The 10th

ANNUAL REPORT

of the

WESTERN TRIANGLE AGRICULTURAL RESEARCH CENTER

Montana Agricultural Experiment Station

Conrad, Montana

1987

Submitted by

Dr. Gregory D. Kushnak, Superintendent & Crop Scientist

MAES Research Report

Montana State University is an Equal opportunity/Affirmative Action institution. Information contained herein is available without regard to race, creed, color, sex or national orgin.

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TABLE OF CONTENTS

1987 Research Center Activities

Crop seminars featuring Western Triangle Research Center data were presented to Triangle Area farmers at various locations during January. Off-station plot tours were held in Glacier, Chouteau, and Liberty counties on June 29, June 30, and July 9, respectively.

During June 16-17, Triangle Area County Agents convened at the Research Center for an update on research developments. We were assisted in conducting the workshop by Gregg Carlson and Grant Jackson of the Northern and Central Research Centers, respectively.

On June 29, the Research Center hosted the Montana Agricultural Experiment Station's Advisory Council. The Council consists of one member from each respective Advisory Committee for Montana's seven Agricultural Research Centers.

The no-till, paired-row planter, constructed by Research Center Staff in 1985, was used this year to conduct a row-space and fertilizer placement study. Arne Benson, an MSU graduate student, helped with the study; and will use the data for his M.S. thesis.

The search to fill the vacant soils position at the Western Triangle Research Center was initiated during the fall in efforts to have someone hired by March 1988. Although budgets have been restrained during the last two years, several resignations and retirements within the M.S.U. statewide Experiment Station system have allowed some hiring to take place.

Research Center staff during 1987 included Dr. Greg Kushnak, Superintendent; Research Technicians Ron Thaut and Larry Christiaens; and Gladys Dunahoo, secretary (half-time). Temporary summer employees included Arne Benson, MSU graduate student; and Ross Moritz, Conrad H.S. student.

Following is a list of Western Triangle Research Center Advisory Committee members:

Past Members

Richard Page, Bynum Teton Co.	1977-79
Dave Shane, Floweree, Cascade Co.	1977-82
Vade Hamma, Brady, Chouteau Co.	1977-82
Wilson Hodgskiss, Choteau, Teton Co.	1977-83
Don Buffington, Ledger, Liberty Co.	1977-83
Jerry Swenson, Cut Bank, Glacier Co.	1977-83
Karl Ratzburg, Ledger, Toole Co.	1977-84
Joe DeStaffany, Conrad, Pondera Co.	1977-84
Dale Vermulm, Cut Bank, Glacier Co.	1977-84
Jack Baringer, Conrad, Pondera Co.	1977-84
Bob LongCake, Shelby, Toole Co.	1982-84
Randy Weaver, Cut Bank, Glacier Co.	1982-84
Paul Kronebusch, Conrad, Pondera Co.	1977-85
Arnold Gettel, Power, Teton Co.	1980-85
Ted Neuman, Vaughn, Cascade Co.	1983-86

(continued)

Current Members

Gary Iverson, Sunburst, Toole Co.
Dave Shane, Floweree, Cascade Co.
Bill McLean, Brady, Chouteau, Co.
Leif Larson, Choteau, Teton Co.
Miles Lewis, Cut Bank, Glacier Co.
Bruce Bradley, Cut Bank, Glacier Co.
Joe Larsen, Galata, Toole Co.
Bob Layne, Valier, Pondera Co.
Richard Thieltges, Chester, Liberty Co.
Bill Richter, Choteau, CES Representative (ex-officio)
Mark Grubb, Pondera Co.
Dave Gettel, Power, Teton Co.

Climatic summary for the 1987 calendar year at the Western Triangle Research Center, Conrad, MT.

	1987 Month												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Spt.	Oct.	Nov.	Dec.	Total or average
Precipitation (inches)	.06	.15	1.31	0.0	1.94	0.85	4.02	2.04	0.50	0.11	0.05	0.02	11.05
Mean Temperature (°F)	27.8	32.9	34.9	48.3	57.3	61.1	68.0	58.8	61.6	47.6	38.2	29.0	47.1

Last killing frost in spring *----------May 26 (31°)

First killing frost in fall *----------October 8 (32°)

Frost free period----------135 days

Maximum summer temperature----------July 15 (91°)

Minumum winter temperature----------January 16 (-8°)

In this summary, 32°F is considered killing frost.

Soil moisture probe depth = 42" on fallow (or 7" available water); 42" on stubble (or 7" available water).

Summary of climatic data by months for the 1986-87 crop year (September thru August) at the Western Triangle Agricultural Research Center, Conrad, MT.

	Sept 1986	Oct 1986	Nov 1986	Dec 1986	Jan 1987	Feb 1987	Mar 1987	Apr 1987	May 1987	June 1987	July 1987	Aug 1987	Total or avg.
Precipitation (inches)	4.38	.40	.34	.13	.06	.15	1.31	0.0	1.94	0.85	4.02	2.04	15.62
Mean Temperature (^{o}F)	50.9	48.3	24.6	29.6	27.8	32.9	34.9	48.3	57.3	61.1	68.0	58.8	45.2

Last killing frost in spring 1987*----------May 26 (31^{o})

First killing frost in fall 1987*----------October 8 (32^{o})

Frost free period 1987----------135 days

Maximum summer temperature----------July 15 (91^{o})

Minimum winter temperature----------January 16 (-8^{o})

* In this summary, 32^{o}F is considered a filling frost.

Soil moisture probe depth = 42" on fallow (or 7" available water); 42" on stubble (or 7" available water).

TITLE: Winter Wheat Variety Investigations

YEAR: 1987

LOCATION: Western Triangle Research Center, Conrad, Montana

PERSONNEL: Gregory D. Kushnak, Ron Thaut, and Larry Christiaens - Research Center, Conrad; Dr. Allan Taylor, MSU, Bozeman.

Winter wheat variety test plots were grown at 4 locations during 1987, which included Conrad (Research Center), Chester, the Knees area and Dutton (Tables 1-7). The trial at Conrad was no-till seeded on chemical fallow, while the other trials were grown on tillage fallow. All locations had good stands and winter survival, in spite of later than normal planting dates (October). Fall soil moisture was abundant at all locations. Some of the varieties which yielded high have either low or unknown winterhardiness levels and should be grown with caution.

The Conrad and Dutton locations showed moderate sawfly damage for most varieties. Varieties that escaped damage fairly well were: Rocky, Centurk, Archer, Hawk, Bighorn, Thunderbird, and Wing. This is probably because these varieties reached boot stage before sawfly emergence in the spring. Sawflys prefer to lay eggs in plants prior to the boot stage. Therefore, wheat varieties that head later will be more vulnerable. On the other hand, an early heading variety does not always guarantee escape from sawflys. It depends upon the difference between boot-stage date and sawfly emergence date, which vary each year.

These trials were conducted by the Western Triangle Research Center, Conrad and the Cooperative Extension Service, in cooperation with Dr. Allan Taylor, Montana State University Plant and Soil Science Department.

The background and detailed descriptions of the varieties tested are included in Extension Bulletin 1098, "Performance Summary of Winter Wheat Varieties in Montanaa," available at all county agent offices.

Table 1. Winter wheat and winter triticale variety trials grown on no-till chem fallow at the Western Triangle Research Center, Conrad, 1987.

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	% Protein
MT 8502	89.0	59.9	30	11.4
MT 7810(hard white)	88.0	58.8	29	13.1
QT 1359	87.9	62.3	33	11.9
Nugaines (white)	87.6	57.7	26	10.1
MT 8107	86.2	62.1	32	11.9
MT 8508	82.5	62.4	35	10.8
RH 845496	82.3	61.2	32	12.3
MT 7951	81.0	61.7	31	12.1
Centurk	81.0	62.4	34	12.2
MT 8029	79.5	62.4	32	12.1
Tiber (MT8003)	79.2	61.0	35	11.7
MT 85107	78.2	62.4	34	11.6
MT 8030	77.7	62.3	29	11.1
Neeley	77.7	60.4	30	12.4
Cheyenne	77.5	61.1	38	12.5
MT 8039 Judith	77.2	60.9	31	12.2
MT 8046	76.7	62.4	31	11.6
Rocky	76.7	62.2	33	12.8
Bighorn	76.4	61.7	27	11.2
MT 8599	76.3	61.1	32	10.6
MT 80194	76.1	60.3	33	11.6
Archer	76.1	59.8	27	11.1
MT 85203	75.5	61.0	23	12.1
Cree	74.0	61.5	36	12.7
Agassiz	74.0	62.0	37	12.8
Warrior	73.5	63.1	33	12.6
NA 362-5	73.5	63.4	27	13.3
MT 8576	73.3	62.5	35	12.9
Hawk	73.1	62.7	28	11.8
MT 85104	73.0	62.5	37	12.8
MT 7811 (hard white)	72.9	60.8	31	12.3
MT 85109	72.1	61.6	35	12.2
MT 8562	71.9	62.0	35	12.8
MT 35131	71.8	59.3	33	12.2
QT 1281	71.5	60.0	32	10.4
MT 8519	71.0	61.3	35	12.6

(continued)

Table 1. cont. winter wheat and winter triticale

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	% Protein
Rodeo	70.6	61.8	29	11.9
MT 85126	70.3	61.7	38	12.9
Winridge	70.2	60.0	33	11.4
Redwin	69.3	62.5	34	12.3
Winalta	69.0	62.8	37	13.9
Norstar	68.3	59.6	39	12.6
MT 85151	67.8	62.3	36	13.2
MT 80203	67.6	61.4	32	12.6
Weston	66.6	61.3	36	12.3
Thunderbird	66.5	63.2	28	12.8
MT 85111	66.4	61.7	33	11.6
Wing	66.1	62.8	33	12.1
ND 8002 Seward	65.5	60.1	33	11.9
MT 79125	65.5	60.1	28	12.8
MT 85145	64.7	60.1	38	13.1
MT 8585	64.3	62.0	34	13.0
Roughrider	62.8	61.0	37	13.1
Norwin	62.7	60.7	24	12.2
RH 1035	61.7	62.6	30	13.3
RH 845504	58.7	61.0	37	13.8
Froid	58.2	60.6	40	13.5
MT 85202	57.1	61.4	37	12.4
RH 845455	52.9	60.0	27	15.3
RH 845457	51.6	61.3	35	14.3
MT 79121	51.3	61.3	25	14.0
MT 79123	44.7	60.8	24	14.9
Winter Triticale				
Decade	97.4*	53.1	41	9.6
Winteri	83.9*	52.4	52	10.5

Location: Research Center, N. of Conrad
Date seeded: September 30, 1986
Seeding conditions: no-till chem-fallow; seed depth 1 inch, moisture probe 40".
Fertilizer: 100# 11-53-0 with seed + 40 N topdress.
Winter injury: none
Sawfly lodging: moderate; except fair to good escape from damage for Rocky, Centurk, Archer, Hawk, Bighorn, Thunderbird, and Wing. Possibly due to earlier boot stage of these varieties.
Harvest date: August 10, 1987.
Precipitation, planting to maturity: 9.2 inches.
* Triticale yield based on 50 pound test weight.
c.v.2: 7.53 . LSD (.05): 15.1 .

Table 1A. Three-year summary for dryland winter wheat varieties grown at the Western Triangle Research Center, Conrad, MT; 1984-1986-1987.

Variety	3-year comparable average Yield bu/a.	Height inches	Test wt.
Neeley	60	30	62
MT 8030	60	30	62
Centurk	58	30	62
Tiber	57	32	61
MT 8039	57	29	60
Cree	57	33	62
Rocky	57	31	62
Nugaines	57	25	57
Bighorn	57	25	63
Thunderbird	57	28	64
Hawk	56	26	63
Agassiz	55	36	63
Archer	55	32	63
Warrior	55	32	63
Cheyenne	55	33	61
Winridge	54	31	59
ND 8002	53	31	60
Redwin	53	32	62
MT 7811	53	29	62
Winalta	52	32	62
Norwin	50	23	62
Norstar	50	36	60
Roughrider	47	33	61

Table 2. Winter wheat variety trial grown near Chester, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad.

Variety	Yield bu/a	Test wt. lb/bu	Plant hgt. inches	Spring survival class 1/	% Protein
Neeley	55.4	59.4	26	3	14.0
Hawk	53.1	61.3	25	2	12.7
Tiber (MT 8003)	52.7	60.5	27	4	14.5
Cree	52.5	60.8	27	3	13.9
Centurk	52.5	61.3	27	2	13.1
MT 8030	52.3	61.2	25		14.0
Rocky	51.7	62.1	25	2	12.6
Norwin	51.3	61.6	19	5	13.6
Archer	51.3	59.1	23		13.1
Redwin	51.2	61.3	27	4	14.6
Weston	51.0	62.4	29		14.6
Cheyenne	50.7	60.9	28	3	14.4
Bighorn	50.6	60.9	23	3	13.7
Thunderbird	50.1	62.0	25	2	13.6
Winridge	49.0	59.3	26	2	13.8
Warrior	48.4	60.3	28	4	14.5
Winalta	47.8	62.3	26	4	14.8
MT 8039	47.5	58.9	26		14.4
Norstar	47.4	60.1	27	5	14.8
Wing	44.4	62.0	24		13.3
Winter Triticale:					
Decade	57.1*	46.9	40		12.3
Wintri	36.6*	46.7	46		13.1

Cooperator & location: Mike Violet, 10 miles south of Chester.
Date seeded: October 7, 1986
Date harvested: July 28, 1987
Previous crop: Fallow
Fertilizer: 11-51-0 actual with seed + 50 N Top.
Moisture probe depth at seeding: 40 inches
Rainfall, April to maturity : 2.9 inches.
1/ Spring survival class: 5=best, 1=very low; based on several location-years of observation.
*Triticale yield based on 50 lb/bu test wt.
c.v. 2 : 3.99
LSD (.05) : 5.9

Table 3. Winter wheat variety trial grown near Dutton, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad.

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	Spring survival class 1/	% Protein
MT 8039	62.2	61.6	29		10.0
Cheyenne	59.5	62.1	33	3	9.0
Bighorn	59.1	62.4	26	3	11.9
Centurk	58.4	62.0	29	2	8.5
Neeley	57.2	62.2	30	3	10.2
Tiber (MT 8003)	57.2	61.8	33	4	10.9
Winridge	56.6	61.4	31	2	9.0
Rocky	56.1	62.8	27	2	11.5
MT 8030	54.7	62.5	28		12.0
Redwin	54.2	62.5	33	4	11.5
Thunderbird	53.4	62.7	28	2	12.5
Weston	53.0	63.4	34		11.6
Archer	52.6	61.0	25	2	11.2
Norstar	52.4	61.8	37	5	9.7
Cree	52.3	62.0	32	3	10.4
Winalta	49.6	62.9	33	4	11.5
Hawk	49.5	61.8	26	2	11.4
Norwin	49.4	63.0	25	5	9.8
Wing	48.8	62.2	29		12.1
Warrior	48.7	62.0	32	4	12.8
Winter Triticale:					11.3
Decade	72.9*	52.6	41		10.3
Wintri	61.4*	51.2	51		

Cooperator: Darryl Goodmundson, 1 mile east of Dutton.
Fertilizer: 11-51-0 actual with seed + 80 AA actual
Previous crop: Fallow
Date seeded: October 6, 1986
Date harvested: July 28. 1987
Moisture probe depth at seeding: 40 inches
Rainfall, April to maturity: 3.65 inches
* Triticale yield based on 50 lb/bu test wt.
1/ Spring survival class: 5=best, 1=very low; based on several location-years of observation.
c.v. 2 : 3.90
LSD (.05) : 6.1

Table 4 . Winter wheat variety trial grown at the Knees east of Brady, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad.

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	Spring survival class 1/	% Protein
Weston	57.4	62.9	32		14.1
Centurk	56.0	62.9	30	2	13.1
Rocky	55.1	63.3	31	2	14.1
Tiber (MT 8003)	54.8	61.9	30	4	14.1
Archer	53.8	61.8	25	2	13.9
Neeley	53.7	61.2	32	3	13.9
MT 8030	52.9	61.5	30		14.8
Cree	51.8	62.7	32	3	14.5
Hawk	50.7	62.7	25	2	14.2
Thunderbird	50.7	63.4	29	2	15.3
MT 8039	50.5	59.2	31		15.7
Redwin	50.2	60.5	29	4	14.9
Cheyenne	49.5	62.5	30	3	14.4
Warrior	49.4	61.9	32	4	15.0
Wing	49.2	63.3	28		14.5
Norwin	48.9	62.2	22	5	13.4
Winridge	47.8	61.0	30	2	13.8
Winalta	47.4	62.2	34	4	14.4
Bighorn	46.1	62.3	28	3	14.4
Norstar	43.9	60.4	34	5	15.4
Winter Triticale:					
Decade	53.5*	51.9	40		13.2
Wintri	47.1*	49.1	45		14.3

Cooperator & location: Dan Picard, 30 miles east of Brady.
Date Seeded: October 6, 1986
Date harvested: July 16, 1987
Previous crop: Fallow
Fertilizer: 11-51-0 actual with the seed and 50# AA-N.
Moisture probe depth at seeding: 40 inches
Rainfall, April to maturity: 2.5 inches.
1/ Spring survival class: 5=best, 1=very low; based on several location-years of observation.
* Triticale yield based on 50 lb/bu test wt.

c.v. 2 : 4.84
LSD (.05) : 7.2

Table 5. Winter wheat variety trial grown near Floweree, Chouteau County, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, and Mont. Co-op Ext. Service.

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	% Protein
Tiber (MT 8003)	40.7	61.0	26	11.3
CS-377	37.5	60.1	25	10.6
Bounty-202	36.2	61.0	26	10.1
CS-376	36.0	58.4	25	11.6
Quantum-555	35.9	60.8	23	9.7
Bighorn	35.3	61.5	23	10.1
Archer	34.8	59.1	26	10.9
Norwin	33.8	62.9	21	11.5
CS-375	33.7	58.7	26	11.3
Manning	32.7	61.9	24	11.6
Ram	32.5	62.9	27	10.8
Cree	31.8	62.3	26	10.7
Norstar	31.5	61.3	32	10.9
Quantum-524	31.0	61.0	27	8.6
Winridge	30.9	60.0	26	8.3
Winalta	30.6	62.9	27	12.6
Agassiz	30.4	62.2	29	11.8
Cheyenne	30.1	61.7	26	10.9
Siouxland	29.7	61.2	27	11.2
Hawk	29.7	61.3	22	10.5
Quantum-515	29.1	61.4	26	11.0
Centurk	27.6	61.9	25	10.0
Roughrider	27.6	62.5	31	11.5
Redwin	27.6	62.2	25	12.2
Wing	26.4	62.9	24	10.6
SR-5221	26.1	61.0	22	12.9
Warrior	25.8	61.7	27	11.8
Neeley	25.4	60.9	26	9.0
Thunderbird	23.9	62.1	25	12.3
Winter Barley:				
Sprinter	12.8	44.8	22	12.2
Schuyler	10.2	43.8	21	14.3
Luther	9.1	41.0	22	13.8

(continued)

Table 5. Winter wheat near Floweree, continued.

Cooperator & location: Wayne Crawford, Floweree.
Date seeded: October 10, 1986
Date harvested: July 28, 1987
Previous crop: Fallow
Rainfall, April to maturity: 5.3 inches.

Table 6. Winter wheat variety trial grown near Sun River, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, and Mont. Co-op Ext. Service.

Variety	Yield bu/a	Test wt. lb/bu	Plant hgt. inches	% Protein
Quantum-555	40.0	61.6	24	12.2
Tiber (MT8003)	37.4	61.7	26	13.1
CS-376	36.4	58.4	25	12.6
Bighorn	35.4	60.7	23	12.7
CS-377	34.9	59.7	26	13.2
Manning	34.9	61.4	25	13.1
Cheyenne	34.7	62.0	28	12.9
Winridge	34.7	61.0	26	11.0
Quantum-524	34.4	60.5	28	13.0
Redwin	33.4	62.0	27	13.2
Cree	33.2	60.5	29	11.9
Hawk	33.1	62.0	24	13.0
Wing	32.6	62.0	25	13.4
Archer	32.6	60.3	26	11.9
Quantum-515	32.5	61.4	26	13.2
Siouxland	32.3	60.5	27	13.9
CS-375	32.1	58.8	26	13.2
Centurk	32.0	61.7	26	13.5
Norstar	32.0	60.8	30	12.2
Warrior	31.7	60.5	28	14.6
Agassiz	31.7	61.4	29	13.7
Roughrider	31.4	61.0	28	13.7
Ram	31.3	60.6	25	13.9
Norwin	31.1	61.7	23	12.1
Thunderbird	31.1	62.9	23	13.6
Bounty-202	31.0	60.4	26	12.1
Neeley	30.8	60.7	25	12.1
Winalta	27.4	61.8	30	14.2
SR 5221	27.0	61.2	23	15.3
Winter Barley:				
Sprinter	36.9	41.3	20	13.5
Schuyler	36.2	40.2	23	14.5
Luther	32.4	39.5	23	13.7

(continued)

Table 6. Winter wheat near Sun River continued.

Cooperator & location: Chuck Merja, 2 miles southeast of Sun River.
Date seeded: October 10, 1986
Date harvested: July 27, 1987
Previous crop: Fallow
Fertilizer: 6-26-0 actual with seed + 50# AA-N.

Table 7. Winter wheat variety trial grown near Eden, Cascade County, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, and Mont. Co-op Ext. Service.

Variety	Yield bu/a	Test wt. lb/bu	Plant hgt. inches	% Protein
CS-377	66.8	60.8	31	8.7
Quantum-555	64.1	61.0	29	8.0
Bounty 202	64.0	61.3	32	9.2
CS-376	60.9	59.7	32	7.8
Manning	60.6	62.8	31	8.1
Quantum-515	59.1	61.6	35	8.2
Cree	59.0	62.8	36	9.8
Tiber (MT 8003)	57.7	60.8	35	8.9
Neeley	57.5	62.8	31	8.1
Norstar	57.3	62.0	39	10.1
Quantum-524	57.1	61.0	36	8.1
Bighorn	57.0	62.5	30	10.3
Hawk	56.8	62.0	32	8.5
Norwin	56.8	63.0	26	9.0
Wing	56.1	63.5	31	9.6
Archer	54.1	60.1	31	9.5
Winalta	54.0	63.2	38	9.5
Thunderbird	52.3	62.2	33	9.3
SR 5221	52.3	61.4	26	12.7
Ram	52.1	60.3	31	8.8
Agassiz	51.9	63.2	38	8.8
Siouxland	51.7	61.4	33	10.6
Cheyenne	51.7	62.9	37	9.1
Warrior	51.2	62.5	36	9.9
CS-375	50.0	60.7	34	7.5
Redwin	48.7	62.8	36	9.9
Winridge	48.6	54.6	35	8.3
Centurk	46.8	62.2	35	8.4
Roughrider	46.6	62.1	38	9.9
Winter Barley:				
Sprinter	72.7	47.8	24	11.8
Luther	50.1	45.4	23	10.9
Schuyler	39.7	46.4	24	13.0

Cooperator & location: Tom Lorang, Eden.
Date Seeded: October 10, 1986
Date harvested: August 4, 1987
Previous crop: Fallow

TITLE: Spring Wheat, Durum, and Triticale variety investigations.

YEAR: 1987

LOCATION: Western Triangle Research Center, Conrad, MT.

PERSONNEL: Gregory D. Kushnak, Ron Thaut, and Larry Christiaens, Research Center, Conrad; and the MSU Dept. of Plant & Soil Science.

Dryland spring wheat, durum, and triticale variety trials were grown near Conrad, Cut Bank, Choteau, Floweree, and Great Falls; and irrigated trials at Conrad and Fairfield. An abundance of soil moisture at planting time was sufficient for good crop growth during the below-normal rainfall period of May and June of 1987. Rainfall was above average in July and August, contributing to exceptionally high yields.

Data for the spring wheat tests at the various locations are presented in Tables 8-14. Sawfly resistant varieties in the tests included three semidwarfs Glenman, Rambo, and Cutlass; and standard height varieties Lew, Fortuna, and Lancer. Cutlass and Lancer were recently developed in North Dakota and Canada, respectively. Glenman, Rambo, and Lew ranked high for yield at most locations; while Cutlass and Lancer ranked very low.

Averaged across all locations, Cutlass and Fortuna ranked highest for protein at 15%. Lew and Lancer averaged 14.5% protein, with Rambo and Glenman at 13 percent. Lancer exhibited very weak straw, and lodged severely on both dryland and irrigated at Conrad.

Among the hollow-stemmed varieties (sawfly susceptible), average proteins were highest for Pondera and Butte-86 at over 14 percent. Copper, NK-751, and Pioneer 2369 were intermediate at approximately 13.5 percent. Copper, recently developed in Idaho, was very late to mature. Butte-86, an early maturing variety, was the lowest yielder at nearly all locations.

Of the soft white wheats, Treasure yielded higher then Owens on both irrigated and dryland. Treasure was later to mature than Owens, and was probably favored more by the late season rains of 1987.

The durum variety trials were grown only at the Conrad dryland and Conrad irrigated sites, (Tables 15-17). Cando, Lloyd, and Sceptre were the top yielders under these high moisture conditions. Cando and Lloyd are short semidwarfs, and may be too short of height under dry conditions; while Sceptre was medium in height and stiff strawed. Monroe was the earliest to mature, and would be more suited for dry conditions or short growing seasons.

Triticale trials were grown only at Choteau, Cut Bank, Conrad dryland, and Conrad irrigated. Five triticale varieties were tested: Karl and Kramer, two semidwarfs from North Dakota; Marval from South Dakota; and Carman and Welsh from Canada. Kramer was tested only at the Conrad site, on dryland. Newana spring wheat was included in the trials as a check.

Data from the four triticale tests are presented in Tables 18 to 21. The variety Karl was the most desirable agronomically. It was earlier to mature, higher yielding, and shorter strawed than the other varieties. Kramer was also short strawed, but was medium in maturity. Karl and Kramer had plant heights nearly as short as Newana wheat. The medium and late maturing varieties yielded high in 1987 because of abundant late rains in July and August. However, in most years these varieties may be too late for dryland. The earliest maturing triticale varieties Karl and Carman, had about the same maturity date as Newana wheat. All varieties suffered moderate sawfly damage.

The test weight of triticale averaged approximately 50 pounds/ bushel, and the yields were calculated on that basis. Proteins of triticale averaged 1.8 percent lower than Newana wheat across all locations; but averaged 0.5 percent higher than the proteins of Lewis, Clark, Hector, and Gallatin barley.

Ergot did not occur in the triticale test plots. However, ergot was observed in some fields of triticale in the Triangle area by Teton County Extension Agent Bill Richter.

These trials were conducted by the MSU Western Triangle Research center, Conrad and the Cooperative Extension Service, in cooperation with the MSU Plant and Soil Science Department.

The background and detailed descriptions of the varieties tested are included in MSU Extension Bulletin 1093, "Performance Summary of Spring Wheat Varieties in Montana," available at all County Agent offices.

Table 8 . Advanced yield dryland spring wheat variety trial north of Conrad, 1987. Mont. Agr, Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein	Stem Solidness 1/
MT 8626	30	82.5	62.3	14.5	15.8
MT 8182 (hard white)	29	81.6	58.6	13.7	6.6
Wheaton	32	80.7	62.0	13.2	7.4
MT 8446	30	79.1	63.4	14.5	5
Success	32	78.4	61.2	12.7	8.4
MT 8602	29	77.7	63.0	14.7	14.2
Glenman*	27	77.6	60.4	13.6	15.8
Owens (soft white)	27	77.3	59.9	11.1	8.2
MT 8424	30	77.1	62.7	15.0	10.6
MT 8402	27	76.9	69.7	14.8	8
Copper	26	76.2	59.6	13.6	10.8
Treasure (soft white)	26	75.8	58.6	11.5	9
MT 8515	32	75.5	62.3	15.2	7.4
MT 7926*	35	75.2	62.8	13.3	22.8
Rambo*	31	73.6	62.9	13.7	8.2
MT 8363	29	73.0	60.4	15.3	6
MT 8520	27	72.9	60.8	14.8	11.4
MT 8601	27	72.5	63.2	14.8	5.6
MT 8320	29	72.0	62.5	14.3	10.4
MT 8529	26	71.7	63.6	14.5	15.2
Ward durum	37	71.6	61.7	13.3	11.8
MT 8429	35	71.5	60.8	14.5	5.2
Crosby durum	32	71.2	63.0	14.2	9
MT 8550	31	70.9	61.1	15.7	11.4
MT 8616	29	70.8	61.1	15.6	15.6
Lew*	34	70.5	63.8	15.1	17
MT 8447	36	70.4	62.3	16.1	22
Fortuna*	34	70.0	63.4	15.0	23.6
MT 8336	30	70.0	63.4	13.9	12
MT 8407	32	69.0	61.8	15.5	23
MT 8561	31	69.0	59.5	13.7	7.4
MT 8537	31	68.8	63.1	15.3	5.6
Pondera	27	68.5	62.7	15.1	12.4
MT 8564	35	68.4	60.8	14.4	9.4
Newana	27	68.4	59.1	14.3	10.2
MT 8664	27	66.6	61.7	15.1	10.8

(continued)

Table 8 cont. advanced yield dryland spring wheat.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein	Stem Solidness 1/
MT 8533	31	65.5	62.9	15.0	12.4
Pioneer 2369	27	65.2	62.8	13.7	9
MT 8623*	33	64.8	61.2	14.6	23
Thatcher	36	64.7	59.9	13.5	7.2
MT 8327	28	64.5	62.4	16.0	6.2
ND 606 *	33	64.2	62.0	14.9	20.6
Cutless*	29	63.8	60.7	16.2	20.8
MT 8647*	30	63.4	61.3	14.4	15.6
MT 8434	29	59.4	63.2	15.3	7.6
Lancer*	36	56.7	62.3	13.5	19.2
MT 8666	29	56.2	60.8	15.9	11
Butte 86	30	54.3	61.6	15.5	7.2

Location: Station
Seeding date : April 15, 1987
Harvest date : August 20, 1987
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
* Sawfly resistant varieties
Soil moisture probe at seeding : 3 feet +
Rainfall from seeding to harvest : 7.84 inches
1/ Stem solidness : 5=hollow; 25=completely solid
c.v. 2 : 5.96
LSD (.05) : 11.8

Table 8A. Three year summary for dryland spring wheat varieties grown at the Western Triangle Research Center, Conrad, MT; 1985-87.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Copper	57	23	60	14.3
Wheaton	55	29	60	13.2
Rambo	54	28	61	14.5
Owens (soft white)	53	25	58	12.5
Treasure (soft white)	50	23	57	13.3
ND 606	49	30	60	14.4
MT 7926	49	30	60	13.8
Pioneer	48	24	62	14.7
Glenman	47	27	58	14.2
Lew	46	30	60	14.6
MT 8402	46	24	65	15.8
Fortuna	45	31	61	14.9
Cutlass	45	26	59	16.9
Success	45	27	59	14.6
Pondera	43	24	60	15.7
Newana	42	24	59	14.4
Crosby durum	42	29	60	15.4
Lancer	42	32	61	13.6
Ward durum	41	31	61	14.6
Thatcher	39	31	58	14.5
Butte 86	38	27	60	16.2

Table 9. Advanced yield irrigated spring wheat trial north of Conrad, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein	Stem Solidness 1/
Success	36	103.7	60.7	13.3	5.75
MT 8561	32	102.1	59.4	12.6	5
Treasure (soft white)	30	101.5	56.0	10.7	5
Copper	32	100.1	60.9	14.0	5
MT 8550	35	99.0	61.5	15.4	5
Newana	29	97.7	62.4	13.0	5
MT 8533	32	97.0	61.6	14.9	10
MT 8182 (hard white)	32	95.6	60.1	14.1	5
MT 8336	32	94.7	64.1	15.4	7.5
Glenman*	34	93.9	62.0	13.4	5
MT 8626	30	93.4	62.4	14.5	5
MT 8515	33	92.8	62.9	15.4	5
MT 8320	32	91.3	62.3	14.1	5
MT 8647*	34	90.7	60.3	13.8	5
ND 606*	37	90.6	60.5	15.1	17
MT 8424	32	89.8	62.2	15.3	5
Wheaton	32	89.7	61.5	12.9	5
MT 8616	33	89.6	61.3	16.5	10.75
MT 8664	31	89.5	60.0	12.5	5
Owens (soft white)	28	89.4	60.6	11.5	5.75
MT 8446	30	89.2	62.6	14.8	5
MT 8402	31	88.2	62.7	14.4	5
MT 8537	34	87.3	64.0	15.3	5
MT 8529	33	86.3	62.5	14.6	10
MT 8520	31	86.2	62.2	14.9	5
MT 8601	31	85.1	62.8	14.5	10
Rambo*	33	84.6	62.5	14.0	10
Lew*	40	84.3	62.8	15.6	17
MT 8602	33	83.7	61.7	14.7	5
MT 8564	43	83.3	62.5	13.7	5
MT 8623*	35	82.9	62.7	14.3	13.5
Pondera	31	82.4	62.4	15.4	5
Pioneer 2369	33	81.7	62.1	14.6	5
MT 8429	33	81.4	60.5	16.2	5
Fortuna*	36	81.2	61.9	15.0	24.75
Crosby durum	36	79.9	62.3	14.7	9.5

(continued)

Table 9 cont. advanced yield irrigated spring wheat.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein	Stem Solidness 1/
MT 8327	30	79.7	61.5	15.6	5
MT 8447	32	78.5	60.8	15.9	17.5
Ward durum	40	78.1	61.6	14.8	8.25
Thatcher	43	77.7	60.6	15.1	8
MT 8407	34	76.4	61.5	15.7	17
MT 8434	30	75.1	61.1	14.4	5
MT 8363	34	74.2	59.8	16.1	5
MT 8666	26	71.7	60.1	15.6	5.5
Cutless*	33	71.4	61.4	15.5	25
Lancer*	39	69.1	61.3	16.8	4
MT 7926*	38	67.6	62.0	13.9	18.2
Butte 86	34	66.3	61.2	14.9	5

Location : Station
Seeding date : April 16, 1987
Harvest date : September 1, 1987
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
* Sawfly resistant varieties
Soil moisture probe at seeding : 3 feet +
Rainfall from seeding to harvest : 8.85 inches
Irrigation method : Sprinkler
1/ Stem solidness : 5= hollow; 25= completely solid.
c.v. 2 : 5.34
LSD (.05) : 12.9

Table 9A. Two year summary for irrigated spring wheat varieties grown at Western Triangle Research Center, Conrad, MT; 1986-87.

Variety	2-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Treasure (soft white)	92	31	57	11.7
Success	89	35	61	12.7
Copper	89	30	61	13.7
Glenman	89	33	62	13.9
ND 606	87	37	61	14.2
Owens (soft white)	84	27	61	11.2
Lew	84	38	63	15.0
Newana	83	29	62	13.9
Rambo	80	31	62	13.8
Fortuna	79	37	63	14.1
Wheaton	78	30	64	13.2
Pioneer	78			14.1
MT 7926	76	37	63	14.4
MT 8402	75	29	63	12.1
Crosby durum	74	34	63	14.3
Pondera	73	30	63	14.8
Ward durum	72	36	62	14.0
Thatcher	70	39	61	13.9
Lancer	66	38	61	16.4
Cutlass	65	32	62	15.0
Butte 86	61	33	62	14.4

Table 10. Irrigated spring wheat variety trial north of Fairfield, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein
Treasure (soft white)	31	102.8	52.6	10.8
Newana	32	101.9	62.0	11.5
Marshall	30	99.9	61.3	12.1
Rambo*	32	99.7	61.0	12.2
Owens (soft white)	31	99.1	59.4	11.1
Wheaton	31	99.0	60.5	11.9
Nordic	34	98.8	60.2	12.5
Pondera	31	97.1	62.0	13.0
Norak	31	95.5	62.8	13.0
ND 681/MT 6830	37	94.5	61.3	13.1
Alex	36	93.5	61.8	13.5
NK 751	30	93.3	60.3	13.0
Glenman*	32	91.5	60.9	11.4
Stoa	37	90.4	60.5	12.7
Len	32	89.5	60.7	11.9
Lew*	36	86.9	62.5	12.7
Copper	29	86.8	59.8	13.3
Cutless*	35	82.1	61.4	14.0
Telemark	30	79.5	60.5	13.6
Success	34	79.4	60.1	11.4
Poineer 2369	31	77.5	61.9	12.8
Fortuna*	36	77.4	61.5	14.8
Lancer*	40	76.3	62.1	13.9
Butte 86	33	73.6	60.9	14.5

Cooperator : Al Meyer
Location : North of Fairfield
Seeding date : April 27, 1987
Harvest date : September 2, 1987
Previous crop : Barley
Fertilizer : 110-60-40-10 worked in
Irrigation method : Flood
* Sawfly resistant varieties
c.v. 2 : 2.62
LSD (.05) : 6.7

Table 11. Spring wheat variety trial north of Cut Bank, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein
Treasure(soft white)	27	87.1	58.9	12.2
Owens (soft white)	32	75.8	61.8	10.7
NK 751	28	77.4	60.9	11.7
Wheaton	30	77.0	60.4	12.8
Rambo*	29	76.3	62.5	12.5
Nordic	31	76.2	61.4	12.9
Glenman*	32	75.8	61.8	12.4
Copper	29	75.3	60.0	13.3
Marshall	29	75.3	62.1	12.6
Pioneer 2369	31	74.5	61.9	13.4
ND 681/MT 6830	39	73.9	63.7	13.3
Pondera	30	73.9	62.4	13.0
Norak	28	73.4	63.9	13.0
Newana	29	73.3	61.7	12.2
Telemark	27	73.2	61.1	13.9
Len	31	72.6	61.9	12.8
Success	32	72.2	61.9	12.9
Alex	37	69.4	62.5	14.3
Lew*	36	67.0	62.8	14.2
Stoa	34	65.9	61.8	13.6
Fortuna*	37	63.8	62.5	15.0
Butte 86	33	61.9	62.6	14.2
Cutless*	32	58.5	61.2	14.5
Lancer*	39	55.6	62.7	14.3

Cooperator : Don Bradley
Location : North of Cut Bank
Seeding date : April 29, 1987
Harvest date : September 2, 1987
Previous crop : Fallow
Fertilizer : 100# 11-51-0 with the seed
Soil moisture probe depth at seeding :
Rainfall from June 4 - September 2 : 5.56 inches
* Sawfly resistant varieties
c.v. 2 : 3.59
LSD (.05) : 7.4

Table 12. Spring wheat variety trial east of Choteau, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein
ND 681/MT 6830	35	52.3	62.0	12.6
Treasure (soft white)	25	51.9	59.3	10.8
Wheaton	28	49.7	60.3	12.2
Owens (soft white)	30	49.6	60.7	11.0
Success	29	48.7	61.6	13.6
Nordic	28	48.7	62.2	12.6
Lew*	37	48.3	62.5	13.2
Norak	26	48.1	62.6	12.5
Glenman*	29	47.4	60.3	12.4
Pondera	29	46.8	62.6	13.6
Fortuna*	36	46.4	60.8	14.3
Marshall	26	45.7	60.9	12.9
NK 751	25	45.6	58.9	12.0
Rambo*	28	45.1	61.8	13.0
Copper	27	44.6	60.5	13.3
Telemark	26	44.6	59.5	13.5
Newana	29	43.6	62.0	13.9
Len	29	43.6	60.8	12.0
Stoa	33	43.6	61.3	14.1
Alex	33	42.6	61.8	13.5
Pioneer 2369	28	40.5	61.5	13.3
Lancer*	36	38.9	61.9	14.8
Cutless*	34	38.3	62.0	14.6
Butte 86	33	38.1	61.4	13.8

Cooperator : Herb Corey
Location : North east of Choteau
Seeding date : April 14, 1987
Harvest date : August 4, 1987
Previous crop : Fallow
Fertilizer : 100# 11-51-0 with the seed
Soil moisture probe depth at seeding : 3 feet +
Rainfall from May 5 - August 4 : 6.5 inches
* Sawfly resistant varieties
c.v. 2 : 4.20
LSD (.05) : 5.4

Table 13. Dryland spring wheat variety trial grown near Floweree Chouteau County, Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad and Mont. Co-op Extension Service.

Variety	Plant height inches	Yield bu/a	Test wt.	% protein
Owens (soft white)	28	42.0	61.0	12.4
Rambo *	28	41.6	62.0	14.3
Treasure (soft white)	24	41.0	60.8	11.9
Copper	28	40.0	60.3	15.1
Marshall	25	39.3	61.2	13.6
NK 751	23	37.8	59.8	13.0
Pondera	27	37.8	62.2	14.9
Len	27	37.6	61.0	13.9
Newana	26	37.6	61.2	14.9
Telemark	24	36.2	60.3	14.5
Glenman *	27	35.2	59.6	13.7
Stoa	31	35.1	61.1	14.6
Pioneer	26	33.3	62.1	14.6
MT 7926 *	32	33.3	62.1	13.2
Nordic	26	32.4	62.3	14.1
Success	29	32.2	61.0	14.6
Alex	31	30.9	61.7	14.6
Lew *	30	29.9	61.8	14.3
Lancer *	34	27.6	61.3	15.5
Fortuna *	32	24.9	60.3	15.8

Cooperator : Wayne Crawford
Location : Floweree
Seeding date : April 13, 1987
Harvest date : August 4, 1987
Previous crop : Fallow
Fertilizer : 49-16-0 actual
* Sawfly resistant varieties

Table 14. Dryland spring wheat variety trial south of Sun River, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad; and Mont. Co-op Extension Service.

Variety	Plant height inches	Yield bu/a	Test wt.	% protein
Treasure (soft white)	22	31.4	60.5	13.0
Copper	22	30.5	61.0	15.2
Stoa	28	30.2	60.1	15.3
Len	22	30.0	60.7	15.3
Success	24	29.1	60.6	15.3
MT 7926 *	26	28.6	60.5	14.4
Nordic	24	28.2	63.0	14.2
Marshall	21	28.1	60.5	15.1
NK 751	20	27.7	57.8	14.7
Telemark	19	27.7	58.4	16.7
Pioneer	23	27.4	61.1	15.7
Newana	25	27.4	62.4	15.3
Pondera	24	26.1	61.5	16.5
Lew *	25	26.0	60.6	14.9
Owens (soft white)	21	24.9	60.5	14.3
Glenman *	24	24.8	58.1	14.6
Rambo *	21	24.3	62.0	15.4
Alex	23	24.0	60.3	16.1
Lancer *	26	23.6	60.7	15.9
Fortuna *	26	19.3	60.3	16.0

Cooperator : Chuck Merja
Location : Southeast of Sun River
Seeding date : April 12, 1987
Harvest date : August 4, 1987
Previous crop : Fallow
Fertilizer
Soil texture : sandy clay loam
* Sawfly resistant varieties

Table 15. Irrigated durum variety trial north of Conrad, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein
Cando	31	118.0	63.6	13.6
Lloyd	32	117.3	63.9	13.6
Sceptre	34	96.3	63.5	12.9
Ward	39	84.6	62.2	14.2
Crosby	42	83.4	61.8	14.8
Vic	42	81.8	60.9	15.2
Medora	40	81.7	61.8	16.2
Monroe	36	76.8	61.2	14.8
Rolette	40	75.9	60.2	15.8

Location : Station
Seeding date : April 16, 1987
Harvest date : September 1, 1987
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
Soil moisture probe depth at seeding : 3 feet +
Rainfall from seeding to harvest : 8. 85 inches
Irrigation method : Sprinkler
c.v. 2 : 4.48
LSD (.05) : 12.2

Table 16. Dryland durum variety trial north of Conrad, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein
Cando	27	85.1	61.7	12.6
Lloyd	25	83.8	62.1	12.8
Sceptre	32	82.9	61.7	13.9
Medora	35	80.3	62.5	15.0
Monroe	33	76.3	61.0	13.4
Ward	34	72.0	61.8	13.1
Crosby	34	69.7	61.4	14.2
Vic	31	68.0	61.7	14.6
Rolette	32	68.0	62.6	13.9

Location : Station
Seeding date : April 15, 1987
Harvest date : Spetember 1, 1987
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed, and 40# N. actual top dressed
Soil moisture probe depth at seeding : 3 feet +
Rainfall from seeding to harvest : 8.85 inches
c.v. 2 : 6.82
LSD (.05) : 15.4

Table 17. Dryland URDN durum variety trial north of Conrad, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant. height inches	Yield bu/a	Test wt.
Stockholm	26	93.3	61.8
D 8261	28	91.1	62.6
D 8263	26	88.1	62.9
LLoyd	25	83.6	62.2
D 8370	25	80.0	61.1
Mindum	43	79.3	62.4
D 8374	28	78.6	61.5
FA 883323	38	77.9	61.7
D 81151	35	76.2	61.5
D 8380	27	74.9	62.0
FA 884326	25	74.2	62.5
D 8269	28	73.6	61.0
D 8304	28	73.3	60.3
D 8191	28	72.5	61.5
NPB 86748	30	72.4	61.4
Ward	37	72.1	61.3
Sceptre	34	71.3	61.7
D 83103	28	69.4	61.7
D 8302	28	67.8	61.3
D 81154	30	67.3	61.5
Fjord	36	66.9	61.0
D 8309	29	65.1	62.2
D 8311	30	65.1	62.2
Rugby	35	64.4	61.1
Vic	38	64.1	61.7
D 8291	25	62.9	59.8
D 8193	28	62.9	61.7
D 8172	35	62.3	60.3
Medora	36	60.6	61.3
Monroe	33	60.6	60.8

Location : Station
Seeding date : April 15, 1987
Harvest date : September 1, 1987
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N. actual top dressed
Soil moisture probe depth at seeding : 3 feet +
Rainfall from seeding to harvest : 8.85 inches
c.v. 2 : 7.62
LSD (.05) : 15.6

Table 18. Irrigated triticale variety trial north of Conrad, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a *	Test wt.	% Protein	Maturity
Karl	35	130.1	55.1	12.5	early
Marval	47	128.7	54.1	12.1	medium
Welsh	46	118.5	51.7	12.9	late
Carman	38	102.3	50.3	13.7	early
Newana wheat	33	94.0	62.3	15.3	early

Location : Station
Seeding date : April 16, 1987
Harvest date : September 1, 1987
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N. actual top dressed
Soil moisture probe depth at seeding : 3 feet +
Rainfall from seeding to harvest : 8.85 inches
Irrigation method : Sprinkler
* Triticale yield calculated on 50-lb test wt; spring wheat yield calculated on 60-lb.
c.v. 2 : 4.30
LSD (.05) : 13.8

Table 19. Dryland triticale variety trial north of Conrad, 1987. Mont. Agri. Expt. Sta., Western Triangle Research Center Conrad, MT.

Variety	Plant height inches	Yield bu/a *	Test wt.	% Protein	Maturity
Karl	30	113.3	54.7	12.2	early
Kramer	32	106.5	51.6	12.1	medium
Marval	42	98.4	52.4	11.6	medium
Welsh	39	83.8	54.2	13.1	late
Newana wheat	29	77.9	60.5	14.0	early
Carman	34	77.7	50.5	13.5	early

Location : Station
Seeding date : April 15, 1987
Harvest date : September 1, 1987
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N. actual top dressed
Soil moisture probe depth at seeding : 3 feet +
Rainfall from seeding to harvest : 8.85 inches
* Triticale yield calculated on 50-lb test wt; spring wheat yield calculated on 60-lb.
c.v. 2 : 6.58
LSD (.05) : 16.9

Table 20. Dryland triticale variety trial north of Cut Bank, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a *	Test wt.	% Protein	Maturity
Karl	34	100.8	53.6	11.6	early
Welsh	41	88.7	47.4	10.4	late
Carman	36	84.6	49.5	12.6	early
Newana wheat	30	80.2	62.0	13.0	early
Marval	42	80.2	47.8	11.3	medium

Cooperator : Don Bradley
Location : North of Cut Bank
Seeding date : April 29, 1987
Harvest date : September 2, 1987
Previous crop : Fallow
Fertilizer : 100# 11-51-0 with the seed
Soil moisture probe depth at seeding : 3 feet +
Rainfall from June 4 - September 2 : 5.65 inches

* Triticale yield calculated on 50-lb test wt; spring wheat yield calculated on 60-lb.

c.v. 2 : 4.24
LSD (.05) : 10.4

Table 21. Dryland triticale variety trial east of Choteau, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a *	Test wt.	% Protein	Maturity
Welsh	38	64.2	51.0	12.6	late
Carman	36	62.5	50.0	13.8	early
Karl	29	62.4	51.2	12.5	early
Marval	39	61.3	50.2	12.2	medium
Newana wheat	28	50.5	60.3	14.2	early

Cooperator : Herb Corey
Location : North east of Choteau
Seeding date : April 14, 1987
Harvest date : August 4, 1987
Previous crop : Fallow
Fertilizer : 100# 11-51-0
Soil moisture probe depth at seeding : 3 feet +
Rainfall from May 5 - August 4 : 6.5 inches
* Triticale yield calculated on 50-lb test wt; spring wheat yield calculated on 60-lb.
c.v. 2 : 2.14
LSD (.05) : 3.6

TITLE: Barley Variety Investigations

YEAR: 1987

LOCATION: Western Triangle Research Center, Conrad

PERSONNEL: Gregory D. Kushnak, Ron Thaut, & Larry Christiaens, Research Center, Conrad; Dr. Tom Blake, MSU, Bozeman

Dryland barley variety trials were grown near Conrad, Cut Bank, Choteau, Floweree, and Sun River; and irrigated trials at Conrad and Fairfield. Data for the various locations are presented in tables 22 to 29.

The abundance of soil moisture at planting time was sufficient for good crop growth during the below-normal rainfall period of May and June. Rainfall was above average in July and August, resulting in higher than normal yields.

In the 1987 dryland tests, the feed varieties Gallatin, Lewis, and Hector yielded higher than Bowman; which was consistent with the results of 1986. Under the drought conditions of 1985, Bowman was the highest yielder, but only slightly above the other three. This three-year performance record indicates Gallatin, Lewis, and Hector to be more widely adapted and stable producers, while superior performance from Bowman can be expected only in very dry conditions.

Harrington ranked high at all locations with favorable moisture conditions. In previous years tests, Harrington ranked very low in yield if drought conditions were encountered.

In the irrigated tests, the two-rowed varieties Harrington, Triumph, Gallatin, and Bellona were among the top yielders, and had excellent lodging resistance. Columbia, a six-rowed variety, had the best lodging resistance. Triumph was very late to mature, and should be grown only under irrigation with a long growing season.

These trials were conducted by the MSU Western Triangle Research Center, Conrad and the Cooperative Extension Service, in cooperation with Dr. Tom Blake, Montana State University Plant and Soil Science Department.

The background and detailed descriptions of the varieties tested are included in MSU Extension Bulletin 1094, "Performance Summary of Barley Varieties in Montana," available at all County Agent offices.

Table 22. Dryland barley variety trial north of Conrad, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt	% Plump	% Thin	% Protein
MT 851032	31	124.2	50.2	94	2	11.5
MT 851161	26	118.5	51.5	97	1	11.9
MT 851216	29	117.4	49.1	97	1	12.9
2B 80-350	28	117.2	53.6	90	3	12.3
MT 851224	27	114.9	51.0	96	2	11.6
MT 83533	29	114.8	52.2	98	0	11.5
MT 851177	25	114.4	51.3	96	1	11.5
BA 1202	23	114.0	50.7	98	1	12.7
Betzes	30	113.9	49.5	81	4	12.1
MT 83518	26	113.8	49.2	96	1	12.1
CT 81616	29	109.4	51.2	96	4	12.2
MT 851195	30	108.5	50.3	97	1	12.9
MT 328202	34	107.7	49.6	99	0	13.0
MT 851012	29	107.6	51.4	97	1	11.6
Lewis	27	107.1	52.6	96	1	12.3
Clark	25	107.1	51.9	97	1	12.6
MT 81502	28	106.6	51.0	95	2	13.0
Hector	30	105.8	52.8	98	0	12.5
MT 83892	30	105.8	50.3	96	0	11.7
Premier	27	105.1	48.4	92	2	13.3
MT 851219	28	104.9	50.8	97	1	13.2
BA 1201	27	104.4	50.7	97	1	12.6
MT 851221	27	104.3	51.7	97	1	12.8
MT 81161	27	103.7	50.3	95	0	12.5
Kimberly	29	103.5	49.2	97	0	13.4
MT 851011	28	102.2	51.9	98	1	12.0
Harrington	31	102.2	51.2	97	1	11.1
MT 851142	27	101.4	51.0	96	2	12.9
Klages	32	101.3	50.3	83	4	12.8
MT 851051	27	101.2	51.2	98	0	12.4
MT 851238	31	100.1	52.4	98	1	12.3
MT 851211	27	100.1	52.2	95	1	12.6
MT 851031	28	99.9	51.9	97	1	12.2
MT 140523	32	99.6	50.5	96	0	12.0
Gallatin	26	99.3	52.8	96	1	12.7
Robust	32	99.2	50.7	97	1	12.3

(continued)

Table 22. cont. dryland barley.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
MT 83424	27	99.1	50.0	97	1	12.4
MT 851108	28	98.7	50.6	98	1	11.1
Piroline	29	98.6	52.2	96	0	12.4
MT 851014	32	98.4	50.7	92	1	12.0
MT 851039	28	97.3	51.2	98	1	12.6
MT 81143	30	97.1	52.1	97	1	12.3
MT 851005	25	96.8	51.0	98	1	13.0
MT 83435	31	96.6	52.4	99	0	12.5
Compana	28	96.4	50.2	98	1	13.3
MT 851220	28	96.1	48.4	97	1	12.6
MT 83444	28	94.7	47.9	92	2	11.9
MT 83491	27	93.7	52.1	96	1	12.7
MT 851090	28	93.2	52.4	98	1	12.9
MT 83422	28	90.3	50.5	94	0	12.4
MT 851013	26	90.2	49.8	95	1	12.0
MT 851163	26	90.0	50.2	97	1	12.4
MT 851188	30	89.5	50.7	96	1	11.4
Morex	29	88.6	47.9	93	2	11.9
Bowman	27	87.9	51.3	99	1	13.0
Ershabet	20	86.7	51.3	75	1	14.0
Wanubet	27	85.8	56.2	74	4	15.7
Steptoe	26	85.5	45.2	95	2	10.5
Waxbar	28	81.4	53.6	75	6	14.7
Wanubet MI	28	80.7	52.2	80	11	-
Prowashonupana	24	79.9	45.2	72	5	15.1
MT 851088	26	78.8	51.0	97	1	11.9
Wanupana	25	70.4	51.7	92	1	15.7
Washonupana	27	60.4	43.5	43	42	17.2

Location : Station
Seeding date : April 15, 1987
Harvest date : August 10, 1987
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N. actual top dressed
Soil moisture probe at seeding : 3 feet +
Rainfall from seeding to harvest : 7.76 inches
c.v. 2 : 6.08
LSD (.05) : 16.9

Table 22A. Three year summary for dryland barley varieties grown at the Western Triangle Research Center, Conrad, MT; 1985-87.

Variety	3-year comparable average					
	Yield bu/a	Height inches	Test wt.	% Plump	% Thin	% Protein
Betzes	84	29	49	66	17	13.0
Harrington	80	31	50	73	7	12.0
Lewis	79	26	52	71	14	13.8
MT 81616	76	26	49	62	22	13.7
Compana	76	26	50	78	4	14.3
Kimberly	76	27	50	67	15	13.8
Gallatin	75	25	51	64	21	14.3
Clark	74	24	51	65	20	14.1
Hector	74	28	51	68	15	13.9
MT 81161	74	25	49	59	23	14.2
Klages	71	27	50	47	30	14.5
Piroline	71	26	51	63	27	14.2
Steptoe	70	26	43	68	17	12.1
Premier	69	24	41	54	28	14.9
Robust	69	30	48	68	21	13.9
Wanubet	67	27	55	38	15	15.2
Bowman	66	27	51	79	5	14.1
Waxbar	65	27	54	58	17	15.5
Wanubet M	64	27	51	29	69	15.4
Morex	62	28	47	63	28	13.5
Prowashonupana	60	24	47	60	11	16.8
Ershabet	59	25	50	58	23	14.8
Wanupana	56	25	49	74	6	16.8
Washonupana	46	26	46	29	71	18.7

Table 23. Irrigated barley variety trial north of Conrad, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
AB 6871	34	143.0	52.9	91	4	12.4
MT 851012	33	141.7	51.5	93	3	11.1
Triumph	29	138.6	52.8	92	2	11.2
BA 1202	33	135.4	52.3	98	2	12.0
MT 851177	28	135.2	52.7	95	2	11.7
Harrington	33	134.1	52.2	95	1	11.0
Bellona	32	130.6	54.1	97	1	11.8
MT 851032	36	130.5	52.5	93	2	12.1
BA 1201	35	129.7	54.4	97	1	11.6
MT 851195	31	129.1	53.4	97	1	12.0
MD 02481	30	128.8	55.0	97	1	11.2
MT 83491	32	128.7	53.7	96	2	12.4
MT 83444	36	128.2	52.6	96	2	11.8
MT 83518	31	128.2	54.0	95	1	12.4
MT 851051	38	128.1	52.3	96	2	12.1
MT 851161	32	128.0	53.3	93	3	11.6
Piroline	34	127.1	52.7	92	2	13.0
Betzes	34	125.3	52.5	88	4	12.4
MT 83424	33	125.1	53.6	96	1	12.0
VD 404382	32	125.1	54.3	93	4	12.2
MT 81143	33	123.9	53.7	94	2	12.5
Gallatin	32	123.8	54.1	96	2	11.8
MT 83435	35	123.3	53.7	98	0	11.4
VD 403582	33	123.0	52.4	98	0	12.5
Clark	30	123.0	52.4	89	6	11.9
VD 415082	33	122.6	53.8	98	1	10.9
MT 851211	37	122.5	53.4	93	3	11.7
MT 851216	34	121.6	52.2	96	1	13.1
Klages	32	120.7	51.0	85	6	11.6
MT 851005	33	120.6	51.7	94	3	18.5
MT 83533	33	120.0	53.6	96	1	10.7
CB 8444	31	119.7	54.8	97	1	12.8
MT 851031	37	119.7	54.3	94	3	12.0
MT 851039	33	119.3	52.4	96	2	11.6
MT 851221	36	119.2	53.8	97	1	12.1
MT 81502	32	118.8	52.6	92	3	11.8

(continued)

Table 23. cont. irrigated barley

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
Kimberly	33	118.6	51.2	85	7	13.5
CB 8331	30	118.2	53.5	95	1	13.2
MT 81616	35	117.9	52.2	95	2	11.2
MT 140523	31	117.7	51.4	91	3	12.2
Bowman	31	117.1	52.0	97	1	12.8
Steptoe	28	116.5	47.7	96	1	10.8
MT 81161	30	115.9	51.3	93	3	12.5
MT 851219	34	115.1	51.9	92	3	12.7
Hector	37	115.0	52.4	94	3	12.2
Lewis	33	114.9	53.6	96	1	12.2
MT 83592	34	113.8	52.2	91	4	11.6
MT 851013	30	112.8	53.4	94	2	11.8
Moravian 3	31	112.6	54.1	96	1	12.2
MT 83422	35	111.9	53.5	95	2	11.2
Piston	33	111.8	54.1	96	1	12.2
Premier	34	111.7	51.2	91	2	10.8
VD 405282	29	106.7	52.7	99	0	11.8
Waxbar	34	100.1	53.7	64	11	13.1
MT 328202	38	98.2	51.5	98	1	14.6
Wanubet	32	96.2	56.2	79	5	14.4
Fiesta	21	93.7	50.1	96	1	13.5
Compana	27	93.4	49.8	79	5	13.2
Wanubet MI	35	92.7	52.8	36	20	14.1
Morex	34	90.0	50.2	91	2	12.5
Robust	37	86.5	51.3	92	2	11.9
Wanupana	25	84.8	54.7	90	2	14.8
Prowashonupana	27	84.7	50.0	69	7	13.7
Washonupana	28	71.7	47.1	41	47	17.0

Location : Station
Seeding date : April 16, 1987
Harvest Date : August 17, 1987
Previous Crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N. actual top dressed
Soil moisture probe at seeding : 3 feet +
Rainfall from seeding to harvest : 7.84 inches
Irrigation method : Sprinkler
c.v. 2 : 6.17
LSD (.05) : 20.3

Table 23A. Two-year summary for irrigated barley varieties grown at the Western Triangle Research Center, Conrad, MT; 1986-1987.

Variety	2-year comparable average					
	Yield bu/a	Height inches	Test wt.	% Plump	% Thin	% Protein
Triumph	132	29	53	92	2	10.9
Steptoe	125	28	49	96	1	10.4
Harrington	123	33	52	96	1	10.7
Kimberly	121	33	52	89	5	12.1
Bellona	121	32	53	92	1	11.5
Betzes	116	34	53	88	4	11.6
Gallatin	114	32	54	96	2	10.8
Hector	114	37	52	94	3	11.7
Lewis	113	33	53	95	1	12.2
MT 81616	112	35	51	93	2	11.3
MT 81161	111	30	52	95	2	12.1
Clark	111	30	52	91	5	12.6
Klages	110	32	52	87	5	11.4
Bowman	108	31	53	98	1	12.1
Piston	107	33	53	95	2	12.0
Piroline	107	34	53	93	2	12.7
Premier	105	34	52	91	3	11.4
Moravian 3	103	31	54	97	1	11.8
Waxbar	95	34	54	64	11	12.7
Compana	93	27	52	89	3	12.8
Wanubet	90	32	56	76	6	12.8
Fiesta	89	21	50	96	1	13.1
Wanubet M1	86	35	52	33	20	13.1
Morex	78	34	51	94	2	11.8
Robust	76	37	51	93	2	12.1
Prowashonupana	76	27	51	69	8	13.1
Wanupana	76	25	54	90	3	14.3
Washonupana	66	28	46	47	41	16.4

Table 24. Irrigated barley variety trial north of Fairfield, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
Menuet	29	141.3	53.2	94	2	10.8
Lewis	31	134.7	52.3	89	4	10.6
Bellona	29	130.2	53.1	93	2	11.3
Steptoe	29	126.3	48.6	97	1	10.4
Harrington	32	126.0	52.9	93	2	11.2
Columbia	29	124.6	46.7	92	3	10.3
Hector	34	124.4	52.5	88	3	11.4
Triumph	29	123.8	50.9	81	6	10.8
Premier	31	122.9	51.5	83	6	11.0
Gallatin	31	120.8	52.8	86	5	11.1
Klages	31	119.8	50.0	73	11	10.3
Clark	31	118.2	50.4	87	5	11.4
Ingrid	33	117.9	51.0	87	3	11.1
Ellice	33	113.3	52.4	96	1	9.9
Hazen	34	109.5	49.6	96	1	11.4
Piroline	30	108.2	51.8	80	8	12.1
Morex	33	106.4	49.1	91	2	11.9

Cooperator : Al Meyer
Location : North of Fairfield
Seeding date : April 27, 1987
Harvest date : August 27, 1987
Previous crop : Barley
Fertilizer : 100-60-40-10 worked in
Irrigation method : Flood
c.v. 2 : 4.82
LSD (.05) : 17.0

Table 25. Dryland barley variety trial north of Cut Bank, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
Steptoe	32	108.8	48.1	96	0	10.1
Lewis	30	102.1	54.9	99	0	10.8
Harrington	30	101.6	53.5	99	0	10.2
MT 81616	31	101.4	53.3	98	1	11.8
MT 81161	31	101.1	54.0	98	0	11.3
Gallatin	30	98.0	53.8	98	1	11.9
Kimberly	31	96.8	54.9	97	0	11.9
Hector	31	95.9	54.0	99	0	11.1
Clark	30	95.0	54.6	98	1	11.5
Bowman	32	93.4	54.5	99	0	12.0
Piroline	31	91.6	54.1	97	1	12.4
Hazen	35	90.7	51.7	99	0	11.2

Cooperator : Don Bradley
Location : North of Cut Bank
Seeding date : April 29, 1987
Harvest date : September 2, 1987
Previous crop : Fallow
Fertilizer : 100# 11-51-0 with the seed
Soil moisture probe depth at seeding : 3 feet +
Rainfall from June 4 - September 2 : 5.56 inches
c.v. 2 : 3.31
LSD (.05) : 9.5

Table 26. Dryland barley variety trial east of Choteau, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
Steptoe	30	86.1	43.1	98	1	9.6
MT 81616	31	81.2	50.2	97	1	11.2
MT 81161	32	80.0	50.1	99	0	11.0
Harrington	30	79.7	50.0	99	1	11.0
Kimberly	31	78.8	51.4	93	1	11.5
Ellice	29	78.3	48.5	99	0	11.0
Lewis	31	77.9	53.0	99	0	12.0
Gallatin	31	73.1	50.5	97	1	11.9
Hector	32	72.7	51.2	98	1	11.7
Clark	30	72.2	49.6	96	1	11.6
Bowman	32	68.6	50.2	99	0	11.7
Piroline	30	68.1	51.1	97	1	11.9
Hazen	35	67.3	47.9	97	1	11.5

Cooperator : Herb Corey
Location : North east of Choteau
Seedng date : April 14, 1987
Harvest date : August 4, 1987
Previous crop : Fallow
Fertilizer : 100 # 11-51-0 with the seed
Soil moisture probe depth at seeding: 3 feet +
Rainfall from May 5 - August 4 : 6.5 inches
c.v. 2 : 5.05
LSD (.05) : 11.2

Table 27. Dryland barley variety trial at Floweree, Chouteau County, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad; and Mont. Co-op Extension Service.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	Protein
Lewis	24	50.2	52.8	91	3	12.3
MT 81616	25	49.0	50.6	88	3	12.8
Steptoe	24	48.8	46.8	88	5	11.5
Harrington	23	43.4	48.3	81	7	12.6
Gallatin	25	43.3	51.0	74	9	12.8
Hector	25	42.8	50.1	82	8	13.3
Piroline	24	42.2	51.6	70	11	12.6
MT 81161	24	41.0	47.6	79	6	12.5
Clark	25	40.2	49.2	83	5	12.8
Bowman	25	39.7	51.4	91	4	13.3
Gustoe	-	37.8	47.7	76	7	11.4
Waxbar	26	35.4	50.3	51	16	13.9
Hazen	26	34.3	45.4	74	5	12.9
Kimberly	25	34.0	43.8	76	9	13.2

Cooperator : Wayne Crawford
Location : Floweree
Seeding date : April 13, 1987
Harvest date : July 28, 1987
Previous crop : Fallow
Fertilizer : 49-16-0 actual

Table 28. Dryland barley variety trial south of Sun River, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center Conrad; and Mont. Co-op Extension Service

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
Steptoe	21	42.1	46.0	93	1	11.5
MT 81616	23	41.0	50.3	94	2	13.5
MT 81161	23	40.0	49.8	87	3	12.7
Hector	24	39.9	50.2	93	2	13.3
Lewis	23	39.8	50.8	90	3	14.6
Gallatin	23	37.3	49.8	88	3	14.0
Clark	23	36.8	48.3	77	6	
Bowman	23	36.6	51.0	97	2	14.2
Waxbar	25	35.0	49.4	44	22	13.2
						15.6
Piroline	24	34.8	50.4	76	6	
Hazen	21	33.6	46.2	89	2	14.2
Harrington	23	32.6	49.1	81	5	13.1
						13.4
Kimberly	24	32.5	46.7	88	4	13.7

Cooperator : Chuck Merja
Location : Southeast of Sun River
Seeding date : April 12, 1987
Harvest date : July 27, 1987
Previous crop : Fallow
Fertilizer :
Soil texture : sandy clay loam

Table 29. Western Regional dryland barley trial north of Conrad, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a.	Test wt.	% Plump	% Thin
ID 810274	31	135.0	50.8	98	1
ID 810099	28	129.6	51.8	99	1
MT 83435	27	126.1	51.9	97	1
OM 8413	26	125.7	52.5	93	2
BA 280350	31	123.9	51.9	97	1
MT 83422	29	123.4	52.6	98	1
MT 81161	30	123.4	51.9	97	1
MT 83533	27	123.3	51.7	97	1
WA 877178	27	121.1	52.9	98	1
Lewis	31	120.8	52.7	98	1
Ellice	32	120.2	51.2	99	1
BA 280529	32	118.2	50.7	98	1
Hector	34	118.0	51.9	97	1
BA 814038	28	117.9	50.2	99	1
MT 81616	29	117.1	51.1	97	1
ND 8671	28	116.3	51.7	99	1
Steptoe	30	116.0	47.9	98	1
MT 140523	30	115.9	51.8	98	1
Clark	35	113.2	51.7	98	1
OR 8432	24	112.9	52.7	99	1
MT 328202	31	111.2	50.2	99	1
MT 83424	32	109.8	51.7	98	1
MT 81502	28	107.3	51.8	97	1
Bowman	27	103.9	51.0	99	1
MT 81143	30	103.6	52.6	95	1
Munsing	25	100.5	51.4	95	1

Location: Station
Seeding date : April 15, 1987
Harvest date : August 12, 1987
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N. actual top dressed
Soil moisture probe depth at seeding : 3 feet +
Rainfall from seeding to harvest : 7.76 inches
c.v. 2 : 5.15
LSD (.05) : 17.1

PROJECT TITLE: Oilseed and pulse crop evaluation under no-till conditions.

PERSONNEL: Gregory D. Kushnak, Ron Thaut, & Larry Christiaens, Western Triangle Research Center, Conrad, MT.

INTRODUCTION/OBJECTIVES:

Oilseed and pulse crops in rotation can benefit grain production (soil amelioration, pest cycle disruption, etc.) The production potential of various oilseed and pulse crops has been determined for fallow systems, under average management levels, in the Western Triangle area. This project seeks to determine production potential of these crops under no-till conditions, where they will most likely be grown in rotation with grain; and also to test new crops as they become available.

In 1987, the oilseed trial consisted of 18 safflower varieties and experimental lines, mostly from the MSU safflower breeding program at Sidney. The pulse crop study consisted of lupine seeding rates, as this crop has been tested very little in the Triangle area. Spring seeded Austrian winter peas were used as a check. Of the pulse crops tested thus far in the Triangle area (pea, lentil, fababean, garbanzo bean, soy bean, dry bean) peas have shown the highest and most stable production on dryland, averaging approximately 1500 pounds/acre. Thus, peas are used as a standard when evaluating new pulse crops.

Both studies were no-till seeded into 2500 lbs/acre of standing barley stubble, using a hoe-type (furrow) planter.

RESULTS:

Soil moisture was abundant at planting time, which allowed good crop growth during the below-normal rainfall period of May and June. Rainfall was above average in July and August.

The lupine and pea stands were initially very good in the no-till conditions. Rabbits and gophers grazed most of the lupine treatments sufficiently to render the seeding rate portion of the study useless. Three plots were undamaged, and were harvested to compare lupine and pea production (Table 30) The peas were not damaged by rodents in this study.

No-till safflower stands were excellent, and diseases and other pests were not detected. The abundance of late season rainfall contributed to the high yields, which ranged from 900 to 2272 lbs/acre, but test weights were moderately low (Table 31) Cool growing season temperatures may have caused the low test weights.

Table 30. Lupine and Austrian W. Pea comparison under no-till conditions, Conrad 1987. Western Triangle Research Center, Conrad, MT.

Crop 1/	Grain yield lbs/acre	Test weight lbs/bu
Pea	1675	64.3
Lupine	1650	60.0

1/ Pea variety was 'Melrose' Austrian winter (spring seeded); Lupine variety was 'Astra'.
Location : Research Center, Conrad.
Seeding date, rate, & depth: 8 May 1987; 6 seeds /sq. foot; 2.25" deep.
Previous crop : chemical fallow (barley stubble).
Fertilizer : 50 lbs/a 11-51-0 with seed.

Table 31. No-till safflower variety trial north of Conrad, 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield lbs/a	Test wt.	% Oil
S-541	27	2272	36.6	
Hartman	27	1908	35.6	
83B3973	25	1905	36.6	
82B3555	27	1771	32.7	
Saffire	22	1753	36.9	
S-317	26	1745	36.1	
82B1277	26	1734	28.5	
S-208	26	1677	35.6	
82B2364	26	1627	35.4	
83B1954	25	1603	35.6	
82B1983	26	1601	36.4	
Girard	27	1437	35.7	
Oker	25	1430	31.8	
Finch	27	1356	37.8	
Oleic Leed	24	1229	34.4	
81B3697	25	1138	34.1	
85B4748	28	1006	27.7	
Partial Hull-290	24	900	29.3	

Location : Station; 10 miles north of Conrad
Seeding date : May 8, 1987; 1.25" deep.
Harvest date : November 29, 1987.
Previous crop : chemical fallow (barley stubble).
Fertilizer : 50 lbs/a 11-51-0 with seed.

Table 32. Canary seed (Phalaris canariensis) yield trial, Sun River and Floweree, 1987. Western Triangle Research Center, Conrad; and Mont. Cooperative Extension Service.

Crop	Yield, lbs/acre at location		Test weight lbs/bu
	Sun River	Floweree	Sun River
Canary grass	806	944	41.1
Spring wheat (Newana)	1644	2256	62.4
Barley (Lewis)	1910	2410	50.8

Cooperators : Chuck Merja, Sun River; Wayne Crawford, Floweree
Seeding date : April 12 and 13, Sun River and Floweree, respectively.
Harvest date : August 4, 1987
Previous crop : Fallow

Title: No-till row-space and fertilizer placement studies.

Year: 1987

Location: Western Triangle Research Center, Conrad, Montana.

Personnel: Greg Kushnak, Ron Thaut, Larry Christiaens - Research Center, Conrad; Arne Benson - MSU graduate student, and Dr. Earl Skogley.

Objectives:

The objectives of this study were: 1) Determine whether phosphorous placement below the seed or to the side of the seed is advantageous to placement directly with the seed; 2) Determine whether nitrogen deep placement is advantageous to surface applied; 3) Determine the effects of paired-row spacings on crop growth and yield; 4) Test phosphorous rates against the Olson phosphorous test recommendations.

Methods:

For objective no. 1, the phosphorous placement treatments were: with seed; 2 inches below seed; and 3 inches to the side of the seed row at 2 inches below seed level. These treatments were tested with the crop grown in a 10-inch, equal row-space configuration. In addition, phosphorous was placed midway between rows at 2 inches deeper than the seed level in a 6 x 14-inch paired row configuration.

For objective no. 2, the nitrogen placement treatments included: surface broadcast; 3 inches to the side of the seed row at 2 inches below seed level in the 10-inch row space; and midway between rows (within a pair) at 2 inches below seed level in the 6 x 14-inch paired-row space.

For objective no. 3, the row space treatments were: 10 x 10-inch equal row space; 6 x 14-inch paired row; and 8 x 12-inch paired row.

For objective no. 4, phosphorous rates were 0, 11, 15, 19, 30, and 50 lbs/acre (a 120 lbs/a treatment was included at the irrigated site).

All treatments were conducted on no-till recrop (wheat stubble), using the semidwarf variety 'Rambo'. The study was conducted at two dryland sites, Conrad and Brady; and one irrigated site at Agawam (north of Choteau). The study utilized the no-till, adjustable row-space, fertilizer deep-placement planter constructed by the Research Center Staff in 1986. The planter and its capabilities are described in the 1986 Western Triangle Research Center Annual Report.

Results:

The data for the study are currently being analyzed and interpreted by Arne Benson for his M.S. thesis. Therefore, the following comments and accompanying data are a preliminary summary, and may not reflect the final interpretation.

Response to phosphorous placement and rate was very small (Tables 33-36). This may have been due to high phosphorous levels in the soil, as all three sites were very high in the Olson test (26 ppm dryland; 39 ppm irrigated). Rainfall early in the growing season (April-June) was very limited, and may have masked the treatment effects somewhat on dryland. This was most pronounced at the Brady site.

In general, phosphorous placement with the seed or directly below the seed row produced a slightly higher yield than placement to the side of the seed (but differences were small). Excavation of roots showed root growth had proceeded at a downward angle, beneath the side banded phosphorous; thus missing contact with the phosphorous band. Phosphorous bands placed with the seed or directly below the seed were in direct contact with the roots. Thus it appears that side banded phosphorous should be placed deeper and/or closer to the seed row than 3-inches to assure root interception. This may not be feasible in wet conditions.

Deep nitrogen placement produced about 2 bu/a higher yields on dryland, and 9 bu/a on irrigated, than the surface broadcast placement (Tables 37-38). The difference may have been due to lack of rainfall during April and May, which left the surface applied nitrogen stranded for a few weeks. In previous studies, where timely rain carried surface applied N into the soil, no differences in yield occurred between the two N-placement regimes.

The conventional 10-inch, equal-spacing row configuration produced higher yields than the paired-row configurations, averaging about 4 bu/a more than the 6 x 14-inch row space (Tables 39-40). The 8 x 12-inch row space yielded intermediate between the 10-inch and the 6 x 14-inch. This suggested that the plants preferred equal spacing, rather than being crowded into paired rows. Lodging due to sawfly damage was more severe in the paired-row plots, as the wide space between row-pairs provided no crop stand to support stems in the adjacent row.

Table 33. Summary of phosphorous rates applied to no-till, paired-row spring wheat; Conrad, Brady, and Agawam, 1987. Western Triangle Research Center, Conrad, MT.

Rate actual N - P_2O_5		Yield bu/a at location			
		Conrad dryland	Brady dryland	Agawam irrigated	Three-location average
*					
(69)	57-11	36.1	20.2	63.5	39.9
"	57-15	36.8	20.7	66.0	41.2
"	57-19	37.4	20.1	60.1	39.2
(93)	77-0	36.5	20.8	61.2	39.5
"	77-11	37.8	18.3	60.4	38.8
"	77-15	33.5	19.4	58.2	37.0
"	77-19	36.5	20.1	60.2	38.9
"	77-30	38.0	18.4	56.6	37.7
"	77-50	39.7	17.4	59.1	38.7
(117)	97-11	39.0	20.5	57.8	39.1
"	97-15	35.8	21.1	62.3	39.7
"	97-19	37.3	19.0	58.3	38.2

Olson Phos. test: 26 ppm (high), both dryland locations; 38 ppm Agawam.
Recommended N & P_2O_5 rate : 77-15-0 dryland; 93-15-0 irrigated.
Growing season precip : 5.5" Conrad, 4.9" Brady, 10.4" Agawam (includes irrigation). Rain was too late at Brady.
Nitrogen topdressed ; phosphorous with seed.
Planted April 22, 24, & 28 ; Conrad, Brady, Agawam, respectively.
Spring wheat stubble, dryland; barley stubble, irrigated
Variety : `Rambo' spring wheat.
* Parentheses indicate N-rates for Agawam irrigated; Phosphorous rates were in common for all three locations.
Cooperators : John Mannen, Brady; Darryl Stott, Agawam area north of Choteau; Paul Kronebusch, Conrad

Soil test:	NO_3-N ppm to 4'	NO_3-N lbs/a to 4'	P	K	% O.M.	pH	E.C.
Conrad	4.6	20.4	26.3	578	3.44	7.6	0.50
Brady	5.5	17.2	25.9	996	2.19	8.0	0.71
Agawam	37.8	104.2	38.6	500	3.65	8.4	0.99

N-rate recommendation based on yield projection x 2.5 lb. N/bu.

Table 34. Protein summary of phosphorous rates applied to no-till, paired-row spring wheat; Conrad, Brady, and Agawam, 1987. Western Triangle Research Center, Conrad, MT.

Rate actual N - P_2O_5		Protein percent at location			
		Conrad dryland	Brady dryland	Agawam irrigated	3-location average
*					
(69)	57-11	13.2	14.4	13.3	13.6
"	57-15	12.8	14.8	13.6	13.7
"	57-19	12.9	14.3	14.8	14.0
(93)	77-0	13.7	15 5	13.9	14.4
"	77-11	13.4	15.7	14.8	14.6
"	77-15	13.7	15.4	14.8	14.6
"	77-19	13:4	15.7	14.5	14.5
"	77-30	13.5	15.5	25.0	14.7
"	77-50	14.0	16.2	15.2	15.1
(117)	97-11	13.7	16.8	15.1	15.2
"	97-15	14.4	16.7	15.1	15.4
"	97-19	14.2	16.8	15.4	15.6

Olson phos. test: 26 ppm (high), both dryland locations; 38 ppm Agawam.
Recommended N & P_2O_5 rate : 77-15-0 dryland; 93-15-0 irrigated.
Growing season precipitation : 5.5" Conrad, 4.9" Brady, 10.4" Agawam (includes irrigation). Rain was too late at Brady.
Nitrogen topdressed ; phosphorous with seed.
Planted April 22, 24, & 28; Conrad, Brady, Agawam, respectively.
Spring wheat stubble, dryland; barley stubble, irrigated
Variety : 'Rambo' spring wheat
* Parentheses indicate N-rates for Agawam irrigated; Phosphorous rates were in common for all three locations.
Cooperators : John Mannen, Brady, Darryl Stott, Agawam area north of Choteau; Paul Kronebusch, Conrad

Soil test:	NO_3-N ppm to 4'	NO_3-N lbs/a to 4'	P	K	% O.M.	pH	E.C.
Conrad	4.6	20.4	26.3	578	3.44	7.6	0.50
Brady	5.5	17.2	25.9	996	2.19	8.0	0.71
Agawam	37.8	104.2	38.6	500	3.65	8.4	0.99

N-rate recommendation based on yield projection x 2.5 lb. N/bu.

Table 35. Summary of Phosphorous placement treatments applied to no-till spring wheat planted in conventional and paired-row spacings; Conrad, Brady, and Agawam, 1987. Western Triangle Research Center, Conrad, MT.

Row space	Phosphorous placement *	Yield bu/a at location			
		Conrad dryland	Brady dryland	Agawam irrigated	Three-location average
10 x 10	with seed	38.5	22.6	59.9	40.3
10 x 10	below seed	38.7	23.3	66.8	42.9
10 x 10	side	36.9	22.6	57.4	39.0
6 x 14	with seed	33.5	19.4	58.2	37.0
6 x 14	side	31.8	17.9	58.6	36.1

* Placement : 'below' = 2 inches directly below seed row; 'side' = 2 inches lower than seed level and 3 inches to the side of the seed row.

Fertilizer rates : 77 and 93 lbs/a N, dryland and irrigated, respectively; 15 lbs/a P_2O_5 all locations. Rates according to soil test recommendation (Olson test = 26 and 38 ppm dryland and irrigated, respectively).

Previous crop : Wheat (dryland sites); barley (irrigated site).

Variety : 'Rambo' spring wheat.

Growing season precipitation : 5.5" Conrad; 4.9" Brady; 10.4" Agawam (includes irrigation). Rain was too late at Brady, stressing the crop.

Cooperators : Paul Kronebusch, Conrad; John Mannen, Brady; Darryl Stott, Agawam area north of Choteau.

Soil test :	NO_3-N ppm to 4'	NO_3-N lbs/a to 4'	P	K	% O.M.	pH	E.C.
Conrad	4.6	20.4	26.3	578	3.44	7.6	0.50
Brady	5.5	17.2	25.9	996	2.19	8.0	0.71
Agawam	37.8	104.2	38.6	500	3.65	8.4	0.99

N-rate recommendation based on yield projection x 2.5 lb. N/bu.

Table 36. Protein summary of Phosphorous placement treatments applied to no-till spring wheat planted in conventional and paired-row spacings; Conrad, Brady, and Agawam, 1987. Western Triangle Research Center, Conrad, MT.

Row space	Phosphorous placement *	Protein percent at location: Conrad dryland	Brady dryland	Agawam irrigated	3-location average
10 x 10	with seed	13.4	15.5	13.6	14.2
10 x 10	below seed	13.6	14.8	13.9	14.1
10 x 10	side	13.8	15.2	14.0	14.3
6 x 14	with seed	13.7	15.4	14.8	14.6
6 x 14	side	13.7	15.6	14.8	14.7

*Placement : 'below' = 2 inches directly below seed row; 'side' = 2 inches lower than seed level and 3 inches to the side of the seed row.

Fertilizer rates : 77 and 93 lbs/a N, dryland and irrigated, respectively; 15 lbs/a P_2O_5 all locations. Rates according to soil test recommendation (Olson test = 26 and 38 ppm dryland and irrigated, respectively).

Previous crop : Wheat (dryland sites); barley (irrigated site).

Variety : 'Rambo' spring wheat.

Growing season precipitation : 5.5 " Conrad; 4.9" Brady; 10.4" Agawam (includes irrigation). Rain was too late at Brady, stressing the crop.

Cooperators : Paul Kronebusch, Conrad; John Mannen, Brady; Darryl Stott, Agawam area north of Choteau.

Soil test :	NO_3-N ppm to 4'	NO_3-N lbs/a to 4'	P	K	% O.M.	pH	E.C.
Conrad	4.6	20.4	26.3	578	3.44	7.6	0.50
Brady	5.5	17.2	25.9	996	2.19	8.0	0.71
Agawam	37.8	104.2	38.6	500	3.65	8.4	0.99

N-rate recommendation based on yield projection x 2.5 lb. N/bu.

Table 37. Summary of Nitrogen placement treatments applied to no-till spring wheat planted in conventional and paired-row spacings; Conrad, Brady, and Agawam, 1987. Western Triangle Research Center, Conrad, MT.

Row space	Nitrogen placement *	Yield, bu/a at location			
		Conrad dryland	Brady dryland	Agawam irrigated	Three-location average
10 x 10	deep	38.9	24.5	71.2	44.9
10 x 10	surface	38.5	22.6	59.9	40.3
6 x 14	deep	34.5	19.7	66.4	40.2
6 x 14	surface	31.8	17.9	58.6	36.1

* N-placement : 'Deep' = 2 inches lower than seed level and 3 inches to the side of the seed row. Phosphorous was placed with the seed in the 10 x 10 treatments; and with the nitrogen band in the 6 x 14 treatments.

Fertilizer rates : 77 and 93 lbs/a N, dryland and irrigated, respectively; 15 lbs/a P_2O_5 all locations. Rates according to soil test recommendation (Olson test = 26 and 38 ppm dryland and irrigated, respectively).

Previous crop : wheat (dryland sites); barley (irrigated site).

Variety : 'Rambo' spring wheat.

Growing season precipitation : 5.5" Conrad; 4.9" Brady; 10.4" Agawam (includes irrigation). Rain was too late at Brady, stressing the crop.

Cooperators : Paul Kronebusch, Conrad; John Mannen, Brady; Darryl Stott, Agawam area north of Choteau.

Soil test:	NO_3-N ppm to 4'	NO_3-N lbs/a to 4'	P	K	% O.M.	pH	E.C.
Conrad	4.6	20.4	26.3	578	3.44	7.6	0.50
Brady	5.5	17.2	25.9	996	2.19	8.0	0.71
Agawam	37.8	104.2	38.6	500	3.65	8.4	0.99

N-rate recommendation based on yield projection x 2.5 lb. N/bu.

Table 38. Protein summary of Nitrogen placement treatments applied to no-till spring wheat planted in conventional and paired-row spacings; Conrad, Brady, and Agawam, 1987. Western Triangle Research Center, Conrad, MT.

Row space	Nitrogen placement *	Protein percent at location			
		Conrad dryland	Brady dryland	Agawam irrigated	3-location average
10 x 10	deep	13.6	14.9	12.7	13.7
10 x 10	surface	13.4	15.5	13.6	14.2
6 x 14	deep	14.2	16.5	14.5	15.1
6 x 14	surface	13.7	15.6	14.8	14.7

* N-placement : 'Deep' = 2 inches lower than seed level and 3 inches to the side of the seed row. Phosphorous was placed with the seed in the 10 x 10 treatments; and with the nitrogen band in the 6 x 14 treatments.

Fertilizer rates : 77 and 93 lbs/a N, dryland and irrigated, respectively; 15 lbs/a P_2O_5 all locations.

Rates according to soil test recommendation (olson test = 26 and 38 ppm dryland and irrigated, respectively).

Previous crop : wheat (dryland sites); barley (irrigated site).

Variety : 'Rambo' spring wheat

Growing season precipitation : 5.5" Conrad; 4.9" Brady; 10.4" Agawam (includes irrigation). Rain was too late at Brady, stressing the crop.

Cooperators : Paul Kronebusch, Conrad; John Mannen, Brady; Darryl Stott, Agawam area north of Choteau.

Soil test:	NO_3-N ppm to 4'	NO_3-N lbs/a to 4'	P	K	% O.M.	pH	E.C.
Conrad	4.6	20.4	26.3	578	3.44	7.6	0.50
Brady	5.5	17.2	25.9	996	2.19	8.0	0.71
Agawam	37.8	104.2	38.6	500	3.65	8.4	0.99

N-rate recommendation based on yield projection x 2.5 lb. N/bu.

Table 39. Summary of conventional and paired-row space treatments for no-till spring wheat at Conrad, Brady, and Agawam, 1987. Western Triangle Research Center, Conrad, MT.

Row space *	Yield bu/a at location. Conrad dryland	Brady dryland	Agawam irrigated	Three-location average.
10 x 10	37.9	22.9	63.6	41.5
8 x 12	36.5	22.1	61.8	40.1
6 x 14	34.4	18.5	59.1	37.3

* Averaged across both 8 x 12 and all five 10 x 10 treatments, respectively.
Only the three 6 x 14 treatments which had fertilizer treatments in common with the 10 x 10 and 8 x 12 treatments were included.
Planted April 22, 24, and 28 at Conrad, Brady, and Agawam, respectively.
No-till planted into wheat stubble Conrad and Brady; barley stubble, Agawam.
Variety : 'Rambo' spring wheat
Growing season precipitation : 5.5" Conrad; 4.9" Brady; 10.4" Agawam (includes irrigation). Rain was too late at Brady, stressing the crop.
Cooperators: Paul Kronebusch, Conrad; John Mannen, Brady; Darryl Stott, Agawam area north of Choteau.

Table 40. Protein summary of conventional and paired-row space treatments for no-till spring wheat at Conrad, Brady, and Agawam, 1987. Western Triangle Research Center, Conrad, MT.

Row space *	Yield bu/a at location			
	Conrad dryland	Brady dryland	Agawam irrigated	3-location average
10 x 10	13.5	15.2	13.7	14.1
8 x 12	14.2	15.3	14.6	14.7
6 x 14	13.6	15.6	14.8	14.7

* Averaged across both 8 x 12 and all five 10 x 10 treatments, respectively.
Only the three 6 x 14 treatments which had fertilizer treatments in common with the 10 x 10 and 8 x 12 treatments were included.
Planted April 22, 24, and 28 at Conrad, Brady, and Agawam, respectively.
No-till planted into wheat stubble Conrad and Brady; barley stubble, Agawam.
Variety : 'Rambo' spring wheat
Growing season precipitation : 5.5' Conrad; 4.9" Brady; 10.4" Agawam (includes irrigation). Rain was too late at Brady, stressing the crop.
Cooperators : Paul Kronebusch, Conrad; John Mannen, Brady; Darryl Stott, Agawam area north of Choteau.