5	16.7	17.5	100.0
Glenman	5	18.4	13.6	15.9	19.7	16.5	16.8	99.3

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

NOTE: No recrop nurseries were harvested in 1988.

Table 6 Agronomic data obtained from a dryland spring durum variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1990.

Date Seeded: April 6, 1990 Date Harvested: August 3, 1990 Size of Plot: 72 Sq. Ft.1/

C.I. or Sel. No.	Variety	Average Heading Date 2/	Average Height Inches	Average Protein Content Percent	Average Test Weight Lbs/Bu	Average Yield Bu/Acre
Stock000	Stockholm	168	20.8	17.9	60.3	14.3
PI 15892	Ward	168	23.4	19.5	58.5	14.2
PI510696	Renville	169	22.3	20.4	59.6	12.1
DT 380	Sceptre	168	21.3	20.3	59.2	12.0
PI478289	Monroe	167	22.5	20.5	57.1	11.7
CI 17789	Vic	168	21.8	19.1	59.9	10.8
WPBLAKER	Laker	169	21.1	18.4	61.7	9.4x
DT 433	Medora	167	20.9	20.7	59.2	8.8x
CI 17282	Crosby	167	22.7	20.4	58.7	8.3x
PI476211	Lloyd	169	20.1	19.0	59.0	8.0x
PI 15326	Rolette	166	21.8	20.6	59.9	7.6xx
CI 17438	Cando	169	19.0	18.9	58.5	4.7xx

Mean grain yield for experiment = 10.15 bushels per acre
F-Value for variety comparisons = 3.10 (significant at .05)
S.E.$\bar{x}$ = 1.62 bushels per acre
L.S.D. at .05 = 4.75 bushels per acre
L.S.D. at .01 = 6.47 bushels per acre
C.V. (SE/Mean) = 16.00%
C.V. (S/Mean) = 27.71%

1/ 4 row plots, rows 18 feet long and 1.0 ft. apart. At harvest, two 16 ft. rows were harvested from the two center rows for yield, test weight, and protein determinations.

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

NOTE: Ward is considered to be the check variety for this nursery with an average yield of 14.2 bushels/acre.

x Indicates a significantly lower yield than the check variety at the .05 level of significance.
xx Indicates a significantly lower yield than the check variety at the .01 level of significance.

Table 6 Agronomic data obtained from a dryland spring durum variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1990. (continued)

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 pints per acre Bronate applied May 31, 1990.

Insecticide: None

Precipitation for average crop year = 13.50 inches. Precipitation for 1990 crop year = 11.74 inches. Crop year considered to be from September 1, 1989 through harvest 1990.

Precipitation for April 1 - July 31 period during 1990 = 6.41 inches. Average precipitation for same period = 7.69 inches.

Table 7 Relative yielding ability of spring durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research center, Sidney, Montana during the 1984-1990 period.

Variety	Number of Years	Year Grown					Average Yield Bu/Acre	Yield in % of Ward Same Trials
		1984	1985	1987	1989	1990		
Westbred Laker	3	--	--	35.6	3.5	9.4	16.2	110.7
Sceptre	3	--	--	28.2	5.4	12.0	15.2	104.1
Vic	4	6.0	--	28.8	5.2	10.8	12.7	100.8
Ward	5	6.6	2.8	25.2	4.4	14.2	10.6	100.0
Stockholm	3	--	--	20.3	4.4	14.3	13.0	89.0
Monroe	3	--	--	20.4	6.5	11.7	12.9	88.1
Renville	2	--	--	--	3.7	12.1	7.9	84.9
Lloyd	5	5.4	3.2	23.2	5.0	8.0	9.0	84.2
Crosby	3	--	--	19.7	6.2	8.3	11.4	78.1
Medora	3	--	--	18.8	4.0	8.8	10.5	72.1
Rolette	2	--	--	10.0	5.7	7.6	7.8	53.2
Cando	5	4.4	2.3	9.3	0.9	4.7	4.3	40.6

NOTE: Varieties in this nursery should not be compared to each other since they are not grown in the same years at the same locations. Compare yields only to the check variety Ward.

NOTE: Recrop durum nurseries were not grown in 1986 and were no harvested in 1988.

Table 8 Relative test weights of spring durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research center, Sidney, Montana during the 1984-1990 period.

Variety	Number of Years	Year Grown 1984	1985	1987	1989	1990	Average Test Wt. Lbs/Bu.	Test Wt. in % of Ward Same Trials
Vic	4	57.3	--	63.6	58.4	59.9	59.8	102.7
Stockholm	3	--	--	63.3	57.9	60.3	60.5	101.8
Westbred Laker	3	--	--	62.5	56.7	61.7	60.3	101.5
Rolette	3	--	--	61.4	59.3	59.9	60.2	101.3
Sceptre	3	--	--	62.7	57.3	59.2	59.7	100.5
Ward	5	54.7	56.9	62.8	57.0	58.5	58.0	100.0
Crosby	3	--	--	62.5	56.6	58.7	59.3	99.7
Cando	4	54.5	56.3	63.0	--	58.5	58.1	99.7
Renville	2	--	--	--	54.7	59.6	57.2	99.0
Medora	3	--	--	62.4	57.7	59.2	58.8	98.9
Monroe	3	--	--	61.5	57.1	57.1	58.6	98.5
Lloyd	5	51.7	55.7	62.2	56.5	59.0	57.0	98.3

NOTE: Varieties in this nursery should not be compared to each other since they are not grown in the same years at the same locations. Compare test weights only to the check variety Ward.

NOTE: Recrop durum nurseries were not grown in 1986 and were not harvested in 1988.

Table 9 Relative heights (inches) of spring durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research center, Sidney, Montana during the 1984-1990 period.

Variety	Number of Years	Year Grown					Average Height Inches	Height in % of Ward Same Trials
		1984	1985	1987	1989	1990		
Ward	5	21	17	20	17	23	19.6	100.0
Medora	3	--	--	20	18	21	19.7	98.3
Rolette	3	--	--	19	18	22	19.7	98.3
Crosby	3	--	--	19	17	23	19.7	98.3
Vic	4	21	--	19	16	22	19.5	96.3
Westbred Laker	3	--	--	20	16	21	19.0	95.0
Monroe	3	--	--	18	16	22	18.7	93.3
Renville	2	--	--	--	15	22	18.5	92.5
Sceptre	3	--	--	18	15	21	18.0	90.0
Stockholm	3	--	--	17	14	21	17.3	86.7
Lloyd	5	18	13	16	14	20	16.2	82.7
Cando	5	18	13	17	11	19	15.6	79.6

NOTE: Varieties in this nursery should not be compared to each other since they are not grown in the same years at the same locations. Compare heights only to the check variety Ward.

NOTE: Recrop durum nurseries were not grown in 1986 and were not harvested in 1988.

Table 10 Relative protein content of spring durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1984-1990 period.

Variety	Number of Years	Year Grown					Average Protein Content Percent	Protein in % of Ward Same Trials
		1984	1985	1987	1989	1990		
Renville	2	--	--	--	22.1	20.4	21.3	105.5
Sceptre	3	--	--	21.0	21.6	20.3	21.0	104.0
Medora	3	--	--	20.8	20.9	20.7	20.8	103.1
Rolette	3	--	--	20.5	21.1	20.6	20.7	102.8
Crosby	3	--	--	19.7	21.6	20.4	20.6	102.0
Cando	5	21.5	20.6	20.4	19.6	18.9	20.2	100.9
Lloyd	5	21.4	20.6	19.4	20.4	19.0	20.2	100.8
Monroe	3	--	--	19.1	21.3	20.5	20.3	100.7
Ward	5	20.0	19.6	20.2	20.8	19.5	20.0	100.0
Vic	4	21.3	--	19.7	20.1	19.1	20.1	99.6
Stockholm	3	--	--	19.2	20.2	17.9	19.1	94.7
Westbred Laker	3	--	--	17.6	20.0	18.4	18.7	92.6

NOTE: Varieties in this nursery should not be compared to each other since they are not grown in the same years at the same locations. Compare heights only to the check variety Ward.

NOTE: Recrop durum nurseries were not grown in 1986 and were not harvested in 1988.

Table 11 Agronomic data obtained from a dryland spring barley nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1990.

Date seeded: April 6, 1990 Date harvested: July 18, 1990 Size of Plot: 72 sq. ft.[1/]

Variety	Average Heading Date[2/]	Average Height Inches	Average Protein Content Percent	Average Test Weight Lbs/Bu	Average Yield Bu/Acre
Clark	169.0	17	16.0	47.2	27.7[aa]
Lewis	169.0	18	17.1	49.1	26.1[a]
MT 140523	169.7	18	17.6	47.7	24.4
Gallatin	166.7	18	15.1	48.6	24.3
Piroline	166.3	17	17.0	48.2	22.9
Steptoe	163.3	18	15.9	41.9	22.5
ND 9866	167.0	20	16.1	50.2	22.2
Hector	169.0	18	17.1	48.0	21.6
Bowman	165.7	19	17.3	49.0	21.4
Bearpaw	169.3	16	16.7	47.7	18.0[x]
Crystal	169.0	17	17.3	48.1	15.3[xx]
Harrington	169.0	16	17.5	46.9	15.1[xx]

Mean grain yield for experiment = 21.78 bushels per acre
F-Value for variety comparisons = 11.40 (significant at .05 and .01)
S.E.x = 1.16 bushels per acre
L.S.D. at .05 = 3.40 bushels per acre
L.S.D. at .01 = 4.63 bushels per acre
C.V. (SE/Mean) = 5.33%
C.V. (S/Mean) = 9.24%

1/ 4 row plots, rows 18 ft. long and 1.0 ft. apart. At harvest, two 16 ft. rows were harvested from the two center rows for yield, test weight, and protein determinations.

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

NOTE: Hector is considered to be the check variety for this nursery with an average yield of 21.6 bushels per acre.

Table 11 Agronomic data obtained from a dryland spring barley nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1990. (continued)

a Indicates a significantly higher yield than the check variety at the .05 level of significance.
aa Indicates a significantly higher yield than the check variety at the .01 level of significance.
x Indicates a significantly lower yield than the check variety at the .05 level of significance.
xx Indicates a significanlty lower yield than the check variety at the .01 level of significance.

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 pints per acre Bronate applied May 31, 1990.

Insecticide: None

Precipitation for average crop year = 13.50 inches. Precipitation for 1990 crop year = 11.74 inches. Crop year considered to be from September 1, 1989 through harvest 1990.

Precipitation for April 1 - July 31 period during 1990 = 6.41 inches. Average precipitation for same period = 7.69 inches.

Table 12 Relative yielding ability of spring barley varieties as compared to Hector when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1985 - 1990 period.

Variety	Number of Years	Year Grown 1985	1986	1987	1989	1990	Average Yield Bu/Acre	Yield in % of Hector Same Trials
Steptoe	5	9.7	62.7	27.2	24.2	22.5	29.3	104.5
MT 140523	2	--	--	--	19.0	24.4	21.7	103.8
ND 9866	1	--	--	--	--	22.2	22.2	102.8
Hector	5	6.8	61.2	30.2	20.2	21.6	28.0	100.0
Clark	5	10.9	53.9	23.0	17.9	27.7	26.7	95.3
Gallatin	5	9.9	53.9	27.0	17.8	24.3	26.6	94.9
Bowman	5	6.2	57.7	25.3	20.8	21.4	26.3	93.9
Lewis	5	10.3	55.3	20.8	18.3	26.1	26.2	93.4
Piroline	5	8.2	50.6	23.5	17.2	22.9	24.5	87.4
Harrington	5	5.3	60.4	21.3	7.5	15.1	21.9	78.3
Crystal	1	--	--	--	--	15.3	15.3	70.8
Bearpaw	3	--	--	23.1	8.7	18.0	16.3	69.2

NOTE: Varieties in this summary should not be compared to each other since they are not grown in the same years at the same locations. Compare yields only to the check variety Hector.

NOTE: Recrop barley nurseries were not harvested in 1988.

Table 13 Relative test weights of spring barley varieties as compared to Hector when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1985 - 1990 period.

Variety	Number of Years	Year Grown 1985	1986	1987	1989	1990	Average Test Wt. Lbs/Bu.	Test Wt. in % of Hector Same Trials
ND 9866	1	--	--	--	--	50.2	50.2	104.6
Lewis	5	43.1	51.5	51.5	47.5	49.1	48.5	101.4
Gallatin	5	42.1	51.5	52.0	46.0	48.6	48.0	100.4
Crystal	1	--	--	--	--	48.1	48.1	100.2
Hector	5	41.8	52.5	51.5	45.5	48.0	47.9	100.0
MT 140523	2	--	--	--	44.5	47.7	46.1	98.6
Bearpaw	3	--	--	49.5	45.5	47.7	47.6	98.4
Bowman	5	42.9	53.0	42.0	48.0	49.0	47.0	98.2
Clark	5	41.3	50.5	50.5	44.0	47.2	46.7	97.6
Piroline	5	40.8	51.0	50.5	43.0	48.2	46.7	97.6
Harrington	5	40.5	50.5	50.0	45.2	46.9	46.6	97.4
Steptoe	5	33.8	47.5	48.5	39.0	41.9	42.1	88.0

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

NOTE: Recrop barley nurseries were not harvested in 1988.

Table 14 Relative heights (inches) of spring barley varieties as compared to Hector when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1985 - 1990 period.

Variety	Number of Years	Year Grown 1985	1986	1987	1989	1990	Average Height Inches	Height in % of Hector Same Trials
ND 9866	1	--	--	--	--	20	20.0	111.1
Hector	5	13	25	18	20	18	18.8	100.0
Gallatin	5	13	24	18	17	18	18.0	95.7
Lewis	5	14	23	17	17	18	17.8	94.7
Crystal	1	--	--	--	--	17	17.0	94.4
Piroline	5	12	24	17	17	17	17.4	92.6
Clark	5	13	23	16	17	17	17.2	91.5
Bowman	5	7	24	17	19	19	17.2	91.5
MT 140523	2	--	--	--	16	18	17.0	89.5
Steptoe	5	13	19	15	19	18	16.8	89.4
Bearpaw	3	--	--	17	15	16	16.0	85.7
Harrington	5	8	23	15	15	16	15.4	81.9

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

NOTE: Recrop barley nurseries were not harvested in 1988.

Table 15 Relative protein contents of spring barley varieties as compared to Hector when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1985 - 1990 period.

Variety	Number of Years	Year Grown					Average Protein Content Percent	Protein in % of Hector Same Trials
		1985	1986	1987	1989	1990		
Piroline	5	19.5	13.0	17.3	20.6	17.0	17.5	104.5
Bearpaw	3	--	--	15.8	21.4	16.7	18.0	103.1
MT 140523	2	--	--	--	20.6	17.6	19.1	102.7
Harrington	5	18.9	12.7	16.1	20.5	17.5	17.1	102.5
Lewis	5	19.2	12.6	16.1	20.4	17.1	17.1	102.2
Crystal	1	--	--	--	--	17.3	17.3	101.7
Gallatin	5	19.1	13.3	16.1	20.5	15.1	16.8	100.6
Hector	5	18.9	12.4	15.1	20.1	17.1	16.7	100.0
Clark	5	16.1	12.3	16.1	20.5	16.0	16.2	96.9
ND 9866	1	--	--	--	--	16.1	16.1	94.2
Bowman	5	16.1	12.1	14.4	17.6	17.3	15.5	92.7
Steptoe	5	13.1	11.1	12.5	14.2	15.9	13.4	79.9

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

NOTE: Recrop barley nurseries were not harvested in 1988.

Table 16 Agronomic data obtained from a dryland spring oat variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1990.

Date seeded: April 6, 1990 Date harvested: July 18, 1990 Size of plot: 72 sq. ft.[1/]

C.I. or Sel. No.	Variety	Average Heading Date [2/]	Average Height Inches	Average Protein Content Percent	Average Test Weight Lbs/Bu	Average Yield Bu/Acre
CI 9252	Otana	168.3	20.9	14.2	34.0	27.9
CI 9401	Ogle	165.3	18.8	13.9	31.5	26.9
CI467882	Border	169.0	17.1	14.0	29.0	25.9
CI 9297	Appaloosa	169.0	18.1	14.0	27.5	23.6
CI483126	Monida (ID 751170)	169.3	18.7	13.5	29.0	23.2[x]
W 80474	Riel (RL 3057/Otana)	168.0	19.4	14.4	35.0	21.6[xx]
CI 8263	Cayuse	167.3	17.2	13.8	28.5	18.3[xx]
CI 6611	Park	169.7	19.2	14.4	28.0	17.8[xx]
OT 308	Calibre	169.7	20.5	14.1	29.5	17.0[xx]
	Rodney	168.3	20.2	13.8	31.0	16.8[xx]
W 78286	Dumont	169.7	20.6	13.8	31.0	16.4[xx]
SD810109	Trucker	166.0	20.9	15.1	35.6	16.2[xx]
W 82056	Robert (OT 212/RL 30)	169.7	19.0	13.8	29.0	15.1[xx]

Mean grain yield for experiment = 20.82 bushels per acre
F-Value for variety comparisons = 8.82 (significant at .05 and .01)
S.E.$\bar{x}$ = 1.54 bushels per acre
L.S.D. at .05 = 4.51 bushels per acre
L.S.D. at .01 = 6.15 bushels per acre
C.V. (SE/Mean) = 7.40%
C.V. (S/Mean) = 12.82%

1/ 4 row plots, rows 18 feet long and 1.0 ft. apart. At harvest, two 16 ft. rows were harvested from the two center rows for yield, test weight, and protein determinations.

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

x Indicates a significantly lower yield than the check variety at the .05 level of significance.
xx Indicates a significantly lower yield than the check variety at the .01 level of significance.

Table 16 Agronomic data obtained from a dryland spring oat variety nursery conducted under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, 1990.

NOTE: Otana is considered to be the check variety for this nursery with an average yield of 27.9 bushels per 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 pints per acre Bronate applied May 31, 1990

Insecticide: None

Precipitation for average crop year = 13.50 inches. Precipitation for 1990 crop year = 11.74 inches. Crop year considered to be from September 1, 1989 through harvest 1990.

Precipitation for April 1 - July 31 period during 1990 = 6.41 inches. Average precipitation for same period = 7.69 inches.

Table 17 Relative yielding ability of spring oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1985-1990 period.

Variety	Number of Years	Year Grown 1985	1986	1987	1989	1990	Average Yield Bu/Acre	Yield in % of Otana Same Trials
Otana	5	16.1	89.6	59.8	24.8	27.9	43.6	100.0
Appaloosa	5	12.2	91.9	58.4	26.2	23.6	42.5	97.3
Monida	5	15.5	90.6	59.3	21.5	23.2	42.0	96.3
Cascade	3	16.7	85.8	55.1	--	--	52.5	95.2
Border	5	14.3	88.3	55.2	23.6	25.9	41.5	95.0
Cayuse	5	11.3	80.0	67.7	25.8	18.3	40.6	93.1
Valley	3	--	79.2	53.9	22.4	--	51.8	89.3
Ogle	4	--	70.0	50.9	27.2	26.9	43.8	86.6
Calibre	4	--	88.2	53.3	11.0	17.0	42.4	83.9
Park	5	12.5	78.1	54.6	16.3	17.8	35.9	82.2
Dumont	4	--	83.6	50.0	15.1	16.4	41.3	81.7
Riel	4	--	74.2	40.1	21.7	21.6	39.4	78.0
Trucker	2	--	--	--	24.7	16.2	20.5	77.6
Robert	2	--	--	--	19.9	15.1	17.5	66.4
Rodney	1	--	--	--	--	16.8	16.8	60.2

NOTE: Varieties in this summary should not be compared to each other since they are not grown in the same years at the same locations. Compare yields only to the check variety Otana.

NOTE: Recrop oat nurseries were not harvested in 1988.

Table 18 Relative test weights of spring oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1985-1990 period.

Variety	Number of Years	Year Grown 1985	1986	1987	1989	1990	Average Test Wt. Lbs/Bu.	Test Wt. in % of Otana Same Trials
Trucker	2	--	--	--	35.0	35.6	35.3	113.9
Riel	3	--	39.0	38.5	33.5	35.0	36.5	105.0
Valley	3	--	40.0	37.0	30.0	--	35.7	101.9
Otana	5	33.7	40.0	37.0	28.0	34.0	34.5	100.0
Dumont	4	--	38.5	39.5	23.5	31.0	33.1	95.3
Ogle	4	--	36.5	34.0	29.0	31.5	32.8	94.2
Monida	5	30.2	38.0	36.0	25.5	29.0	31.7	91.9
Calibre	4	--	37.5	39.0	21.0	29.5	31.8	91.4
Rodney	1	--	--	--	--	31.0	31.0	91.2
Border	5	30.0	37.5	34.5	24.0	29.0	31.0	89.8
Robert	2	--	--	--	26.5	29.0	27.8	89.5
Park	5	29.5	38.0	34.0	24.5	28.0	30.8	89.2
Cayuse	5	27.4	36.0	34.0	24.5	28.5	30.1	87.1
Cascade	3	26.3	37.0	33.0	--	--	32.1	87.0
Appaloosa	5	29.2	36.0	31.0	24.5	27.5	29.6	85.8

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

NOTE: Recrop oat nurseries were not harvested in 1988.

Table 19 Relative heights (inches) of spring oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1985-1990 period.

Variety	Number of Years	Year Grown					Average Height Inches	Height in % of Otana Same Trials
		1985	1986	1987	1989	1990		
Trucker	2	--	--	--	35	21	28.0	136.6
Cascade	3	18	36	25	--	--	26.3	101.3
Otana	5	18	34	26	20	21	23.8	100.0
Calibre	4	--	31	27	19	20	24.3	96.0
Rodney	1	--	--	--	--	20	20.0	95.2
Riel	4	--	33	24	20	19	24.0	95.0
Dumont	4	--	33	24	18	21	24.0	95.0
Park	5	19	30	24	18	19	22.0	92.4
Robert	2	--	--	--	18	19	18.5	90.2
Monida	5	16	29	23	17	19	20.8	87.4
Cayuse	5	17	26	24	16	17	20.0	84.0
Appaloosa	5	15	27	22	17	18	19.8	83.2
Border	5	16	27	21	16	17	19.4	81.5
Valley	3	--	26	21	17	--	21.3	80.0
Ogle	4	--	24	21	18	19	20.0	79.2

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

NOTE: Recrop oat nurseries were not harvested in 1988.

Table 20 Relative protein contents of spring oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana during the 1986 - 1990 period.

Variety	Number of Years	Year Grown 1986	1987	1989	1990	Average Protein Content Percent	Protein in % of Otana Same Trials
Trucker	2	--	--	17.4	15.1	16.3	109.4
Park	4	14.6	15.5	16.2	14.4	15.2	103.1
Riel	4	14.7	15.3	16.1	14.4	15.1	102.7
Otana	4	13.9	15.3	15.5	14.2	14.7	100.0
Border	4	13.5	15.5	15.6	14.0	14.7	99.5
Valley	2	--	14.8	15.8	--	15.3	99.4
Robert	2	--	--	15.4	13.8	14.6	98.3
Ogle	4	13.4	14.7	15.6	13.9	14.4	97.8
Rodney	1	--	--	--	13.8	13.8	97.2
Appaloosa	4	12.3	14.6	15.9	14.0	14.2	96.4
Dumont	4	13.1	14.1	15.6	13.8	14.2	96.1
Cascade	2	12.8	15.2	--	--	14.0	95.9
Cayuse	4	12.8	14.1	15.4	13.8	14.0	95.2
Monida	4	12.7	14.3	14.6	13.5	13.8	93.5
Calibre	4	12.9	14.2	13.8	14.1	13.8	93.4

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

NOTE: Recrop oat nurseries were not harvested in 1988.