THIRTY-FIFTH ANNUAL REPORT

1983

Special Report No. 9

Northwestern Agricultural Research Center
of the
Agricultural Experiment Station
Montana State University

4570 Montana 35
Kalispell, Montana 59901

Prepared By
Vern R. Stewart
Professor of Agronomy and Superintendent

Todd K. Keener
Agricultural Research Technician II

ADMINISTRATION 750

The Administration project concerns itself with all aspects of the research program on the Northwestern Agricultural Research Center which includes personnel as well as the equipment purchased for use in the office.

Personnel working at the center in 1983 include:

Vern R. Stewart, Superintendent & Professor of Agronomy (April 1952)
Leon E. Welty, Assoc. Professor (January 1973)
Jeantte Calbick, Secretary II (September 1963)
Todd Keener, Agric. Res. Tech. II (March 1978)
Gary Haaven, Agric. Res. Tech. I (April 1982)
Roger Hybner, Field Aide I (April 1983 - September 1983)
Louise Prestbye, Agric. Res. Tech. II (6 month appointment beginning May 1983)
Gerard Byrd, Field Aide I (October 25, 1982 thru March 31, 1983)
Ranch Hand II (April 1, 1983 thru April 30, 1983)

Other Employees:

Craig Arnold 1/	(June 2 thru August 4)
Barbara Barton	(June 16 thru September 23)
Jeanne Borer	(June 13 thru September 15)
Jeffery Borer	(June 16 thru September 16)
Kristi Carda	(June 15 thru September 16)
Larry Conrad	(parttime in April)
Randy Cowan	(June 16 thru September 16)
LaVonne Gardner	(parttime May and July)
Victor Hannam	(May 3 thru June 14)
Stacy Isch 2/	(June 22 thru August 17)
Shawn Loughery	(June 15 thru October 14)
Cifford Nichols	(August 8 thru August 22)
Glen Thompson (yard care)	(May thru September)
Oscar Buller	(October 1 thru December 13)

1/ Terminated by Superintendent because of poor work.
2/ Terminated because of illness.

The Super Brain computer was exchanged for an IBM PCXT. With this computer more programs can be adapted and the screen is in color. The Lotus 123 program was also purchased to compliment the IBM.

A portable Radio Shack computer was purchased to enable the technicians to take data from the field and plug it directly into the IBM. This will be a time saving device.

A new 36"x48" filing cabinet was purchased for the superintendent's office which will release an older file for use in the library.

GENERAL FARM 751

Project 751 used to be the Physical Plant project and covered the maintenance of buildings, yards and roadways. It is now called the General Farm Project and concerns itself with all aspects of the farming program on the Northwestern Agricultural Research Center.

Purchased under this project are the following items:

A 1983 GMC pickup, which has been nicknamed the 'go-cart' by the crew, for use by research projects 755 and 758.

Additional irrigation equipment was purchased to enhance the efficiency of irrigation. This should reduce moving pipe from the R rotation to the X and Y rotations, thus saving time and energy.

A Wiley Mill was purchased for project 755 at a cost of $3357. The Western Agricultural Research Center contributed $1000 toward the purchase of this piece of equipment.

ACTIVITIES FOR 1983

Date	Activity	Staff	Location
January			
6	Farm Show Comm. Meeting	Stewart	Kalispell
	Soil Conservation District Meeting	Stewart	Kalispell
7	Promotion & Tenure Meeting	Welty	Bozeman
11	John Deere Days	Stewart	Kalispell
18	Advisory Council of Flathead Co. Ext.	Stewart	Kalispell
20	W & NW Agric. Res. Advisory Committee	Stewart	Allentown
		Welty	Allentown
21	Foundation Seed Stocks meeting	Stewart	Bozeman
25	MT Wheat Research & Marketing Comm.	Stewart	Bozeman
31 thru	Planning Conference	Stewart	Bozeman
February			
4		Welty	Bozeman
7- 8	Food Legume Production Meeting	Stewart	Spokane, WA
		Welty	Spokane, WA
14	Extension Advisory Council meeting	Stewart	Kalispell
24	Farm Show	Stewart	Kalispell
		Welty	Kalispell
March			
3	Crops & Soils Day	Stewart	Creston
		Welty	Creston
8-10	Western Section Weed Science	Stewart	LasVegas, NV
16	FFA Advisory Committee	Stewart	Kalispell
17	Up-Dating Confer. for County Agents	Stewart	Allentown
		Welty	Allentown
	Mint Growers	Stewart	Kalispell
25	Eastside Grange Talk	Stewart	Creston
April			
11	Advisory Council of Flathead Co. Ext.	Stewart	Kalispell
19	FFA Banquet	Stewart	Kalispell
May			
4	Chamber of Commerce Luncheon	Stewart	Kalispell
5	Budget Meeting	Stewart	Bozeman
26	Flathead Chapter FFA Tour	Stewart	Creston
		Welty	Creston
June			
23	Tour (18 people)	Stewart	Creston
30	Montana Seedmen Assoc. Banquet	Stewart	Kalispell

ACTIVITES FOR 1983 con't

Date	Activity	Staff	Location
July			
20	Foundation Seed Committee meeting	Stewart	Bozeman
21	Research Center Administration meeting	Stewart	Hamilton
22	Fertilizer Advisory Committee meeting	Stewart	Hamilton
23	Western Research Center Field Day	Stewart	Corvallis
		Welty	Corvallis
August			
3	Twilight Tour	Stewart	Creston
		Welty	Creston
September			
22-23	Superintendent's Retreat	Stewart	Bozeman
October			
19	Herbicide Recertification meeting	Stewart	Havre
21	Herbicide Recertification meeting	Welty	Butte
November			
4	Electronic Show	Stewart	Kalispell
9-10	Potato Growers meeting	Stewart	Kalispell
15	Cerone meeting	Stewart	Kalispell
18	Chamber of Commerce meeting	Stewart	Kalispell
December			
6	Faculty Meeting	Stewart	Bozeman
		Welty	Bozeman
7	Variety Recommendation meeting	Stewart	Bozeman
		Welty	Bozeman
8	Foundation Seed Advisory Council	Stewart	Bozeman
15	Chamber Ag Business Meeting	Stewart	Kalispell
15	FFA Advisory Committee	Stewart	Kalispell
16	Adv. Council Flathead Co. Ext.	Stewart	Kalispell

VISITORS:

Date	Visitor	Representing	Address
January			
7	Floyd LaBrant	Farmer	Kalispell
12	Herman Byrd	Neighbor	Creston
February			
14	Steve Knoll	Farmer	Kalispell
	Harold Clarke	Farmer	Columbia Falls
25	Mr.&Mrs. E. Roebucker	Farmer	Kalispell
March			
3	Don Baldridge	Coop. Extension MSU	Bozeman
4	Jim Story	WARC - Entomologist	Corvallis
	Don Graham	WARC - Soil Scientist	Corvallis
15	Billie Jean Marht	Job Applicant	Kalispell
16	Roger Hybner	Job Applicant	Kalispell
	Kathryn Hyde	Job Applicant	Kalispell
17	Wally Olsen	Westchem	
18	Maureen Macho	Job Applicant	Whitefish
21	Harold Clarke	Farmer	Columbia Falls
	Charles Jaquette	Farmer	Kalispell
	Jim & Linda Adams	Monsanto	Great Falls
23	Bill Peterson	Dist. Supervisor Co. Agts.	Missoula
28	Keith Johnson	DuPont	
29	Ron Lockerman	P&SS - MSU	Bozeman
April			
8	Phil Clarke	Farmer	Columbia Falls
	Boyd Blackmer	Farmer	Columbia Falls
20	Grange Elves	Insurance salesman	
	John Holbrook	Insurance salesman	
	Vonnie Gardner	Job Applicant	Kalispell
	Arnie Grob	Neighbor	Kalispell
	Jim Shaw	Neighbor	Kalispell
21	Bill Vergine	Treweek Construction	Kalispell
22	John Sheldon	Farmer	Kalispell
25	Herb Sandon	Sandon Construction	Kalispell
May			
9	Nancy Swanson	Teacher	Bigfork
	Rose Svennungsen	Teacher	Bigfork
11	Warren Barce	Job Applicant	Polson
	Kathleen Reick	Job Applicant	Kalispell
	Louise Prestbye	Job Applicant	Columbia Falls
	Jim Morgan	Gustafson	
12	Dr.&Mrs. Arne Hovin	Ag. Exp. Stn. - MSU	Bozeman
	George Evans	P&SS - MSU	Bozeman
13	George Evans	P&SS - MSU	Bozeman

VISITORS (con't)

Date	Visitor	Representing	Address
May			
17	Reb Bishop	Monsanto	Great Falls
	Jim Toft	Monsanto	Missoula
	Tom Armstrong	Monsanto	St Louis, MO
	Jim Adams	Monsanto	Great Falls
24	Marcie Quist	Rhome-Poulenc Inc.	Bozeman
26	Herb Sandon	Sandon Construction	Kalispell
June			
1	Bob Kirby Family & 2 students	Teacher	Stanford
6	Joan Deily	N.W. Telephone	Kalispell
8	Al Luke	Union Carbide	Idaho Falls, ID
16	Sue Bowers	Federal Crop Ins.	Helena
	Claudia Glantz	Federal Crop Ins.	Helena
	Leola Arnold	Bomar Office Supply	Kalispell
17	Ron Hill	Omnidata	
	Linda Dye	Omnidata	
21	Don Grfaham	WARC-Soil Scientist	Corvallis
	Earl Skogley	P&SS - MSU	Bozeman
	Gerry Sutton	MT Ag. Exp. Stn.-MSU	Bozeman
28	Brian,Tennis & Bonnie Marks		LaMott, Alberta, Canada
29	Lloyd & Debbie Coulterwood		
30	Nancy Mathison		
July			
1	Dan Toya	Stauffer	Blackfoot, ID
13	Don Mathre	P&SS - MSU	Bozeman
	Jack Martin	P&SS - MSU	Bozeman
15	Kevin Kephart	Graduate Student	
	Kenneth Kephart & wife		
27	Arne Grob	Neighbor	Kalispell
August			
2	Clyde & Jeanne Pederson	Farmers	Kalispell
	Al Luke	Union Carbide	Idaho Falls, ID
4	Ron Pack	Pack & Co.	Kalispell
5	Bill Sykes	Fiscal Anlyst's Office	Helena
	Ken & Betty Paul		Kalispell
	Cliff Nichols	Job Applicant	
22	Darrell Wesenberg	Scientist	Aberdeen, ID
24	James Cali	Job Applicant	
26	Don Graham	WARC-Soil Scientist	Corvallis
September			
6	Beryl Mahlum	Farmer	Somers
12	Harold Small	Farmer	Kalispell
	Allan Taylor	P&SS - MSU	Bozeman
	Rick Prestbye		Columbia Falls

VISITORS (con't)

Date	Visitor	Representing	Address
October			
5	Harvey Tripple	Monsanto	Denver, CO
	Jim Adams	Monsanto	Great Falls
6	George Evans	P&SS - MSU	Bozeman
7	Bryon Hoylman	Heating Company	Kalispell
November			
9	James Welsh	Dir. Ag. Exp. Stn.	Bozeman
14-15	Ric Roach	Dir's. Office - MSU	Bozeman
18	Vonda Gould		Kalispell
	Jim Adams	Monsanto	Great Falls
	Bob Lilienthal	Lilienthal Insulation	Kalispell
23	Wanda Gould		Kalispell
	Gary Griffin	Creative Kitchens	Whitefish
	Roger & Starla Mallorey	Farmers	Plains
28	Markus Budget	Western Bldg. Centers	Kalispell
December			
29	Fred Heintz	Job Applicant	Columbia Falls
30	Oscar Buller	Job Applicant	Kalispell

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1983 NORTHWESTERN AGRICULTURAL RESEARCH CENTER REPORT

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4	Feed Mills Co-op Supply Inc. - Ronan Equity Supply Company - Kalispell Kalispell Feed & Grain Supply Inc. - Kalispell Western Seed & Supply Company - Ronan

CLIMATOLOGICAL DATA
NORTHWESTERN AGRICULTURAL RESEARCH CENTER

Kalispell, MT

Since the Northwestern Agricultural Research Center began in 1949 the National Climatic Center, Asheville, NC has been supplied with weather data each month. At 8:00 a.m., the maximum and minimum air temperature, soil temperature (4" and 8") and precipitation are recorded.

SUMMARY OF THE 1982-83 CROP YEAR

The crop year, September 1982 through August 1983, was warmer than normal with an overall mean temperature of 44.0°F. This was attributed to the mild temperatures during the winter months of January, February and March. January was 8.6 degrees warmer than the long time average, with February and March each about 5 degrees warmer. The coldest day was 3°F on December 11, 1982. The warmest day was recorded on August 8, 1983 with a temperature of 97°F.

Total precipitation was 1.57 inches more than the 34 year average. July was the wettest month with 3.66 inches which is 2.17 inches above the average. September 1982, April and June 1983, each had over 2 inches of precipitation for a total of 7.74 inches. Precipitation for November and December was about normal, but January and February were way below with only 1.78 inches total for the two months.

The frost free period was almost normal for this crop year. The first freezing day was September 6, 1983 with a temperature reading of 31°F. Our last frost free day in the spring was May 15, 1983, with a reading of 31°F, which is 11 days earlier than average.

In Tables 2 through 5 there is a detailed description of weather information for the crop year September through August 1983. Table 6 gives the daily precipitation. A summary of climatic data for years 1950 through 1983 will be found in Tables 7 through 10.

Table 1. Summary of climatic data by months for the 1982-83 crop year (September thru August) and averages for the period 1949-83 at the Northwestern Agricultural Research Center, Kalispell, MT.

Item	Sept. 1982	Oct. 1982	Nov. 1982	Dec. 1982	Jan. 1983	Feb. 1983	Mar. 1983	Apr. 1983	May 1983	June 1983	July 1983	Aug. 1983	Total or Average
Precipitation (inches)													
Current Year	2.37	.75	1.39	1.60	.93	.85	1.71	2.41	1.20	2.96	3.66	1.16	20.99
Ave. 1949 to 1982-83	1.48	1.36	1.42	1.68	1.60	1.15	1.09	1.40	2.19	2.90	1.49	1.66	19.42
Mean Temperature (F)													
Current Year	53.4	41.0	29.1	25.9	30.3	33.8	37.9	42.4	51.9	57.6	59.6	65.4	44.0
Ave. 1949 to 1982-83	53.8	43.5	32.8	26.5	21.7	28.2	33.4	42.9	51.6	58.3	64.0	63.0	43.3
Last killing frost in spring*													
1983				May 15 (31°F)									
Ave. 1949-83				May 26									
First killing frost in fall*				September 6 (31°F)									
Ave. 1949-83				September 14									
Frost Free Period													
1983				114 days									
Ave. 1949-83				111 days									
Maximum summer temperature				97° F on August 8, 1983									
Minimum winter temperature				3° F on December 11, 1982									

* In this summary 32° is considered a killing frost.

Table 2. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1983.

	Average temperature by month and year Degrees Fahrenheit												
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	$\bar{x}$ for Year
1949-50	54.1	41.5	38.5	25.0	4.2	25.6	31.2	41.9	49.7	57.0	64.0	62.5	41.3
1950-51	53.8	45.9	31.5	29.5	20.2	27.7	27.0	42.1	50.0	54.2	64.7	60.4	42.3
1951-52	50.6	40.8	30.8	16.9	18.0	26.6	29.3	45.8	52.4	56.7	61.8	62.8	41.0
1952-53	56.0	45.5	30.4	27.6	36.0	32.9	37.2	41.2	49.5	54.6	64.3	63.1	44.9*
1953-54	56.1	46.2	37.0	31.3	21.1	31.2	29.6	40.8	52.5	54.9	63.4	60.1	43.7*
1954-55	52.9	41.5	38.8	28.8	25.7	22.1	24.5	39.1	47.7	58.8	62.7	62.2	42.1
1955-56	52.5	44.6	23.5	21.8	23.3	20.9	31.5	44.2	54.0	59.0	64.8	62.0	41.8
1956-57	55.2	44.1	30.9	28.5	10.2	23.4	33.3	43.7	55.6	59.7	65.4	62.4	42.7
1957-58	55.8	41.4	32.1	32.4	29.1	30.4	32.2	43.6	59.6	62.3	65.2	67.9	46.0*
1958-59	55.5	44.6	32.8	28.2	24.7	23.1	35.3	45.2	48.1	59.9	64.5	61.0	43.6*
1959-60	53.0	43.9	25.5	27.6	19.4	25.2	32.3	44.3	50.6	59.6	68.8	60.6	42.6
1960-61	55.0	45.2	34.4	24.9	27.8	37.0	38.3	42.0	52.6	64.7	66.2	67.8	46.3*
1961-62	49.6	42.3	28.2	23.6	17.4	25.7	30.9	47.2	51.5	58.6	62.1	62.1	41.6
1962-63	54.7	44.7	38.0	32.5	11.8	33.1	38.7	43.2	51.4	59.4	63.0	64.9	44.6*
1963-64	58.7	47.4	35.8	24.0	28.5	28.3	30.6	42.8	51.1	58.7	64.3	58.9	44.1*
1964-65	51.2	43.7	33.7	22.1	30.2	28.7	28.6	45.2	50.6	57.6	64.6	63.6	43.3*
1965-66	46.4	47.6	35.0	28.8	26.3	27.7	34.5	42.9	54.3	56.0	64.5	61.7	43.8*
1966-67	59.3	43.4	33.4	30.2	31.0	33.2	32.9	40.6	52.2	59.4	66.1	67.2	45.7*
1967-68	61.0	45.9	33.8	25.1	23.3	32.8	41.2	42.0	49.8	59.0	64.6	61.3	45.0*
1968-69	53.8	42.9	33.4	19.9	13.1	24.0	29.6	47.1	53.9	58.8	62.3	63.6	41.9
1969-70	56.0	40.0	35.2	27.7	21.9	29.9	32.8	40.2	53.2	62.0	64.8	62.6	43.9*
1970-71	48.7	40.1	31.3	26.2	23.6	29.9	33.2	43.6	52.5	54.9	61.9	68.2	42.8
1971-72	49.5	40.4	34.1	22.2	17.0	27.3	38.5	40.6	51.9	59.3	61.5	65.9	42.4
1972-73	50.2	40.3	33.7	19.9	20.7	27.8	37.7	42.2	51.5	57.5	65.1	64.5	42.6
1973-74	53.3	44.1	29.3	30.8	21.0	32.3	33.6	42.7	48.0	61.5	64.8	61.6	43.6*
1974-75	52.8	43.6	34.8	30.1	21.5	21.5	29.9	37.6	48.6	55.9	69.1	59.8	42.1
1975-76	52.1	42.9	35.4	27.5	27.7	29.9	31.0	43.4	51.9	54.5	63.4	61.3	43.4*
1976-77	55.2	42.4	33.1	28.6	20.0	30.9	34.4	45.0	49.7	61.5	62.6	62.8	43.9*
1977-78	51.7	42.5	30.4	22.0	21.6	26.1	34.3	43.7	48.1	59.1	63.4	60.3	41.9
1978-79	53.7	43.7	27.2	18.8	4.1	24.9	34.7	42.3	51.5	59.4	65.0	65.4	40.9
1979-80	56.9	46.6	30.7	33.0	16.3	29.0	32.6	47.1	54.8	56.9	63.5	58.6	43.8*
1980-81	54.1	45.3	35.8	32.2	30.1	31.3	38.5	44.5	52.5	53.8	62.8	66.4	45.6*
1981-82	55.3	43.2	36.0	27.0	21.6	24.5	37.5	39.4	49.8	59.8	61.1	63.0	43.2
1982-83	53.4	41.0	29.1	25.9	30.3	33.8	37.9	42.4	51.9	57.6	59.6	65.4	44.0*
$\bar{x}$	53.8	43.5	32.8	26.5	21.7	28.2	33.4	42.9	51.6	58.3	64.0	63.0	

Mean temperature for all years = 43.3

* Denotes years above average temperature.

Table 3. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1983.

	Average maximum temperature by month and year Degrees Fahrenheit												$\bar{x}$ for
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Year
1949-50	71.4	52.4	45.7	32.1	14.4	34.6	38.4	52.3	63.1	70.1	78.6	79.5	52.7
1950-51	70.9	55.8	38.2	36.3	28.7	36.6	37.3	57.9	63.2	66.6	82.4	77.0	54.2
1951-52	64.2	47.5	37.2	23.6	25.9	35.7	39.5	61.8	65.7	70.2	79.2	79.5	52.5
1952-53	73.4	62.6	40.6	33.2	41.3	39.1	46.8	51.5	62.5	66.8	83.3	79.5	56.7*
1953-54	72.3	61.0	45.6	36.7	29.1	38.4	40.0	51.0	67.2	67.0	80.1	74.4	55.2*
1954-55	66.4	53.4	45.9	34.9	31.8	31.2	33.9	48.1	60.5	74.7	76.9	82.4	53.3
1955-56	67.6	55.5	30.8	29.2	30.7	30.1	39.7	57.4	67.5	73.3	81.2	77.8	53.4
1956-57	71.0	53.7	37.6	35.5	19.0	33.2	43.3	55.3	70.2	72.4	82.1	80.0	54.4
1957-58	74.3	50.5	40.1	38.5	33.7	37.9	43.5	54.4	77.5	75.7	80.8	85.5	57.7*
1958-59	69.7	57.9	39.6	34.1	31.8	31.9	43.9	57.9	61.5	74.3	83.2	76.3	55.2*
1959-60	64.0	53.6	33.9	33.3	27.5	34.1	43.4	56.1	63.0	74.8	88.7	74.1	53.9
1960-61	72.1	57.8	41.1	29.8	35.0	43.1	48.2	51.6	65.3	82.0	83.7	86.3	58.0*
1961-62	62.3	53.3	35.1	30.4	26.0	33.4	40.5	60.7	62.7	74.2	79.2	77.5	52.9
1962-63	71.7	54.7	43.8	37.9	19.9	41.4	48.9	55.7	67.1	71.8	79.6	82.5	56.2*
1963-64	74.6	59.4	43.4	30.2	35.1	37.7	39.7	53.3	63.5	71.4	80.3	72.9	55.1*
1964-65	63.9	55.0	41.0	28.9	35.1	36.9	41.0	57.6	64.3	71.4	80.8	77.1	54.4
1965-66	57.5	61.1	42.6	35.4	31.8	35.3	45.4	54.8	69.8	69.1	81.2	78.4	55.2*
1966-67	74.9	55.1	41.1	35.8	36.7	40.9	41.3	52.6	66.0	73.3	84.8	87.2	57.5*
1967-68	78.9	55.8	41.3	30.8	31.5	40.8	52.6	54.2	63.4	72.2	82.7	75.7	56.6*
1968-69	65.9	53.1	40.6	27.3	20.8	32.5	40.9	59.5	68.7	72.0	78.9	83.0	53.6
1969-70	70.4	49.7	43.0	32.8	28.5	36.2	42.5	49.7	67.9	75.5	79.1	80.9	54.7
1970-71	62.5	52.2	40.0	34.1	30.6	38.6	41.6	56.2	66.4	67.3	78.0	87.5	54.6
1971-72	64.2	53.1	41.2	30.9	27.1	35.9	47.9	51.7	64.7	72.4	76.9	83.3	54.1
1972-73	64.0	51.3	41.4	28.6	30.6	38.5	47.7	53.8	65.8	69.6	83.7	83.2	54.9*
1973-74	67.6	56.3	36.8	36.5	28.5	39.6	43.5	53.1	59.2	76.2	80.3	77.6	54.6
1974-75	70.9	61.4	43.2	37.4	32.0	31.5	39.4	48.1	61.2	68.5	85.5	73.0	54.3
1975-76	69.4	52.3	40.4	35.1	36.2	37.6	40.1	54.3	66.2	66.3	79.0	74.4	54.3
1976-77	73.2	57.7	42.1	36.1	28.0	39.1	42.7	60.2	61.9	77.0	76.6	77.4	56.0*
1977-78	64.7	55.4	38.5	29.4	28.8	35.5	45.5	54.3	58.1	72.6	77.5	74.2	52.9
1978-79	65.7	59.2	35.9	28.2	13.7	33.2	45.3	52.5	64.3	73.9	81.5	82.8	53.0
1979-80	74.1	59.5	37.8	39.2	25.2	35.9	40.8	60.4	66.9	69.0	77.0	73.2	54.9*
1980-81	66.9	59.0	43.9	39.2	34.0	38.9	49.7	54.8	63.3	63.8	78.1	85.0	56.4*
1981-82	70.8	54.1	44.9	34.2	29.7	33.3	45.8	50.5	62.5	74.3	75.0	80.6	54.6
1982-83	69.2	53.2	36.9	33.0	36.8	42.2	47.5	55.2	66.4	70.6	73.1	82.9	55.6*
$\bar{x}$	68.8	55.4	40.3	33.2	29.3	36.5	43.2	54.7	64.9	71.8	80.3	79.5	

Mean temperature for all years = 54.8

* Denotes years above average.

Table 4. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1983.

Year	Average minimum temperature by month and year, Degree's Fahrenheit												$\bar{x}$ for Year
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	
1949-50	36.7	35.0	31.2	17.8	-6.0	16.6	23.9	31.5	36.3	43.9	49.4	45.5	30.2
1950-51	36.6	36.0	24.8	22.6	11.7	18.8	16.6	26.2	36.7	41.7	46.9	43.7	30.2
1951-52	37.0	34.0	24.4	10.1	10.0	17.4	19.1	29.8	39.1	43.1	44.3	46.1	29.5
1952-53	38.6	28.3	20.2	21.9	30.6	26.7	27.5	30.9	36.5	42.3	45.3	46.7	33.0*
1953-54	39.8	31.4	28.4	25.9	13.1	24.0	19.2	30.6	37.7	42.8	46.7	45.7	32.1*
1954-55	39.3	29.5	31.6	22.7	19.5	13.0	15.0	30.0	34.9	42.8	48.5	42.0	30.7
1955-56	37.3	33.6	16.1	14.4	15.9	11.7	23.3	30.9	40.5	44.7	48.2	46.1	30.2
1956-57	39.4	34.4	24.2	21.5	1.4	13.6	23.2	32.0	40.9	47.0	48.7	44.8	30.9
1957-58	37.2	32.3	24.1	26.2	24.5	22.8	20.9	32.8	41.7	48.8	49.5	50.3	34.3*
1958-59	41.2	31.2	26.0	22.2	17.5	14.2	26.6	32.4	34.7	45.4	45.8	45.6	31.9*
1959-60	42.0	34.1	17.0	21.8	11.2	16.3	21.1	32.4	38.1	44.3	48.8	47.0	31.2
1960-61	37.9	32.5	27.6	19.9	20.6	30.9	28.4	32.3	39.8	47.4	48.7	49.2	34.6*
1961-62	36.8	31.2	21.2	16.8	8.7	17.9	21.2	33.7	40.3	43.0	45.0	46.6	30.2
1962-63	37.6	34.6	32.2	27.1	3.7	24.7	28.4	30.6	35.7	47.0	46.4	46.9	32.9*
1963-64	42.7	35.3	28.1	17.7	21.8	18.9	21.4	32.2	38.6	46.0	48.3	44.9	33.0*
1964-65	38.4	32.3	26.4	15.3	25.3	20.4	16.2	32.7	36.9	43.8	48.4	50.0	32.2*
1965-66	35.2	34.0	27.4	22.1	20.8	20.0	23.6	30.9	38.7	42.8	47.7	45.0	32.4*
1966-67	43.6	31.7	25.6	24.6	25.3	25.5	24.5	28.6	38.4	45.4	47.4	47.2	34.0*
1967-68	43.1	35.9	26.3	19.4	15.0	24.8	29.7	29.8	36.1	45.7	46.4	46.8	33.3*
1968-69	41.7	32.6	26.1	12.5	5.4	15.4	18.2	34.6	39.0	45.5	45.7	43.5	30.0
1969-70	41.6	30.3	27.4	22.6	15.3	23.4	23.0	30.7	38.5	48.2	50.5	44.3	33.0*
1970-71	34.9	27.9	22.5	18.3	16.5	21.0	24.8	31.0	38.6	42.3	45.7	48.8	31.0
1971-72	34.7	27.6	26.9	13.5	7.7	18.6	29.0	29.0	39.2	46.3	45.8	48.5	30.6
1972-73	36.4	29.2	25.9	11.1	11.0	17.4	27.8	29.6	36.4	44.4	46.5	45.8	30.1
1973-74	38.9	32.0	21.8	25.2	13.5	25.1	23.6	32.4	36.7	46.9	49.5	45.6	32.6*
1974-75	34.7	25.7	26.3	22.9	10.9	11.5	20.4	27.1	36.1	43.3	52.7	46.5	29.8
1975-76	34.7	33.4	30.3	20.0	19.1	22.2	22.0	32.4	37.6	42.6	47.8	48.3	32.5*
1976-77	37.2	27.2	24.1	21.1	12.0	22.6	26.1	29.9	37.4	46.0	48.5	48.2	31.7
1977-78	38.6	29.5	22.2	14.6	14.5	16.7	23.2	33.1	38.1	45.6	49.2	46.4	31.0
1978-79	41.7	28.3	18.4	9.3	-5.6	16.5	24.0	32.1	38.7	44.9	48.5	48.0	28.7
1979-80	39.7	33.7	23.6	26.8	7.5	22.1	24.5	33.7	42.7	44.7	50.0	44.0	32.8*
1980-81	41.3	31.6	27.7	25.1	26.2	23.8	27.2	34.2	41.7	43.7	47.6	47.8	34.8*
1981-82	39.7	32.2	27.0	19.8	13.5	15.7	29.2	28.4	37.2	45.3	47.3	45.4	31.7
1982-83	37.6	28.8	21.4	18.7	23.7	25.3	28.4	29.5	37.5	44.7	46.1	48.0	32.5*
$\bar{x}$	38.6	31.7	25.1	19.8	14.2	19.9	23.6	31.1	38.1	44.8	47.7	46.4	

Mean temperature for all years = 31.8

* Denotes years above average temperature.

Table 5. Summary of precipitation records at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1983.

	Total precipitation in inches by month and year											
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Total
1949-50	1.03	1.05	1.67	.92	2.62	1.13	2.31	.84	.15	3.90	3.12	.75	19.49*
1950-51	.52	2.30	1.16	2.48	.94	1.29	.62	2.32	3.77	2.26	1.03	2.86	21.55*
1951-52	1.49	5.62	1.01	3.31	1.03	.98	.97	.17	1.32	3.95	.56	.69	21.10*
1952-53	.13	.05	.60	.98	1.84	1.14	.98	2.07	2.00	3.31	T	1.62	14.72
1953-54	.71	.03	.87	1.30	2.65	.79	.83	.79	1.52	2.98	2.91	3.79	19.17
1954-55	1.09	.54	1.00	.43	1.00	1.31	.44	.82	1.18	1.86	3.08	.00	12.75
1955-56	1.64	1.89	1.97	2.38	1.76	1.53	.87	1.28	1.06	4.20	2.13	3.21	23.92*
1956-57	1.16	1.10	.53	.96	1.47	1.14	.75	1.22	1.75	2.51	.52	.78	13.89
1957-58	.10	1.59	.96	1.76	1.56	2.67	.97	1.47	2.20	2.56	.84	.58	17.26
1958-59	1.99	1.16	2.90	2.77	1.95	1.33	.75	1.62	4.10	1.75	T	.91	21.23*
1959-60	4.22	3.36	4.32	.34	1.67	1.10	1.01	1.23	3.27	.69	.13	2.43	23.77*
1960-61	.55	1.44	1.72	1.24	.65	1.46	1.96	2.26	4.02	1.45	.76	.64	18.15
1961-62	3.40	1.22	1.77	2.09	1.33	1.15	1.59	.96	2.59	1.15	.11	.72	18.08
1962-63	.58	1.85	1.31	.91	1.69	1.21	.85	1.07	.57	5.00	1.44	2.10	18.58
1963-64	1.46	.75	.95	1.70	1.46	.41	1.57	.87	3.33	3.86	3.01	1.64	21.01*
1964-65	2.27	.85	1.62	3.62	2.25	.64	.24	2.55	.81	2.30	1.15	4.74	23.04*
1965-66	1.72	.21	1.31	.55	1.42	.67	.53	.76	1.18	6.57	2.49	1.64	19.05
1966-67	.79	1.34	3.33	1.68	1.50	.62	1.27	.99	1.30	2.53	.02	.01	15.38
1967-68	.91	1.88	.62	1.16	.79	1.15	.68	.57	3.92	2.22	1.00	3.42	18.32
1968-69	4.51	2.39	1.59	3.12	3.05	.75	.69	1.39	1.19	5.21	.70	.09	24.68*
1969-70	1.54	1.90	.31	1.14	3.10	.89	1.49	.76	1.97	4.37	3.08	.44	20.99*
1970-71	1.79	1.38	1.75	.99	1.84	.77	.69	.58	2.45	4.42	1.31	1.11	19.08
1971-72	.94	.87	1.70	1.62	1.10	1.65	2.11	.95	1.48	3.28	1.77	.98	18.45
1972-73	1.38	1.84	.80	2.19	.52	.56	.70	.45	1.13	2.14	.01	.63	12.35
1973-74	1.37	1.41	2.95	1.94	1.35	1.32	1.40	3.36	1.82	1.80	1.01	.62	20.35*
1974-75	.80	.12	1.10	1.31	1.56	1.08	1.50	1.27	1.50	1.40	1.08	4.26	16.98
1975-76	1.18	2.96	.85	1.39	.91	1.12	.34	1.92	1.90	2.49	1.49	3.42	19.97*
1976-77	.96	.62	.73	.86	.83	.71	1.40	.41	2.90	.52	3.60	1.50	15.04
1977-78	2.84	.56	1.62	4.10	2.15	.99	.72	2.54	3.56	2.63	3.90	3.34	28.96*
1978-79	1.90	.15	.96	.91	1.70	1.45	.82	2.33	2.67	1.23	.40	1.79	16.31
1979-80	1.03	1.75	.50	1.03	1.53	2.03	.97	1.88	5.48	3.89	1.08	2.45	23.62*
1980-81	1.20	.83	.78	2.58	1.81	1.85	2.17	1.75	3.86	4.70	1.17	.96	23.66*
1981-82	.77	.56	1.49	1.91	2.38	1.48	1.16	1.60	1.25	2.41	2.06	1.17	18.24
1982-83	2.37	.75	1.39	1.60	.93	.85	1.71	2.41	1.20	2.96	3.66	1.16	20.99*
$\bar{x}$	1.48	1.36	1.42	1.68	1.60	1.15	1.09	1.40	2.19	2.90	1.49	1.66	

Mean precipitation for all crp years = 19.42

* Denotes years above average precipitation.

Table 6. Precipitation by day for crop year, September 1, 1982 thru August 31, 1983. Northwestern Agricultural Research Center, Kalispell, MT

Date	Sept. 1982	Oct. 1982	Nov. 1982	Dec. 1982	Jan. 1983	Feb. 1983	Mar. 1983	Apr. 1983	May 1983	June 1983	July 1983	Aug. 1983
1	T		T			.01	.05	.16			.01	
2							.36	.07			.37	
3				.23	.09		.03	.27		.10	.48	
4	.19	T	.03	.03	.13		.06	T			.04	
5			.05	.03	.12							.14
6			.14		.12		.11		.08			
7			.06		.02	.16	.05		.25			
8					.08	.01	.33		.09		.02	
9						.10	T	.02	.15		.15	
10	.05				.05	.04		.11	.26		.03	
11	.06		.06		.02			.03		.20	.05	.82
12	.19	T	.25				.59			.09		.10
13	.01		.25	.32		T				.16	.04	T
14		T		.33			.03				1.05	
15		.01		.02		.01	.01				.14	
16		T	T	.13		.06			.01	.37	.39	
17		.18	T			.04			.20	.01	.01	
18		.03	.06	T		.05				.69		
19		.01	.32	.09		.11			.16	.04		
20			.05							T	.13	
21	.20		.06	.24	.01	.02					.44	
22	.25	.03		.16	.03	.02						T
23	T	.27			.05	T				.07		
24		.03					T	.28		.21	.03	.01
25	.02	.01			.08		.01	.83			.14	.06
26	.53			.02	T	.21		.45			.10	
27	.01	.07			.02	.01		.03				.02
28	.47	.01	T	T	.11		.02	.16		.60		
29	.39	.10	.01	T						.02	.03	.01
30		T	.05	T			.06			.40		
31				T			T				.01	
Total	2.37	.75	1.39	1.60	.93	.85	1.71	2.41	1.20	2.96	3.66	1.16

Table 7. Frost free period at the Northwestern Agricultural Research Center from 1950 thru 1983.

Year	Date Last Freeze	Temperature Degrees F	Date First Freeze	Temperature Degrees F	Frost Free Season
1950	June 10	32	Sept. 11	29	93
1951	June 1	29	Sept. 15	29	106
1952	June 14	32	Sept. 8	29	86
1953	May 23	32	Sept. 16	31	116
1954	May 29	31	Sept. 30	26	124
1955	May 25	28	Sept. 13	31	111
1956	May 3	26	Sept. 2	32	122
1957	May 23	30	Sept. 9	30	109
1958	May 14	31	Sept. 27	31	136
1959	June 11	32	Aug. 30	30	80
1960	June 18	32	Sept. 6	32	80
1961	May 6	32	Sept. 12	29	129
1962	May 30	32	Sept. 3	25	96
1963	May 22	28	Sept. 18	32	119
1964	May 25	26	Sept. 11	28	109
1965	June 7	30	Sept. 6	31	91
1966	May 18	26	Sept. 30	28	135
1967	May 26	28	Sept. 23	32	120
1968	May 20	32	Sept. 21	32	124
1969	June 13	28	Sept. 6	32	85
1970	May 11	32	Sept. 10	31	122
1971	July 7	32	Sept. 14	28	69
1972	May 4	32	Sept. 12	32	131
1973	May 22	31	Sept. 2	31	103
1974	May 18	31	Sept. 2	30	107
1975	May 25	32	Sept. 12	32	110
1976	May 21	30	Sept. 8	30	110
1977	May 16	29	Sept. 27	28	133
1978	May 23	31	Sept. 17	28	116
1979	May 30	31	Oct. 1	32	123
1980	June 4	32	Sept. 24	31	111
1981	May 5	28	Sept. 24	25	142
1982	May 30	31	Sept. 15	23	108
1983	May 15	31	Sept. 6	31	114
$\bar{x}$ for all years	May 26	30	Sept. 14	30	111

Table 8. Temperature extremes at the Northwestern Agricultural Research Center, Kalispell, MT from 1950 thru 1983.

Year	Minimum		Maximum	
	Date	Temperature Degrees F	Date	Temperature Degrees F
1950	Jan. 30	-40	Aug. 31	88
1951	Jan. 28	-25	Aug. 2	92
1952	Jan. 1	-14	Aug. 31	90
1953	Jan. 6	8	July 12	97
1954	Jan. 20	-32	July 6	90
1955	Mar. 5	-20	June 22	96
1956	Feb. 16	-25	July 22	90
1957	Jan. 26	-34	July 13	91
1958	Jan. 1	2	Aug. 11	94
1959	Nov. 16	-30	July 23	96
1960	Mar. 3	-32	July 19	98
1961	Jan. 2	0	Aug. 4	100
1962	Jan. 21	-32	Aug. 16	92
1963	Jan. 30	-24	Aug. 9	94
1964	Dec. 17	-28	July 8	91
1965	Mar. 24	-10	July 31	89
1966	Mar. 4	- 7	Aug. 2, 25	91
1967	Jan. 24	2	Aug. 19	95
1968	Jan. 21	-23	July 7	94
1969	Jan. 25	-13	Aug. 24	97
1970	Jan. 15	-14	Aug. 21, 25	92
1971	Jan. 12	- 8	Aug. 6, 9	96
1972	Jan. 28	-24	Aug. 9, 10	92
1973	Jan. 11	-22	July 11	97
1974	Jan. 5	-18	June 16, 20	93
1975	Jan. 12, Feb. 9	-16	July 12	96
1976	Feb. 5	- 4	July 27	90
1977	Dec. 31	-11	June 7	91
1978	Dec. 31	-31	July 16	91
1979	Jan. 1	-31	July 20	97
1980	Jan. 29	-20	July 23	92
1981	Feb. 21	-21	Aug. 26, 27	97
1982	Feb. 9, 10	-23	Aug. 8	91
1983	Dec. 25	-29	Aug. 8	97

Table 9. Summary of temperature records at the Northwestern Agricultural Research Center, January 1950 thru December 1983.

Date	Average Temperature by Month and Year Degrees Fahrenheit												$\bar{x}$ for Year
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1950	4.2	25.6	31.2	41.9	49.7	57.0	64.0	62.5	53.8	45.9	31.5	29.5	41.4
1951	20.2	27.7	27.0	42.1	50.0	54.2	64.7	60.4	50.6	40.8	30.8	16.9	40.5
1952	18.0	26.6	29.3	45.8	52.4	56.7	61.8	62.8	56.0	45.5	30.4	27.6	42.7
1953	36.0	32.9	37.2	41.2	49.5	54.6	64.3	63.1	56.1	46.2	37.0	31.3	45.8*
1954	21.1	31.2	29.6	40.8	52.5	54.9	63.4	60.1	52.9	41.5	38.8	28.8	42.9
1955	25.7	22.1	24.5	39.1	47.7	58.8	62.7	62.2	52.5	44.6	23.5	21.8	40.4
1956	23.3	20.9	31.5	44.2	54.0	59.0	64.8	62.0	55.2	44.1	30.9	28.5	43.2
1957	10.2	23.4	33.3	43.7	55.6	59.7	65.4	62.4	55.8	41.4	32.1	32.4	43.0
1958	29.1	30.4	32.2	43.6	59.6	62.3	65.2	67.9	55.5	44.6	32.8	28.2	46.0*
1959	24.7	23.1	35.3	45.2	48.1	59.9	64.5	61.0	53.0	43.9	25.5	27.6	42.7
1960	19.4	25.2	32.3	44.3	50.6	59.6	68.8	60.6	55.0	45.2	34.4	24.9	43.4*
1961	27.8	37.0	38.2	42.0	52.6	64.7	66.2	67.8	49.6	42.3	28.2	23.6	45.0*
1962	17.4	25.7	30.9	47.2	51.5	58.6	62.1	62.1	54.7	44.7	38.0	32.5	43.8*
1963	11.8	33.1	38.7	42.3	51.4	59.4	63.0	64.9	58.7	47.4	35.8	24.0	44.3*
1964	28.5	28.3	30.6	42.8	51.1	58.7	64.3	58.9	51.2	43.7	33.7	22.1	42.8
1965	30.2	28.7	28.6	45.2	50.6	57.6	64.6	63.6	46.4	47.6	35.0	28.8	43.9*
1966	26.3	27.7	34.5	42.9	54.3	56.0	64.5	61.7	59.3	43.4	33.4	30.2	44.5*
1967	31.0	33.2	32.9	40.6	52.2	59.4	66.1	67.2	61.0	45.9	33.8	25.1	45.7*
1968	23.3	32.8	41.2	42.0	49.8	59.0	64.6	61.3	53.8	42.9	33.4	19.9	43.7*
1969	13.1	24.0	29.6	47.1	53.9	58.8	62.3	63.6	56.0	40.0	35.2	27.7	42.6
1970	21.9	29.9	32.8	40.2	53.2	62.0	64.8	62.6	48.7	40.1	31.3	26.2	42.8
1971	23.6	29.9	33.2	43.6	52.5	54.9	61.9	68.2	49.5	40.4	34.1	22.0	42.8
1972	17.0	27.3	38.5	40.6	51.9	59.3	61.5	65.9	50.2	40.3	33.7	19.9	42.2
1973	20.7	27.8	37.7	42.2	51.5	57.5	65.1	64.5	53.3	44.1	29.3	30.8	43.7*
1974	21.0	32.3	33.6	42.7	48.0	61.5	64.8	61.6	52.8	43.6	34.8	30.1	43.9*
1975	21.5	21.5	29.9	37.6	48.6	55.9	69.1	59.8	52.1	42.9	35.4	27.5	41.8
1976	27.7	29.9	31.0	43.4	51.9	54.5	63.4	61.3	55.2	42.4	33.1	28.6	43.5*
1977	20.0	30.9	34.4	45.0	49.7	61.5	62.6	62.8	51.7	42.5	30.4	22.0	42.8
1978	21.6	26.1	34.3	43.7	48.1	59.1	63.4	60.3	53.7	43.7	27.2	18.8	41.7
1979	4.1	24.9	34.7	42.3	51.5	59.4	65.0	65.4	56.9	46.6	30.7	33.0	42.9
1980	16.3	29.0	32.6	47.1	54.8	56.9	63.5	58.6	54.1	45.3	35.8	32.2	43.9*
1981	30.1	31.3	38.5	44.5	52.5	53.8	62.8	66.4	55.3	43.2	36.0	27.0	45.1*
1982	21.6	24.5	37.5	39.4	49.8	59.8	61.1	63.0	53.4	41.0	29.1	25.9	42.2
1983	30.3	33.8	37.9	42.4	51.9	57.6	59.6	65.4	50.4	42.9	36.6	11.1	43.3
$\bar{x}$	21.7	28.2	33.4	42.9	51.6	58.3	64.0	63.0	53.7	43.5	32.7	26.1	

Mean temperature for all years = 43.3

* Denotes years above average mean.

Table 10. Summary of precipitation records at the Northwestern Agricultural Research Center, Kalispell, MT, January 1950 thru December 1983.

Date	Total Precipitation (inches) by Months and Years												Total for Year
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1950	2.62	1.13	2.31	.84	.15	3.90	3.12	.75	.52	2.30	1.16	2.48	21.28*
1951	.94	1.29	.62	2.32	3.77	2.26	1.03	2.86	1.49	5.62	1.01	3.31	26.52*
1952	1.03	.98	.97	.17	1.32	3.95	.56	.69	.13	.05	.60	.98	11.43
1953	1.84	1.14	.98	2.07	2.00	3.31	T	1.62	.71	.03	.87	1.30	15.87
1954	2.65	.79	.83	.79	1.52	2.98	2.91	3.79	1.09	.54	1.00	.43	19.32
1955	1.00	1.31	.44	.82	1.18	1.86	3.08	-	1.64	1.89	1.97	2.38	17.57
1956	1.76	1.53	.87	1.28	1.06	4.20	2.13	3.21	1.16	1.10	.53	.96	19.79*
1957	1.47	1.14	.75	1.22	1.75	2.51	.52	.78	.10	1.59	.96	1.76	14.55
1958	1.56	2.67	.97	1.47	2.20	2.56	.84	.58	1.99	1.16	2.90	2.77	21.67*
1959	1.95	1.33	.75	1.62	4.10	1.75	T	.91	4.22	3.36	4.32	.34	24.65*
1960	1.67	1.10	1.01	1.23	3.27	.69	.13	2.43	.55	1.44	1.72	1.24	16.48
1961	.65	1.46	1.96	2.26	4.02	1.45	.76	.64	3.40	1.22	1.77	2.09	21.68*
1962	1.33	1.15	1.59	.96	2.59	1.15	.11	.72	.58	1.85	1.31	.91	14.25
1963	1.69	1.21	.85	1.07	.57	5.00	1.44	2.10	1.46	.75	.95	1.70	18.79
1964	1.46	.41	1.57	.87	3.33	3.86	3.01	1.64	2.27	.85	1.62	3.62	24.51*
1965	2.25	.64	.24	2.55	.81	2.30	1.15	4.74	1.72	.21	1.31	.55	18.47
1966	1.42	.67	.53	.76	1.18	6.57	2.49	1.64	.79	1.34	3.33	1.68	22.40*
1967	1.50	.62	1.27	.99	1.30	2.53	.02	.01	.91	1.88	.62	1.16	12.81
1968	.79	1.15	.68	.57	3.92	2.22	1.00	3.42	4.51	2.39	1.59	3.12	25.36*
1969	3.05	.75	.69	1.39	1.19	5.21	.70	.09	1.54	1.90	.31	1.14	17.96
1970	3.10	.89	1.49	.76	1.97	4.37	3.08	.44	1.79	1.38	1.75	.99	22.01*
1971	1.84	.77	.69	.58	2.45	4.42	1.31	1.11	.94	.87	1.70	1.62	18.30
1972	1.10	1.65	2.11	.95	1.48	3.28	1.77	.98	1.38	1.84	.80	2.19	19.53*
1973	.52	.56	.70	.45	1.13	2.14	.01	.63	1.37	1.41	2.95	1.94	13.81
1974	1.35	1.32	1.40	3.36	1.82	1.80	1.01	.62	.80	.12	1.10	1.31	16.01
1975	1.56	1.08	1.50	1.27	1.50	1.40	1.08	4.26	1.18	2.96	.85	1.39	20.03*
1976	.91	1.12	.34	1.92	1.90	2.49	1.49	3.42	.96	.62	.73	.86	16.76
1977	.83	.71	1.40	.41	2.90	.52	3.60	1.50	2.84	.56	1.62	4.10	20.99*
1978	2.15	.99	.73	2.54	3.56	2.63	3.90	3.34	1.90	.15	.96	.91	23.76*
1979	1.70	1.45	.82	2.33	2.67	1.23	.40	1.79	1.03	1.75	.50	1.03	16.70
1980	1.53	2.03	.97	1.88	5.48	3.89	1.08	2.45	1.20	.83	.78	2.58	24.70*
1981	1.81	1.85	2.17	1.75	3.86	4.70	1.17	.96	.77	.56	1.49	1.91	23.00*
1982	2.38	1.48	1.16	1.60	1.25	2.41	2.06	1.17	2.37	.75	1.39	1.60	19.62*
1983	.93	.85	1.71	2.41	1.20	2.96	3.66	1.16	1.70	1.13	1.96	2.57	22.24*
$\bar{x}$	1.60	1.15	1.09	1.40	2.19	2.90	1.49	1.66	1.50	1.36	1.42	1.73	

Mean annual precipitation for 34 years = 19.49

*Denotes years above average.

CHEMICALS USED IN HERBICIDE STUDIES 1982-83, NWARC, KALISPELL,MT

Common name	Trade name	Chemical name	Company
	AC 222,293 *	2/6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)	Am. Cyanamide
Barban	Carbyne	4-chloro-2-butynyl-m-chloro-carbanilate	Velsicol
Bentazon	Basagran	3-isopropyl-1H-2,1,3-benzothiadiazin-4-(3H)-one-2,2-dioxide	BASF
Bromoxynil	Brominal /Buctril	3,5-dibromo-4-hydroxybenzonitrile	Union Carbide Rhone Poelenc
	CGA 82725 *	no chemistry available	Ciba-Giegy
Chlorsulfuruon	Glean	2-chloro-N[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)aminolcarbonyl]benzenesulfonamide	DuPont
Dicamba	Banvel	3,6-dichloro-o-anisic acid	Velsicol
Diclofop-m	Hoelon	2-[4-(2,4-dichlorophenoxy)phenoxy propanoic acid	Am. Hoechst
Difenzoquat	Avenge	1,2-dimethyl-3,5-diphenyl-1H pyrazolium	Am. Cyanamide
Dinoseb	Premerge	2-sec-butyl-4,6-dinitrophenol	Dow
Diuron	Karmex	3-(3,4-dichlorophenyl)-1,1-dimethylurea	DuPont
	Dowco 433	Methyl 2-(4-((3-chloro-5-(trifluoromethyl)-2-pyridinyl)oxy)phenoxy) propanoate	Dow
	DPX-T6376	Methyl-2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)aminolcarbonyl]aminolsulfonyl]benzoate	DuPont
	DPX-Y6202	2-[4-[(6-chloro-2-quinoxalinyl)oxy]-phenoxy]-propionic acid ethyl ester	DuPont
EPTC	Eptam	S-ethyl dipropylthiocarbamate	Stauffer
Ethalfluralin	Sonalan	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl) benzenamine	Elanco
Fluazifop-b	Fusilade	Butyl-2-[4-(5-trifluoromethyl-2-pyridinyl-oxy)phenoxy]propanoate	ICI
Glyphosate	Roundup	N-(phosphonomethyl) glycine	Monsanto
Hexazinone	Velpar	3-cyclohexyl-6-(dimethylamino)-1-methyl--1,3,5-triazine-2,4-(1H,3H)-dione	DuPont
MCPA	MCPA	[(4-chloro-o-tolyl)oxy]acetic acid	Union Carbide

Common name	Trade name	Chemical name	Company
Mefluidide	Embark	N-[2,4-dimethyl-5-[[(trifluoromethyl)-sulfonyl]amino]phenyl]acetamide	Union Carbide
Metolachlor	Dual	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide	Ciba-Giegy
Metribuzin	Sencor or Lexone	4-amino-6-tert-butyl-3-(methylthio)-as triazin-5(4H)one	Mobay DuPont
Napropamide	Devrinol	2-(α-naphthoxy)-N-N-diethylpropionamide	Stauffer
Oryzalin	Surflan	3,5-dinitro-N-N-dipropylsulfanilamide (4 4)	Elanco
Oxyflourfen	Goal	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene	Rohm and Haas
Paraquat	Paraquat	1-1'-dimethyl-4,4'-bipyridium ion	Chevron
Pendimethalin	Prowl	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	Am. Cyanamide
Profluralin	Tolban	N-(cyclopropylmethyl)- , , -trifluoro-2,6-dinitro-N-propyl-p-toluidine	Ciba-Giegy
Pronamide	Kerb	3,5-dichloro(N-1,1-dimethyl-2-propynyl) benzamide	Rohm and Haas
Propham	Chem-Hoe *	isopropyl carbanilate	PPG
	RH 0265	no chemistry available	Rohm and Haas
	R 40244	1-(m-trifluoromethylphenyl)-3-chlor-4-chloromethyl-2-pyrrolidone	Stauffer
Sethoxydim	Poast	2[(1-ethoxyimino)butyl]-5[(2-ethylthio)-propyl]-3-hydroxy-2-cyclohexen-1-one	BASF
	SSH 0860	1-amino-3-(2,2-dimethylpropyl)-6-(ethyl-thio)-1,3,5-triazine-2,4(1H,3H)-dione	Mobay
Terbacil	Sinbar	3-tert-butyl-5-chloro-6-methyluracil	DuPont
Terbutryn	Igran	2-(tert-butylamino)-4-(ethylamino)-6-(methylthio)-s-triazine	Stauffer
Triallate	Fargo	S-(2,3,3-trichloroallyl)diisopropylthio-carbamate	Stauffer
Trifluralin	Treflan	α,α,α-trifluoro-2,6-dinitro-N-N-dipropyl-p-toluidine	Elanco
2,4-D	2,4-D	(2,4-dichlorophenoxy)acetic acid	Cenex
2,4-DB	2,4-DB	4-(2,4-dichlorophenoxy)butyric acid	Union Cabide

* May need revision in near future

TITLE: Broadleaf Herbicides on Small Grains (1983)

PERSONNEL: Vern R. Stewart and Todd K. Keener

SUMMARY:

Four studies were conducted to evaluate broadleaf herbicides in small grains: 1) Broadleaf Herbicide Study I; 2) Broadleaf Herbicide Study II; 3) Combination Herbicide Study and 4) Bedstraw Herbicide Study.

1) Broadleaf Herbicide Study I - Excellent yields (exceeding 100 bu/a) were harvested and good broadleaf weed control observed in plots treated with metribuzin, chlorsulfuron, DPX-T6376 and RH 0265.

2) Broadleaf Herbicide Study II - Several herbicides alone and in combination were evaluated in this study to determine their effect on a wide spectrum of weed species. The majority of treatments were very effective in broadleaf herbicide control.

3) Combination Herbicide Study - Yields above 100 bu/a and excellent broad spectrum weed control were obtained from the combination of chlorsulfuron plus diclofop and triallate plus chlorsulfuron. Treatments with equally good yields, yet less effective broadleaf weed control were; bromoxynil plus diclofop, AC 222,293 and bromoxynil plus AC 222,293.

4) Bedstraw Herbicide Study - Of the twenty treatments evaluated for bedstraw control those found most effective were;chlorsulfuron plus bromoxynil, chlorsulfuron plus bromoxynil plus MCP, R 40244, R 40244 plus bromoxynil and RH 0265.

INTRODUCTION:

The first three studies were conducted in spring barley and the Bedstraw Herbicide Study was established in winter wheat. Ingrid spring barley was seeded in 12' strips using an IH press drill at 60 lbs/a. Herbicides were applied perpendicular to each strip in a 10' swath, providing a treated area of 120 ft^2. Treatments were replicated four times in a randomized block design. Wild oat were controlled in the Broadleaf Herbicide Study I and Broadleaf Herbicide Study II with an uniform application of diclofop.

Post plant herbicides were applied just after planting and incorporated using a hand rake. Pre emergence surface applications were applied to bare soil prior to crop emergence. Post emergence herbicides were applied according to stage of growth of the crop or weeds. In the bedstraw study herbicides were applied post emergence at designated stages of weed growth in an established stand of winter wheat.

All herbicides were applied with a research type tractor mounted sprayer. The experiments were harvested with a Hege plot combine. Plot sizes for the spring barley studies were 10' x 12' (120 ft^2) and 10' x 20' (200 ft^2) for the bedstraw study.

RESULTS:

Broadleaf Herbicide Study I - Excellent yields and broadleaf weed control was obtained when using metribuzin (.25 lb ai/a), metribuzin plus bromoxynil (.25 + .25 lb ai/a), chlorsulfuron (.125 oz ai/a), DPX-T6376 (.0625 oz ai/a), DPX-T6376 plus bromoxynil (.0625 oz + .25 lb ai/a) and RH0265 (.25 lb ai/a). Mean yield for the experiment was 100.4 bu/a, however there were no statistically significant differences in yield. SSH 0860 (1.0 lb ai/a) and R 40244 (.25 lb ai/a) gave only fair broadleaf weed control. Plant heights and test weights were reduced in the herbicide combinations containing metribuzin. Table 1.

Broadleaf Herbicide Study II - All of the treatments evaluated gave some measure of effective broadleaf weed control. There were a few instances where a compound may have been weak on one or two weed species but in most cases good control was observed on all species.

Yields, test weights and percent plumps did not vary significantly when analyzed statistically.

R 40244 at 1.0 lb ai/a applied post emergence surface, did appear injurious to the crop. Treatments with this compound resulted in lower yields and test weights. The percent plump kernels, height and vigor of plants were also reduced.

The basagran combinations gave excellent weed control except were somewhat weak on chickweed when used in combination with 2,4-D formulations.

Bromoxynil alone was weak on wild buckwheat and field chickweed, however in combination with MCPA and chlorsulfuron it was effective on all weeds. Chlorsulfuron alone was weak on wild buckwheat in this study. Table 2.

Combination Herbicide Study - Those herbicide combinations which proved effective in controlling broadleaf weeds as well as wild oat and green foxtail were chlorsulfuron plus diclofop, triallate plus chlorsulfuron, bromoxynil plus diclofop, AC 222,293 and AC 222,293 plus bromoxynil. These treatments all yielded above 100 bu/a. Other treatments which yielded well yet lacked in weed control were SSH 0860 combinations.

Chlorsulfuron combinations in most causes demonstrated excellent broadleaf weed control. The better treatments were a combination of chlorsulfuron with grass herbicides which effectively controlled both wild oat and green foxtail (i.e. diclofop and triallate).

Percent plump averages were significantly reduced in grain treated with R 40244, or combinations with R 40244. Although, broadleaf and grass control was good in all of these treatments yields were reduced, but were not less than the check.

Any treatment which included metribuzin caused a significant

Results (con't)

reduction in test weight and in most cases a slight reduction in yield, however yields were found to be statistically non significant in this experiment.

AC 222,293 when applied alone, demonstrated fair broadleaf control and excellent grass control at the .65 lb ai/a rate. When combined with bromoxynil this treatment provided the highest yield as well as excellent weed control. In combination with chlorsulfuron, AC 222,293 provided good weed control, however yields were somewhat less than the bromoxynil-chlorsulfuron combination. DPX-T6376 at .0625 oz ai/a provided excellent broadleaf weed control.

SSH 0860 was weak on several broadleaf species, however yields were higher than the check. Table 3.

Bedstraw Herbicide Study - Bedstraw (Galium aparine L.) competition was severe throughout the test and in some cases thinned plots as much as 63%. No treatment totally controlled bedstraw yet the best results were obtained from the following applications; chlorsulfuron combined with bromoxynil or bromoxynil plus MCPA, R 40244 plus bromoxynil or RH 0265.

Moderate phytotoxicity was noted from the applications of chlorsulfuron at .25 oz ai/a, chlorsulfuron plus bromoxynil/MCPA, DPX-T6376 plus bromoxynil, terbutryn at 1.25 lb ai/a, R 40244 at .25 lb ai/a and RH 0265.

Two effective treatments for total broadleaf control were chlorsulfuron plus bromoxynil (.125 oz + .375 lb ai/a) and R 40244 plus bromoxynil (.25 + .25 lb ai/a). Chlorsulfuron and DPX-T6376 were not effective in the control of bedstraw when used alone. The combination of chlorsulfuron and mefluidide resulted in less bedstraw control than chlorsulfuron used alone. No yields were obtained from the study because of the severe bedstraw populations.

Regrowth of bedstraw was observed in many of the herbicide plots several weeks after application. Treatments may have been more effective if applied at an earlier growth stage. Table 4.

Table 1 Agronomic data form the Broadleaf Herbicide Study I in Ingrid spring barley. Northwestern Agricultural Research Center in 1983. Field R-9, plot size 48 sq.ft.

Date planted: May 19 1983 Date harvested: September 6, 1983

Treatment	Appln.	Rate* ai/A	Yield bu/A	Test Wt. lbs/bu	% Plump	Height inches	1/ Visor
Metribuzin	Post2	.25	102.9	48.0	77.3	23.5	10
Metribuzin + Bromoxynil	Post2	.25+ .25	95.0	46.8	71.5	22.3b	10
Metribuzin + Chlorsulfuron	Post2	.25+ .125 oz	101.1	46.5	70.3	21.8b	9.8
Metribuzin + DPX-T6376	Post2	.25+ .0625 oz	94.6	46.5	73.8	21.3b	9.8
Bromoxynil	Post	.25	99.3	47.9	77.8	25.3	10
Chlosulfuron	Post	.125 oz	102.4	48.0	77.8	25.3	10
DPX-T6376	Post	.0625 oz	107.1	48.1	78.3	26.0	10
DPX-T6376 + Bromoxynil	Post	.0625 oz .25	100.9	47.8	76.8	24.0	10
SSH 0860	POPI	1.0	100.4	47.7	78.3	25.5	9.9
RH 0265	Post	.125	96.5	47.2	73.8	22.5	10
RH 0265	Post	.25	100.7	47.3	76.0	18.0b	9.8
R 40244	PES	.25	108.2	47.2	75.5	25.8	10
Chlorsulfuron + Bromoxynil	Post	.125 oz .25	97.7	47.1	73.5	24.5	9.8
Check	----	----	98.7	47.4	69.0	24.8	10
		$\bar{X}$	100.38	47.39	75.0	23.6	
		F 2/_	.767	.870	1.70	4.06**	
		S.E.X	4.53	5.82	2.35	1.11	
		L.S.D.	12.96	1.66	6.72	2.40	
		C.V. %	4.51	1.23	3.14	4.71	

1/ Visor rating, 0-10 scale: 0 = dead plants, 10 = normal healthy plants
2/ F Value for treatment comparison

* Note: Rates given are in lbs. ai/A unless otherwise stated

Table 1 (cont'd)

Application Data:

POPI = post plant incorporated
PES = pre emergence surface
POST = early post application
POST2= later post application
(secondary roots developed on barley)

Appln.	Date	Air temp	Soil temp	Wind (mph)	Humidity
POPI	5-19	52 F	50 F	3-5 mph	49 %
PES	5-19	52 F	50 F	3-5 mph	49 %
POST	6-08	78 F	82 F	0-2 mph	18 %
POST2	6-13	72 F	74 F	0 mph	20 %

Table ____. Broadleaf Herbicide Study (cont'd)

Treatment	Appln.	Rate* ai/A	% Weed Control FW	BW	LQ	PW	FF	HB	CW
Metribuzin	Post2	.25	100	90	100	100	94	89	100
Metribuzin + Bromoxynil	Post2	.25+ .25	75	74	75	75	75	75	75
Metribuzin + Chlorsulfuron	Post2	.25+ .125 oz	100	100	100	100	100	100	100
Metribuzin + DPX-T6376	Post2	.25+ .0625 oz	100	96	100	99	100	100	100
Bromoxynil	Post	.25	99	79	100	78	94	63	65
Chlosulfuron	Post	.125 oz	100	93	100	99	96	89	100
DPX-T6376	Post	.0625 oz	100	99	100	99	100	100	99
DPX-T6376 + Bromoxynil	Post	.0625 oz .25	100	96	100	100	100	93	100
SSH 0860	POPI	1.0	31	5	30	33	23	50	100
RH 0265	Post	.125	100	75	99	99	100	100	99
RH 0265	Post	.25	100	100	86	100	100	100	97
R 40244	PES	.25	69	50	38	73	59	75	75
Chlorsulfuron + Bromoxynil	Post	.125 oz .25	100	100	99	100	99	99	100
Check	----	----	0	0	0	0	0	0	0

Table 1 (cont'd)

* Note: Rates given are in lbs ai/A unless otherwise stated

1/ % Weed Control: FW = fanweed (Thlaspi arvense)
BW = wild buckwheat (Polygonum convulvulus)
LQ = lambsquarter (Chenopodium album)
PW = pigweed (Amaranthus retroflexus)
FF = false flax (Camelina sativa)
HB = henbit (Lamium amplexicauli)
CW = chickweed (Stellaria media)

Table 2. Data from the Broadleaf Herbicide Study II in Ingrid spring barley. Northwestern Agricultural Research Center , Kalispell MT. in 1983. Field R-9, plot size: 48 sq. ft.

Date seeded: May 19, 1983 Date harvested September 6,1983

Treatment	Rate lb ai/A	Appln	YIELD Bu / A	Test Wt lbs/bu	% Plump	Height inches	Vigor 1/
R 40244	.25	PES	88.7	47.8	72.8	26.5	10.0
R 40244	.50	PES	88.3	48.6	78.5	26.5	10.0
R 40244	1.0	PES	88.6	47.9	75.3	25.3	9.3
R 40244	.25	POES	92.8	48.1	74.0	26.3	10.0
R 40244	.50	POES	85.6	47.7	73.0	25.0	10.0
R 40244	1.0	POES	78.2	46.8	69.0	21.3	8.5
R 40244 + BROMOX.	.25+.25	POST	85.6	47.8	73.5	24.8	10.0
R 40244 + MCPA	.25+.375	POST	80.9	48.4	74.5	23.8	9.4
MCPA	.375	POST	94.2	47.9	79.8	26.5	10.0
BROMOXYNIL 2E	.25	POST	91.1	48.8	75.3	25.0	10.0
BROMOXYNIL + MCPA	.375 .375	POST	86.8	48.5	74.5	25.3	10.0
BENTAZON + 2,4-D AMINE + O.C. 3/	.50 .40	POST	89.0	48.6	78.5	25.3	10.0
BENTAZON + 2,4-D ESTER + O.C. 3/	.50 .30	POST	87.4	48.4	75.5	25.3	10.0
BENTAZON + 2,4-DP+ O.C. 3/	.50 1.0	POST	85.8	48.2	73.5	25.8	10.0
BENTAZON + MCPA + O.C. 3/4/	.75	POST	90.1	48.3	78.8	26.0	10.0
BENTAZON + MCPA + O.C. 3/4/	1.125	POST	90.6	48.3	76.5	25.0	9.8
BENTAZON + DICAMBA + O.C.3/	.50 .06	POST	81.1	48.7	72.8	25.8	9.5
BENTAZON + O.C.	.75	POST	86.6	48.6	76.3	25.0	9.5
BENTAZON + BROMOXYNIL+O.C.3/	.50 .375	POST	92.4	48.4	74.5	26.5	10.0
BROMOXYNIL 5/	.375	POST	90.6	48.2	76.5	25.5	9.5
BROMOXYNIL 5/	.50	POST	88.8	48.2	70.0	26.0	9.9
BROMOXYNIL+MCPA 6/	.375/375	POST	86.6	48.4	78.0	25.3	9.8
BROMOXYNIL+ MCPA 6/	.50/.50	POST	88.8	48.2	76.8	25.0	10.0
BROMOXYNIL+MCPA 6/	.75/.75	POST	87.5	47.9	77.5	24.8	10.0
BROMOXYNIL 5/ + CHLORSULFURON	.375 .1 oz	POST POST	85.1	48.3	75.3	25.3	10.0
BROMOXYNIL 5/ + CHLORSULFURON	.25 .1 oz	POST	90.3	47.9	75.3	26.5	10.0
CHLORSULFURON	.1 oz	POST	85.2	48.4	78.5	25.3	10.0
CHLORSULFURON	.2 oz	POST	89.4	48.2	78.8	25.8	10.0
CHLORSULFURON	.5 oz	POST	82.4	47.5	71.0	25.8	10.0
MCPA	.5	POST	89.8	49.0	76.8	26.3	9.8
CHECK	---	----	87.8	49.0	77.0	26.8	10.0
			$\bar{X}$ 87.6	48.22	75.4		
			F 7/ 1.01	1.34	1.11		
			S.E.X. 3.55	.386	2.53		
			L.S.D. 9.97	1.09	7.10		
			C.V. % 4.05	.801	3.35		

Table 2. Broadleaf Herbicide Study II (cont'd)

Treatment	Rate lb ai/A	Appln	% Weed Control FW	BW	LQ	PW	CW	NCF
R 40244	.25	PES	100	33	98	93	73	75
R 40244	.50	PES	100	86	80	100	100	93
R 40244	1.0	PES	100	99	100	100	100	100
R 40244	.25	POES	100	74	96	100	100	95
R 40244	.50	POES	100	95	100	99	100	99
R 40244	1.0	POES	100	99	100	100	100	100
R 40244 + BROMOX.	.25+.25	POST	100	100	100	100	100	100
R 40244 + MCPA	.25+.375	POST	100	96	100	100	100	100
MCPA	.375	POST	100	35	100	100	60	85
BROMOXYNIL 2E	.25	POST	100	99	100	100	84	98
BROMOXYNIL + MCPA	.375 .375	POST	100	95	100	100	94	94
BENTAZON + 2,4-D AMINE + O.C. 3/	.50 .40	POST	100	98	100	100	63	90
BENTAZON + 2,4-D ESTER + O.C. 3/	.50 .30	POST	100	65	100	100	63	90
BENTAZON + 2,4-DP+ O.C. 3/	.50 1.0	POST	100	73	100	100	60	76
BENTAZON + MCPA + O.C. 3/4/	.75	POST	100	38	100	100	81	88
BENTAZON + MCPA + O.C. 3/4/	1.125	POST	100	81	100	100	66	88
BENTAZON + DICAMBA + O.C.3/	.50 .06	POST	100	100	98	86	83	95
BENTAZON + O.C.	.75	POST	90	85	90	100	91	95
BENTAZON + BROMOXYNIL+O.C.3/	.50 .375	POST	99	100	100	100	98	96
BROMOXYNIL 5/	.375	POST	100	98	100	100	93	95
BROMOXYNIL 5/	.50	POST	99	75	100	100	70	100
BROMOXYNIL+MCPA 6/	.375/375	POST	100	100	100	100	78	100
BROMOXYNIL+ MCPA 6/	.50/.50	POST	100	98	100	100	88	96
BROMOXYNIL+MCPA 6/	.75/.75	POST	100	99	100	100	98	100
BROMOXYNIL 5/ + CHLORSULFURON	.375 .1 oz	POST	100	100	100	100	100	100
BROMOXYNIL 5/ + CHLORSULFURON	.25 .1 oz	POST	99	99	100	100	98	100
CHLORSULFURON	.1 oz	POST	100	76	100	100	100	100
CHLORSULFURON	.2 oz	POST	100	99	100	100	99	100
CHLORSULFURON	.5 oz	POST	100	99	100	100	99	100
MCPA	.5	POST	100	35	100	100	51	90
CHECK	---	----	0	0	0	0	0	0

1/ Visor: 0 - 10 scale, 0 = dead plants due to chemical or mechanical injury
10 = normal healthy plants

2/ % Weed Control: FW = fanweed or field pennycrest (Thlaspi arvense)
BW = wild buckwheat (Polygonum convolvulus)
LQ = lambsquarter (Chenopodium album)
PW = pigweed (Amaranthus retroflexus)
CW = chickweed (Stellaria media)
NFC = night flowering catchfly (Silene noctiflora)

3/ O.C. = oil concentrate adjuvant prescribed for bentazon sprays, .25 % v/v

4/ Basagran M (3.13 lb. ai / gal)

5/ Brominal 4E (4 # bromoxynil per gal)

6/ Brominal 3+3 (3 # bromoxynil and MCPA per gal)

7/ F value for treatment comparison

Table 3. Agronomic data from the combination herbicide study, Northwestern Agricultural Research Center, Kalispell, MT in 1983. Field No R-9.
Date Seeded: May 19, 1983 Date Harvested: September 6, 1983

Treatment	Rate Lb or Oz ai/a	Appli-cation	Yield Bu/A	Test Weight Lbs/Bu	% Plump	Height Inches	Vigor[1]	% Weed Control[2] FW	BW	LQ	PW	HB	FF	Set	WO
Chlorsulfuron[6] + diclofop[6]	.125 oz + .75	Post Post	101.7	47.9	75.0	27.5	10.0	100	70	100	100	99	100	75	93
Chlorsulfuron[6] + difenzoquat[6]	.125 oz + .75	Post Post	97.7	48.7	74.3	28.5	9.9	100	76	99	100	88	100	100	71
Chlorsulfuron[6] + metribuzin[7]	.125 oz + .125	Post Post	88.4	46.2	65.3b	18.8	9.1	100	100	100	100	100	100	95	64
Chlorsulfuron[6] + CGA 82725[6]	.125 oz + .25	Post Post	88.1	47.7	76.3	28.2	9.4	100	85	98	100	98	100	100	30
Triallate[4] chlorsulfuron[6]	1.25 + .125 oz	POPI Post	103.2	48.4	77.8	29.2	9.8	100	94	100	100	98	99	100	76
R 40244[6] + barban[6]	.5 + .33	Post	94.2	46.6	64.3b	25.8	9.5	100	75	99	100	100	93	100	81
R 40244[6] + barban[6]	.5 + .5	Post	88.1	47.7	66.5b	25.3	9.9	100	86	100	95	99	83	100	99
R 40244[6] + difenzoquat[6]	.5 + 1.0	Post Post	97.6	47.4	61.8b	27.5	9.4	100	95	75	83	96	70	100	100
Triallate[4] + R 40244[5]	1.0 + .5	POPI PES	90.5	48.1	67.0b	27.5	9.3	100	94	94	93	100	94	100	78
Metribuzin[7] + bromoxynil[7]	.125 + .25	Post Post	92.1	46.5	61.8b	26.0	9.5	100	99	100	100	100	96	100	85
Bromoxynil[6] + diclofop[6]	.375 + .75	Post Post	101.6	48.6	66.5b	30.0	10.0	88	100	93	80	55	68	100	99
Bromoxynil[6] + difenzoquat[6]	.375 + .75	Post Post	98.7	47.0	69.5b	28.9	10.0	90	98	98	100	60	79	100	60
AC222,293 + DM710[6]	.5	Post	98.0	49.4	75.8	30.8	10.0	100	100	20	40	48	0	100	100
AC222,293[6] + DM710[6]	.65	Post	104.4	49.5	72.0	30.2	10.0	100	100	45	83	28	5	100	98
DPX-T6376[6] + diclofop[6]	.0625 oz+ .75	Post Post	97.1	47.8	74.5	26.5	10.0	100	78	100	100	100	100	100	78
DPX-T6376[6] + difenzoquat[6]	.0625 oz+ .75	Post Post	94.2	46.6	71.3	29.8	9.9	88	65	88	100	96	100	100	60
SSH 0860[4] + diclofop[6]	1.0 + .75	POPI Post	99.5	48.0	79.0	27.0	9.8	39	48	61	55	35	42	100	85
SSH 0860[4] + difenzoquat[6]	1.0 + .75	POPI Post	99.9	48.7	77.3	29.8	9.8	34	35	59	75	59	10	100	69
AC 222,293[6] + chlorsulfuron[6]	.5 + .25 oz	Post Post	93.8	48.1	76.5	27.5	9.9	100	98	100	100	99	100	100	100

Table 3 . (con't)

Treatment	Rate Lb or Oz ai/a	Application	Yield Bu/A	Test Weight Lbs/Bu	% Plump	Height Inches	Vigor[1]	% Weed Control[2] FW	BW	LQ	PW	HB	FF	Set	WO
AC 222,293[6] +	.5 +	Post													
bromoxynil[6]	.25	Post	105.4	48.3	77.8	26.3	9.8	100	100	93	100	55	51	100	100
Barban[6]	.5	Post	93.7	47.6	77.3	29.0	10.0	0	5	0	85	0	10	100	93
Difenzoquat[6]	1.0	Post	85.2	47.3	73.8	27.0	10.0	0	25	38	75	0	20	100	78
Triallate[4]	1.0	POPI	85.4	48.4	81.5	29.8	10.0	0	8	13	44	20	0	100	60
Check	0		89.2	47.9	79.8	29.5	9.8	0	0	0	0	0	0	0	0
	$\bar{x}$		95.30	47.8	72.6										
	F^3		1.124	1.38	2.87**										
	S.E.$\bar{x}$		5.66	.724	3.47										
	L. S. D. (.05)		15.96	2.04	9.80										
	C.V. %		5.94	1.51	4.79										

1/ Vigor: 0 = dead plants due to chemical or mechanical injury
10 = normal healthy plants

2/ Weeds Observed: FW = Fanweed (Thlaspi arvense); BW = Wild Buckwheat (Polygonum convolvulus)
LQ = Lambsquarter (Chenopodium album); PW = Pigweed (Amaranthus retroflexus)
HB = Henbit (Lamium amplexicaule); FF = Flase Flax (Camelina sativa)
SET = Setaria (Setaria viridis); WO = Wild Oat (Avena fatua)

3/ F - value for treatment comparison

4/ POPI = Post plant incorporated

5/ PES = Pre emergence surface

6/ Post = Post application

7/ Metribuzin applications - secondary roots developed

APPLICATION DATA:

	Application	Date	Temperature Air	Temperature Soil	Wind MPH	Relative Humitidy
4/	POPI	5/19	52°F	50°F	3-5	49%
5/	PES	5/19	52°F	50°F	3-5	49%
	Post	6/ 8	78°F	82°F	0-2	18%
	Metribuzin	6/13	72°F	74°F	3-6	14%

Table 4. Bedstraw herbicide study on winter wheat. Dale Sonstelie farm, Kalispell, MT in 1983. Plot Size: 240 ft^2.

Date Seeded: September 28, 1982 No Harvest Taken

Treatment	Rate Lbs ai/a	Stand Loss[1] % of Plot	Plant[2] Vigor	% Weed Control[3] Bedstraw	Fanweed	Chickweed
Bromoxynil	.375	10.6	10.0	56	83	43
Bromoxynil + MPCA	.375 + .375	3.4	10.0	65	93	76
Chlorsulfuron	.0625 oz.	27.3	10.0	30	96	100
Chlorsulfuron	.125 oz.	8.0	7.3	48	100	100
Chlorsulfuron	.25 oz.	8.0	5.0	60	100	98
Chlorsulfuron + dicamba	.125 oz. + .125	13.7	7.3	48	100	100
Chlorsulfuron + bromoxynil	.125 oz. + .375	4.0	7.3	81	100	100
Chlorsulfuron + bromoxynil+MCPA	.125 oz. + .375 + .375	1.8	5.3	83	100	100
Chlorsulfuron + mefluidide	.0625 oz. + .25 oz.	45.0	10.0	7	100	100
Chlorsulfuron + mefluidide	.0325 oz. + .25 oz.	50.0	10.0	10	100	100
DPX-T6376	.0625 oz.	60.0	10.0	7	100	100
DPX-T6376	.0325 oz.	63.3	10.0	5	100	100
DPX-T6376 + bromoxynil	.0325 oz. + .375	8.7	5.9	68	93	100
Terbutryn	1.25	18.0	5.0	58	92	100
Metribuzin	.125	55.0	10.0	0	92	97
Metribuzin + bromoxynil	.125 + .25	19.0	10.0	43	83	73
R 40244	.25	3.3	5.9	80	82	63
R 40244 + bromoxynil	.25 + .25	3.3	7.6	83	98	62
RH 0265	.25	5.0	5.6	78	78	70
Weedy Check	0	61.7	10.0	0	0	0

1/ Stand loss due to competition from weed growth or chemical injury.
2/ Rated on sacle of 0-10: 0 = no stand; 10 = normal healthy plants.
3/ % Weed Control of: Bedstraw (*Galium aparine*) 3-5"diameter and prostrate at application
Fanweed (*Thlaspi arvense*) 2" diameter
Chickweed (*Stellaria media*) 1-4" tall at application

APPLICATION DATA:

Application	Date	Temperature Air	Temperature Soil	Wind	Relative Humidity	Cloud Cover
Post	4/5/83	43°F	49°F	3mph	28%	Clear

TITLE: A three year study of chlorsulfuron and DPX-T6376 on weed control, soil residual and crop tolerance. (1983)

PERSONNEL: Vern R. Stewart, Todd K. Keener and Pete Fay.

SUMMARY:

DPX-T6376 - chlorsulfuron application timing study - Lower rates of DPX-T6376 are most effective applied post emergence (2-leaf to 5-tiller) with a surfactant. Chlorsulfuron performed best applied at the 2 to 4-leaf stage (.125 oz ai/a) with a surfactant.

1983 uniform chlorsulfuron plant-back study - Higher rates of chlorsulfuron (.25 - 1.0 oz ai/a) reduced yield, height and also thinned stands of Newana spring wheat.

1982/83 Plant-Back Study - Lentils, alfalfa, corn, potatoes and sunflowers were all sensitive to chemical residue of chlorsulfuron and DPX-T6376 the season following application. Barley was sensitive after emergence and into the early season to high rates of chemicals remaining in the soil yet did not show a reduction in yield at harvest time.

1981/82 Plant-Back Study - A crop of lentils planted two years after chlorsulfuron applications was sensitive to chemical residue resulting from .5 and 1.0 oz ai/a applications.

INTRODUCTION:

Chlorsulfuron, a relatively new herbicide, gives excellent broadleaf weed control in small grains. In an effort to establish the most effective timing for chlorsulfuron, and the closely related analog DPX-T6376, studies were undertaken in small grains. To better understand the residual activity of this herbicide yearly plant-back investigations were initiated using sensitive crops grown in this area.

DPX-T6376, chlorsulfuron application timing study - Pre emergence surface and post applications were applied to Ingrid spring barley seeded in strips 12' wide. Herbicide plots were perpendicular to drill strips making plots 10' x 12' (120 ft^2). Treatments were replicated four times in a complete randomized block design.

1983 uniform chlorsulfuron plant-back study - Five rates of chlorsulfuron were applied to spring wheat in an established solid, seeded stand of Newana spring wheat. Plots were 15' x 30'. In 1984 these plots will be seeded to various crops that are grown in crop rotations in northwestern Montana.

1982/83 Plant-Back Study - Last year several rates and applications of DPX-T6376 and chlorsulfuron were made to a solid seeded stand of spring barley. After the season was completed the plots were disked once to incorporate the stubble. In the spring they were disked again and a seedbed was prepared. Six crops were seeded perpendicular to the 1983 treated plots. Corn, lentils, alfalfa, barley and sunflowers were planted using a research plot seeder. The potatoes were planted using a field type planter. No herbicides were used

Introduction (con't)

during the season except an occasional rope wick application of glyphosate. Evaluations were made throughout the 1983 growing season. Yields were obtained for barley, alfalfa and selected potato plots.

1981/82 Plant-Back Study - Lentils were solid seeded to an area that had been treated with several rates of chlorsulfuron two years before. An International 12' press type drill was used to seed 60 pounds lentils per acre. No harvest was made.

All treatments in the above studies were applied using a tractor mounted research type sprayer in approximately 26 gallons of water.

Grain was harvested with a Hege plot combine. Alfalfa was harvested using a Rhem forage harvester. Potatoes were harvested by hand.

RESULTS:

DPX-T6376 - chlorsulfuron application timing study - DPX-T6376 when applied at lower rates (.03 oz - .0625 oz ai/a) gave effective weed control when applied between the two leaf and five tiller stage of growth. When applied at higher rates yields were reduced when applied at the 3 to 5 tiller stage of growth. Weed control was greater for DPX-T6376 at all post emergence applications. The addition of a surfactant to DPX-T6376 was not found to enhance yields, test weight, percent plump or weed control.

Comparing three application timings for chlorsulfuron at .125 oz ai/a it was found the best yields and weed control were provided form an application at the 2 to 4-leaf stage (grain). Table 1.

1983 uniform chlorsulfuron plant-back study - Five rates of chlorsulfuron tested on spring wheat were all found to provide excellent broadleaf weed control. The lower rate (.0625 oz ai/a) was not as effective on wild buckwheat as the higher rates. The higher rates reduced yields, test weights, heights, tillers and in some cases stands. Next year six crops will be seeded in the test area perpendicular to treated plots, and will be observed as indicators of chlorsulfuron residue in the soil. Table 2.

1982/83 Plant-Back Study - In making observations on several crops replanted into chemically treated plots (treated one year ago), phytotoxicity from chemical residue was recorded for several treatments. At the .0625 and .125 oz ai/a rate of DPX-T6376 crop injury was less for the PES applications while the higher rates (.25 and .5 oz ai/a) were less phytotoxic in Post applications. Residue of DPX-T6376 and chlorsulfuron were both moderately to highly phytotoxic to alfalfa, lentils, sunflowers, corn and potatoes at the .25 and .5 oz ai/a rates one year after application. Barley showed some injury early in the season, but was not noticeable at harvest.

DPX-T6376 applied Post was less injurious at .0625 and .125 oz ai/a when combined with a surfactant as compared to PES applications or even Post application without a surfactant. Chlorosulfuron results were similar under the same conditions.

Results (con't)

The chlorsulfuron applications of PES and Post were equal in considering crop damage (phytotoxicity). Table 3.

Yields were obtained from barley, alfalfa and selected plots in the potatoes. Barley yields did not vary significantly between treatments. The highest grain yields were obtained from chlorsulfuron .5 oz ai/a PES, chlorsulfuron .125 oz ai/a Post, and DPX-T6376 plus a surfactant .0625 oz ai/a PES. The mean yield was 49.1 bu/a. Test weights did not vary significantly and ranged from 45.7 to 47.3 lbs/bu. The higher test weights came from the plots which had higher yields. When analyzing percent plump figures it was found that the following treatments for plumpness were significnatly less than the check; DPX-T6376 .0625 oz ai/a PES, chlorsulfuron .0625 oz ai/a PES, bromoxynil plus MCPA, and DPX-T6376 (.0625 oz ai/a) plus diclofop (.75 lb ai/a).

Alfalfa yields did not vary significantly. All yields were generally low which relates both to chemical injury from residue and also the late harvest date. The highest yield was 1.09 T/A from chlorsulfuron (.125 lb ai/a) plus surfactant Post treatment. Injury reduced yields from plots that had been treated with higher rates of both chemicals, with greater reduction in Post applications. Table 4.

Potato yields were taken from selected chlorsulfuron treatments. Table 5. The highest total yield was harvested from the chlorsulfuron (.0625 oz ai/a plus surfactant) Post application plot. The majority of Post application plots yielded better than the PES plots except for the .5 oz ai/a rate which reduced yields more when applied Post. More number one quality potatoes were harvested from chlorsulfuron .25 and .125 oz ai/a Post plots. The percent of seed size potatoes were greater in the PES application than they were in the Post application. Table 5.

1981/82 Plant-Back Study - Lentils were injured severely by residual chlorsulfuron which had been applied two years earlier at .5 and 1.0 oz ai/a. Slight stand thinning and chlorosis were observed in treated areas of .25 oz ai/a also. This test was recropped the season after chlorsulfuron was applied using several different crops (lentils, alfalfa, potatoes and corn). All of these crops showed some phytotoxicity in the first replant season.

CONCLUSIONS:

Chlorsulfuron and DPX-T6376 both have strong residual tendencies in northwestern Montana soils. This of course, will vary with soil type, soil pH, and climatic conditions. From the data obtained in three years of testing these compounds it appears that alfalfa or lentils should not be considered in a crop rotation where high rates of chlorsulfuron or DPX-T6376 have been used (.5 oz or more ai/a) in the last two years. Even lower rates (.125 oz to .5 oz ai/a) can reduce stands of corn, sunflowers, alfalfa and lentils one year after application. Although potato yields were not effected dramatically by residue from these two chemicals it should be considered a factor that effects quality and yield.

Table 1. Agronomic data from the DPX-T6376 timing study in Ingrid spring barley. Northwestern Agricultural Research Center in 1983, Kalispell, MT. Field R-9. Plot size: 48 sq. ft.
Date Planted: May 19, 1983 Date Harvested: September 7, 1983

Treatment	Rate Oz ai/a	Application	Yield Bu/A	Test Wt Lbs/Bu	% Plump	Plant Height	Plant Vigor	% Weed Control[2] FW	LQ	PW	FF	CW	BW
DPX-T6376 + surf[1]	.031	PES	95.5	47.5	83.0	27.8	10.0	74	55	5	41	58	63
DPX-T6376 + surf[1]	.062	PES	88.5	48.7	84.8	24.5	10.0	80	100	100	50	55	85
DPX-T6376 + surf[1]	.125	PES	95.0	48.1	83.3	26.8	10.0	100	85	100	78	100	91
DPX-T6376 + surf[1]	.25	PES	91.1	47.6	86.8	27.8	10.0	96	85	65	95	96	83
DPX-T6376 + surf[1]	.031	2-4 leaf	92.7	47.7	81.0	27.3	10.0	100	100	100	96	100	96
DPX-T6376 + surf[1]	.062	2-4 leaf	95.6	48.3	83.5	26.3	10.0	100	100	100	100	100	100
DPX-T6376 + surf[1]	.125	2-4 leaf	98.4	47.3	80.8	25.0	10.0	100	100	100	100	100	100
DPX-T6376 + surf[1]	.25	2-4 leaf	79.1b	45.0	77.8	18.0	8.4	100	100	100	100	100	100
DPX-T6376 + surf[1]	.031	3-5 tiller	101.6	47.2	80.5	25.0	9.9	100	100	100	100	100	100
DPX-T6376 + surf[1]	.062	3-5 tiller	94.7	47.1	79.5	21.5	6.9	100	100	100	100	100	100
DPX-T6376 + surf[1]	.125	3-5 tiller	81.5b	46.9	79.5	19.0	9.3	100	100	100	100	100	100
DPX-T6376 + surf[1]	.25	3-5 tiller	76.9b	38.6	79.8	18.0	9.0	100	100	100	100	100	100
DPX-T6376	.125	2-4 leaf	95.3	48.0	83.5	26.5	10.0	100	99	100	100	100	100
DPX-T6376	.25	2-4 leaf	86.1b	46.9	83.0	23.0	9.9	100	100	100	100	100	100
DPX-T6376	.125	3-5 tiller	91.3	47.5	83.3	23.5	9.5	100	98	100	100	100	100
Chlorsulfuron + surf[1]	.125	PES	96.9	47.6	84.0	25.0	10.0	51	63	58	61	80	83
Chlorsulfuron + surf[1]	.125	2-4 leaf	100.7	48.0	84.0	26.0	10.0	100	100	100	100	100	98
Chlorsulfuron + surf[1]	.125	3-5 tiller	87.7	48.0	81.3	26.5	10.0	99	80	75	90	100	100
Check	0		96.7	48.2	83.3	26.8	10.0	0	0	0	0	0	0
$\bar{x}$			91.81	47.06	82.22								
F[3]			4.14**	1.51	.55								
S.E.$\bar{x}$.			2.88	1.79	3.00								
L.S.D. (.05)			9.69	5.07	8.51								
C.V. %			3.72	3.80	3.65								

1/ Surfactant applied with chemical, X-77 at .25% V/V
2/ Applications: PES = Pre emergence surfact; 2-4 leaf - 2 to 4 leafs on grain; 3-5 tiller - 3 to 5 tillers on grain.
3/ FW = Fanweed (Thlaspi arvense); LQ = Lambsquarter (Chenopodium album)
PW = Pigweed(Amaranthus retroflexus);FF = False flax (Camelina sativa)
CW = Chickweed (Stellaria media); BW = Wild Buckwheat (Polygonum convolvulus)
4/ F - value for treatment comparison

APPLICATION DATA:

Application	PES	2-4 leaf	3-5 tiller
Date	5/19	6/3	6/6
Temperature (air)	52°F	64°F	75°F
Temperature (soil)	50°F	61°F	82°F
Wind (mph)	3-5	0	6
Humidity	49%	56%	16%

Table 2. Agronomic data from the Uniform Chlorsulfuron Plant-back Study grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1983. Field No. R-9, random block design.
Date Seeded: May 19, 1983 Date Harvested: September 21, 1983 Plot Size: 450 ft^2

Treatment	Rate Oz ai/a	Yield Bu/A	Test Wt. Lbs/Bu.	Height Inches	Plant Counts Plant/Ft of Row	Plant Counts Tillers/Ft of Row	% Stand[1] Reduction	% Weed Control[2] LQ	BW	FW	NF	CW	HB
Chlorsulfuron	1.0	53.4	55.4	32.8	6.8	29.1	5.5	100	99	100	100	100	100
Chlorsulfuron	.5	42.1	54.7	33.0	6.4	28.5	1.7	100	95	100	100	100	100
Chlorsulfuron	.25	53.5	54.8	32.8	6.0	27.1	3.7	100	83	100	100	100	100
Chlorsulfuron	.125	52.2	55.8	33.1	6.2	31.0	3.7	100	83	100	99	100	100
Chlorsulfuron	.0625	56.3	56.7	34.9	7.3	30.0	1.5	100	55	100	98	100	100
Check	0	43.8	54.6	34.8	5.1	20.4	17.5	0	0	0	0	0	0
$\bar{x}$		50.20	55.31	33.5	6.3	27.7							
$S_3E.\bar{x}$		7.575	1.232	.737	1.00	3.25							
F[3]		.618	.645	1.826	.521	1.38							
L.S.D.(.05)		NS	NS	NS	NS	NS							
C.V. %		15.09	2.23	2.20	15.95	11.75							

1/ % stand reduction due to chemical injury or weed competition
2/ % weed control (ocular rating) - LQ = Lambsquarter (Chenopodium album); BW - Wild Buckwheat (Polygonum convolvulus); FW = Fanweed (Thlaspi arvense); Night flowering catchfly (Silene noctiflora); CW = Chickweed (Stellaria media); HB = Henbit (Lamium amplexicaule).
3/ F - value for treatment comparison

APPLICATION DATA:

Application	6/10/83
Air Temperature	70°F
Soil Temperature	62°F
Wind (mph)	0
Humidity	32%
Soil pH	8.3
% O.M.	6.2

Stage of application	Weeds
6-8 leaves, 2-3 inches	Lambsquarter
4-10 leaves, 3 inches	Wild buckwheat
4- 8 leaves, 2 inches	Fanweed
8-12 leaves, 2-3 inches	Night flowering catchfly
Seedling	Chickweed
Wheat, 4th tiller, 2 inch roots	
4- 6 leaves, 1 inch	Henbit

Table 13. Agronomic observations from the 82/83 plantback study. Northwestern Agricultural Research Center, Kalispell, MT, in 1983. Field R13, random block design, three replications. Plot size: 300 sq. ft. (50 sq. ft. per re-planted crop).

Treatment	Rate oz ai/A	Appln type	** BARLEY 1/** Ht	Std	Phy	**LENTILS 1/** Ht	Std	Phy	**ALFALFA 1/** Ht	Std	Phy
DPX-T6376	.0625	PES	24.3	2.0	1.5	12.0	2.7	.8	14.0	2.3	1.3
DPX-T6376	.125	PES	25.3	2.3	2.3	11.0	2.0	2.8	10.3	1.7	3.8
DPX-T6376	.25	PES	22.0	2.3	6.9	8.7	1.3	8.5	7.3	.8	8.8
DPX-T6376	.50	PES	23.0	2.0	6.5	6.0	.7	9.8	4.0	.2	9.9
CHLORSULF.	.0625	PES	24.3	2.7	1.5	12.3	2.3	3.5	11.0	1.5	4.3
CHLORSULF.	.125	PES	23.7	2.3	3.2	10.3	1.3	6.9	7.3	1.0	6.6
CHLORSULF.	.25	PES	21.7	2.0	4.0	6.0	.7	9.6	3.3	.3	9.9
CHLORSULF.	.50	PES	25.3	2.0	4.5	3.0	.3	9.9	2.5	.3	9.9
DPX-T6376	.0625	POST	25.0	2.3	3.8	11.0	1.7	5.8	6.0	1.2	7.8
DPX-T6376	.125	POST	22.7	2.3	1.2	9.7	2.0	4.1	10.7	1.3	5.0
DPX-T6376	.25	POST	24.7	2.0	2.7	8.7	1.7	7.0	9.7	1.2	6.0
DPX-T6376	.50	POST	23.2	2.0	3.2	7.7	1.2	7.8	5.7	.6	8.0
CHLORSULF.	.0625	POST	25.0	2.7	2.0	10.7	2.3	3.5	8.0	1.4	5.8
CHLORSULF.	.125	POST	24.7	2.3	3.0	8.0	1.5	7.8	6.0	1.1	8.0
CHLORSULF.	.25	POST	21.7	1.3	4.2	6.0	.8	8.7	5.0	.6	9.3
CHLORSULF.	.50	POST	21.0	2.0	6.5	4.0	.4	9.8	3.0	.3	9.5
DPX-T6376 + SURF 3/	.0625	POST	28.0	3.0	1.2	10.7	2.2	3.5	11.2	1.4	4.1
DPX-T6376 + SURF 3/	.125	POST	24.7	2.7	.8	11.3	2.3	3.7	12.0	2.0	3.2
CHLORSULF.+ SURF 3/	.0625	POST	25.7	2.0	.8	13.3	2.7	2.7	12.3	2.0	3.0
CHLORSULF.+ SURF 3/	.125	POST	24.7	2.7	.5	10.7	2.7	.8	10.7	2.0	3.2
BROMOXYNIL+ MCPA 4/	.375 .375	POST	26.7	2.7	0	14.0	2.7	.3	16.3	2.7	.3
DPX-T6376 + DICLOFOP 4/	.0625 .75	POST	25.7	3.0	.3	12.0	2.7	2.8	14.0	2.3	1.0
CHECK	-----	----	26.0	2.7	0	14.3	2.7	0	15.0	2.7	0

Table 3. 82-83 Plant-back Study (cont'd).

Treatment	Rate oz ai/A	Appln type	** POTATO 1/ Ht	** Std	** Phy	** SUNFLOWERS 2/ Ht	** Plt	*** Vis	*** Phy	**** CORN 2/ Ht	**** Plt	**** Vis	***** Phy
DPX-T6376	.0625	PES	16.7	2.0	0.0	30.7	7.3	N/C	.2	22.0	5.7	N/C	.8
DPX-T6376	.125	PES	19.7	3.0	.2	25.3	5.0	C	1.8	18.5	5.0	N/C	1.7
DPX-T6376	.25	PES	16.3	3.0	.3	23.7	7.0	N/C	4.3	16.0	5.0	N/C	5.0
DPX-T6376	.50	PES	17.0	2.0	2.8	14.3	3.7	N/C	9.5	11.7	5.0	N/C	4.3
CHLORSULF.	.0625	PES	17.0	2.3	1.2	28.3	5.3	C	3.2	19.3	5.3	N	2.8
CHLORSULF.	.125	PES	20.0	2.0	1.0	22.0	6.0	C	2.5	15.0	6.0	N/C	2.7
CHLORSULF.	.25	PES	17.7	1.7	2.7	16.7	4.7	C	7.3	6.7	4.7	N/C	6.3
CHLORSULF.	.50	PES	14.3	1.0	3.8	6.0	3.3	N/C	9.4	6.7	2.3	N/C	9.9
DPX-T6376	.0625	POST	16.3	2.0	2.1	24.3	5.0	N/C	4.5	13.3	4.3	N/C	5.1
DPX-T6376	.125	POST	18.7	2.0	.8	23.3	4.3	C	1.7	15.3	2.3	N/C	3.3
DPX-T6376	.25	POST	17.3	2.3	.5	19.0	6.3	N/C	6.2	17.7	6.0	N/C	4.2
DPX-T6376	.50	POST	18.0	2.0	.2	14.3	4.7	N/C	7.9	11.7	4.3	N/C	7.2
CHLORSULF.	.0625	POST	19.3	2.3	.7	23.7	5.7	N/C	3.2	16.0	5.3	N/C	3.3
CHLORSULF.	.125	POST	16.7	1.7	1.8	22.0	6.7	N/C	3.0	6.0	4.0	N/C	6.8
CHLORSULF.	.25	POST	16.3	1.3	3.0	20.0	7.0	N/C	5.8	13.7	5.3	N/C	8.0
CHLORSULF.	.50	POST	14.3	1.3	4.8	14.0	3.7	N/C	9.3	4.3	4.3	N/C	9.0
DPX-T6376 + SURF 3/	.0625	POST	20.0	2.3	1.3	26.3	5.7	N/C	3.2	18.7	4.3	N/C	3.7
DPX-T6376 + SURF 3/	.125	POST	21.3	2.7	.3	30.3	5.7	N	.3	19.3	4.3	N	.5
CHLORSULF.+ SURF 3/	.0625	POST	21.3	2.7	0	34.3	7.7	N	.7	18.3	5.0	N	.7
CHLORSULF.+ SURF 3/	.125	POST	21.3	2.7	.5	34.0	7.7	N	0	17.3	4.0	N	1.8
BROMOXYNIL+ MCPA 4/	.375 .375	POST	20.7	2.7	3.3	32.7	5.3	N	0	9.3	3.7	N	3.2
DPX-T6376 + DICLOFOP 4/	.0625 .75	POST	20.7	2.3	0	32.0	6.7	N/C	.2	19.7	5.7	N	3.2
CHECK	-----	----	20.3	2.0	0	36.3	6.3	0	0	20.7	4.3	0	0

Table 3 (con't)

1/ Agronomic measurements for each crop: barley, lentils, alfalfa, potato, sunflower, and corn. Measurements include:
Height (Ht) recorded in inches .
Stand (Std) rated on 0-3 scale: 0 = no stand, 1 = light stand, 2 = moderate stand, 3 = heavy stand
Phytotoxicity (Phy) plant injury due to chemicals, 0-10 scale, 0 = no chemical injury, 10 = dead plants due to chemicals

2/ Additional agronomic notes for sunflowers and corn include:
Plants/four feet of row (Plt) = actual plant counts per four feet of row. These counts were taken in sunflowers and corn only
Visor (vis): an ocular observation to determine presense of chlorosis or necrosis on plants, N = indicates dead leaf tissue
C = indicates chlorosis in plant tissue
N/C = both necrosis and chlorosis present
* NOTE: Visor and phyto notes should be considered together, i.e. visor will indicate if necrosis or chlorosis occured while the phyto rating will indicate the severity of those reactions.

3/ Surfactant used was X-77 at .125 % v/v

4/ Rate given is in lbs. ai/A rather than oz ai/A

Table 4. Agronomic data from the 1982/83 Plant-back Study. Northwestern Agricultural Research Center, Kalispell, MT in 1983. Random block design. Three replications. Plot Size: 300 ft^2 (50 ft^2 per crop replanted).

Treatment	Rate Oz ai/a	Application Type	Barley Yield Bu/A	Barley Test Wt Lbs/Bu	Barley % Plump	Alfalfa Tons/A
DPX-T6376	.0625	PES	38.8	45.7	80.7b	.94
DPX-T6376	.125	PES	45.3	46.6	86.0	1.04
DPX-T6376	.25	PES	42.4	46.5	83.7	.74
DPX-T6376	.50	PES	43.0	46.8	84.0	.25
Chlorsulfuron	.0625	PES	52.2	46.5	82.0b	.71
Chlorsulfuron	.125	PES	45.5	46.5	86.7	.70
Chlorsulfuron	.25	PES	44.8	46.0	82.7	.34
Chlorsulfuron	.50	PES	62.5	47.1	86.3	.63
Check	0		47.6	46.7	83.7	.91
DPX-T6376	.0625	Post	52.4	46.4	86.0	.66
DPX-T6376	.125	Post	48.6	46.2	85.0	.94
DPX-T6376	.25	Post	51.1	47.4	86.7	.89
DPX-T6376	.50	Post	49.8	45.8	83.7	.68
Chlorsulfuron	.0625	Post	54.9	46.8	86.0	.72
Chlorsulfuron	.125	Post	57.2	47.1	84.3	.72
Chlorsulfuron	.25	Post	42.6	46.3	82.7	.57
Chlorsulfuron	.50	Post	44.1	45.7	84.0	.35
DPX-T6376 + surf[1]	.0625	Post	58.4	47.3	84.0	.55
DPX-T6376 + surf[1]	.125	Post	55.7	47.2	85.3	.90
Chlorsulfuron + surf.[1]	.0625	Post	48.0	46.5	84.3	1.09
Chlorsulfuron + surf.[1]	.125	Post	47.4	46.6	86.0	.93
Bromoxynil[3] + MCPA[3]	.375+.375	Post	46.7	46.6	78.3b	1.04
DPX-T6376 + diclofop[3]	.0625+.75	Post	50.0	46.4	80.3b	1.01
Check	0		49.4	46.8	86.7	.85
	$\bar{x}$		49.10	46.57	84.13	.756
	F^2		.807	.915	2.13*	1.64
	S.E.$\bar{x}$		6.35	.486	1.50	.180
	L.S.D. (.05)		18.07	1.38	4.26	.512
	C.V. %		12.93	1.04	1.78	23.80

1/ Surfactant used X-77 .125% V/V
2/ F- value for treatment comparison
3/ Rate given is in lbs ai/a rather than oz ai/a
b/ Values significantly less than the check .05 level
Applications of pre emergence and post emergence herbicides made spring 1982.

Barley Harvested: 10/7/83
Alfalfa Harvested: 10/7/83

Table 5. Potato data from Chlorsulfuron Plant-back Study (Chlorsulfuron treatments only). Northwestern Agricultural Research Center, Kalispell, MT in 1983. Size of plot 50 ft^2 (9 ft^2 harvested).

Treatment*	Rate Oz ai/a	Application Type	Yield Composition (%) #1	#2	Seed	Culls	Total Cwt/A
Chlorsulfuron	.0625	PES	6.2	5.0	88.8	0.0	200.5
Chlorsulfuron	.125	PES	13.9	3.1	82.9	0.0	238.1
Chlorsulfuron	.25	PES	6.2	5.7	83.8	4.3	212.7
Chlorsulfuron	.5	PES	13.5	0.0	86.5	0.0	211.1
Chlorsulfuron	.0625	Post	16.2	5.2	76.5	2.1	238.0
Chlorsulfuron	.125	Post	19.3	5.0	73.0	2.7	263.7
Chlorsulfuron	.25	Post	23.1	0.0	75.1	1.8	226.6
Chlorsulfuron	.5	Post	18.7	0.0	78.6	2.7	197.6
Chlorsulfuron + surfactant	.0625 + .125% V/V	Post	18.7	0.0	76.6	4.7	313.4
Chlrosulfuron + surfactant	.125 + .125% V/V	Post	10.0	15.8	71.4	2.7	261.3
Check	0		1.8	0.0	98.2	0.0	258.4
	$\bar{x}$		13.42	3.62	81.05	1.91	238.3
	F^1		.787	1.56	.781	.780	.756
	S.E.$\bar{x}$		7.50	3.80	9.01	1.96	39.54
	L.S.D. (.05)		10.61	5.37	12.72	2.77	55.92
	C.V. %		55.88	104.8	11.11	102.7	16.60

1/ F- value for treament comparison
* Treatments applied spring of 1982
Potatoes dug - 10/18/83

TITLE: Wild Oat Herbicide Studies (1983)

PERSONNEL: Vern R. Stewart and Todd K. Keener

SUMMARY:

Wild oat weed pressure was not severe in two trials which were designed to test the efficacy of herbicides and different application times. Barban applied at the three leaf stage provided the best yield and test weight in the application study. AC 222,293 proved to be very effective in the control of wild oat at rates from .25 lb ai/a to .65 lb ai/a applied at the 2 to 3-leaf stage.

INTRODUCTION:

Wild oat is the primary grassy weed problem in Montana. Evaluation of newly released herbicides or different application techniques were studied to provide the farmer with an effective herbicide to control this weed.

Two studies were conducted at the Northwestern Agricultural Research Center this year on wild oat and green foxtail. The first study (Wild Oat Staging Card Experiment) was in cooperation with Pete Fay, Weed Specialist, Montana State University, to determine proper timing and effective use of wild oat herbicides. In the second experiment we evaluated two new wild oat/grass herbicides.

RESULTS:

Wild Oat Staging Card - Yields and test weights were not significantly different statistically. Yields ranged from 69.2 bu/a to 82.8 bu/a. Test weights were low for spring wheat, and varied from 53.85 lbs/bu to 57.18 lbs/bu. The top yield and test weight were recorded from the treatment of barban (.375 lb ai/a) applied at the 3-leaf stage. Height varied from 34.4 inches to 37.0 inches yet was not significantly different. Weed populations of wild oat and green foxtail were light. Total control of wild oat was observed using barban (.375 lb ai/a) at the 4-leaf stage and diclofop (1.0 lb ai/a) at the 5-leaf stage. As the weed pressure was not adequate these results do not realistically reflect the best time to apply wild oat herbicides. Table 1.

Green Foxtail/Wild Oat Study - Yield, test weight and height did not vary significantly from the check. Wild oat plants were significantly less in all the treated plots. AC 222,293 treatments gave 95% control of wild oat. CGA 82725 did not perform well in respect to wild oat control at the rates applied. The labeled wild oat herbicides gave less control than AC 222,293. Table 2.

Table 1. Agronomic data from the wild oat herbicide application study. Northwestern Agricultural Research Center in cooperation with Dr. Pete Fay, Montana State University. Plot Size - 48 ft^2.

Date Seeded: May 19, 1983 Date Harvested: September 21, 1983

Treatment	Rate Lb ai/a	Stage Wild Oat	Yield Bu/A	Test Wt Lbs/Bu	Height Inches	# Wild Oat Panicle/Ft^2	% Weed Control Wild Oat	% Weed Control Setaria
Barban	.375	2-leaf	80.6	56.8	35.1	.5	97.5	20
Diclofop	1.0	2-leaf	69.2	55.4	35.4	1.3	90.0	95
Difenzoquat	1.0	2-leaf	76.6	56.2	35.6	3.5	65.0	90
Triallate	1.25	POPI	71.4	54.3	35.9	5.3	46.3	100
Barban	.375	3-leaf	82.8	57.2	35.4	1.0	90.0	95
Diclofop	1.0	3-leaf	80.3	54.6	36.3	.5	96.3	65
Difenzoquat	1.0	3-leaf	80.1	56.2	36.3	2.3	81.3	100
Barban	.375	4-leaf	80.2	55.9	34.4	0.0	100.0	100
Diclofop	1.0	4-leaf	75.3	54.9	35.4	.25	98.5	95
Difenzoquat	1.0	4-leaf	76.0	56.7	35.6	1.0	88.8	80
Barban	.375	5-leaf	78.0	55.6	35.3	2.5	75.0	80
Diclofop	1.0	5-leaf	80.0	55.0	35.5	0.0	100.0	75
Difenzoquat	1.0	5-leaf	81.4	54.0	37.0	.25	98.8	90
Check	0		74.2	54.3	35.3	6.3	0.0	75
		$\bar{x}$	77.6	55.45	35.6	1.76		
		F^{1}	.785	1.18	1.08			
		S.E.$\bar{x}$	135.5	.989	.597			
		L.S.D.(.05)	12.61	2.83	1.26			
		C.V. %	5.82	1.78	1.68			

1/ F - value for treatment comparison

APPLICATION DATA:

Stage	Date	Temperature Air	Temperature Soil	Wind MPH	Relative Humidity	Cloud Cover
2-leaf	6/ 6	75°F	82°F	6	16%	Sunny
3-leaf	6/ 9	78°F	84°F	4-6	18%	Prt Cldy
4-leaf	6/13	72°F	74°F	3-6	14%	Sunny
5-leaf	6/21	63°F	55°F	0-3	23%	Sunny
POPI	5/19	52°F	50°F	3-5	49%	Sunny

Table 2 Agronomic data from the Green Foxtail\ Wild Oat Trial. Northwestern Agricultural Research Center, Kalispell, MT in 1983. Plot size: 48 sq. ft.

Date seeded: May 19,1983 Date harvested: September 23,1983

Treatment	Rate # ai/A	Stage w. oat	Yield Bu/ A	Test Wt. Lbs/bu	Height Inches	** Wild Oats Plts/plot	** Oats %Ctrl
AC 222,293 1/	.25	2-3 lf	58.8	55.1	34.9	1.0a	95.0
AC 222,293 1/	.375	2-3 lf	66.4	56.1	34.8	.8a	95.0
AC 222,293 1/	.50	2-3 lf	63.3	56.1	35.0	.3a	98.8
AC 222,293 1/	.65	2-3 lf	65.5	57.4	35.0	.3a	98.8
CGA 82725	.125	2-5 lf	59.2	55.8	34.8	11.5a	8.8
CGA 82725	.5	2-5 lf	63.1	56.4	34.0	6.5a	47.5
Triallate	1.25	POPI 2/	53.8	54.4	34.4	4.5a	65.0
Diclofop	.75	3-5 lf	62.5	56.0	34.9	3.3a	71.3
Barban	.375	1-3 lf	53.4	55.5	33.8	5.0a	63.8
Difenzoquat	.75	5 lf	59.6	55.7	34.5	10.7a	25.0
Check	---	----	56.2	55.6	34.4	19.5	0.0
		$\bar{X}$	60.17	55.81	34.57	5.75	
		F 3/	1.492	1.231	.623	5.907**	
		S.E.X.	108.4	.696	.522	2.480	
		L.S.D.(.05)	10.44	2.010	1.17	5.58	
		C.V. %	6.00	1.250	1.50	43.18	

1/ Surfactant with AC 222,293 was DM 710 7.6 oz, 6.4 oz, 4.7 oz, and 3.8 oz per 20 gallons water respectively
2/ POPI = post plant incorporated
3/ F value for treatment comparison

Application Data:

Appln.	POPI	2-3 & 2-5 lf
Date	5-19-83	6-9-83
Air temp	52 F	78 F
Soil temp	50 F	84 F
Wind (MPH)	3-5	4-6
Humidity	49%	18%
Cloud cover	sunny	prtly cldy

TITLE: Triallate Incorporation Study Using Spring Wheat Varieties

PERSONNEL: Vern R. Stewart and Todd K. Keener

SUMMARY:

Three rates of triallate and two incorporations of the product were evaluated in two varieties of spring wheat, Owens and Newana. Yields were significantly reduced by the PPI incorporation, but were not affected by triallate rates. Test weights were reduced significantly as the rates of triallate were increased.

INTRODUCTION:

Triallate treatments were applied and pre plant incorporated (PPI) in an area in which spring wheat was seeded. The PPI treatments were incorporated with a Morris. The whole test was then planted to strips of Newana and Owens spring wheat. The planting of varieties was randomized. Post plant treatments were applied and incorporated with a harrow after planting. All treatments were applied using a research type tractor mounted sprayer.

Head and plant counts were taken prior to harvest. A Hege plot combine was used to harvest the plots which were 4' x 12' (48 ft^2). Table 1.

RESULTS:

The PPI treatments were significantly lower in yield than the post plant incorporated. There were significant differences in yield due to varieties with Owens being somewhat higher in yield than Newana under these conditions. We did not find a significant interaction between varieties and methods, nor did we find interaction between varieties and rates. It is interesting to note that the rates of triallate used did not significantly effect yield.

The higher rates of triallate tend to reduce the test weight of spring wheat in this test. Preplant incorporated treatments in Newana resulted in lower test weights. There was a difference in the test weight between varieties also. Test weights from the post plant incorporated plots were slightly lower than the preplant incorporated plots. These differences were found to be statistically significant. The interactions between the various treatments were not significant.

The number of heads per foot were not effected by the rates of triallate used. There was however, a significant difference because of varieties in the number of heads per three linear feet. The variety Newana had a significant reduction in heads per foot with the PPI method of incorporation whereas there was little difference in heads per foot in the variety Owens. Incorporation techniques did cause significant differences in the number of heads per linear foot in both varieties. An interaction between varieties and method is illustrated by the difference in the variety Newana. Newana appears more sensitive to the PPI method than Owens.

The number of plants per three linear feet were found to be non significant when all parameters were evaluated, however we did see a slight reduction in plants per foot in the variety Newana where triallate was applied preplant incorporated. Higher rates of triallate appeared to reduce plants per foot of row.

Table 1. Summary of agronomic data from triallate (Fargo) variety interaction experiment in the absence of wild oats. Northwestern Agric. Research Center in 1983. Field No. R-5.

Seeding Date: April 27, 1983 Size of Plot: 48 square feet[1/]

Treatment Rate lbs ai/a	Newana		Owens		$\bar{x}$
	Incorporation Method[2/]				
	PPI	POPI	PPI	POPI	
			Yield Bushel/Acre		
1.00	27.10	30.87	32.70	36.50	31.79
1.25	28.83	30.40	32.63	36.37	32.06
1.50	30.07	31.00	32.87	33.97	31.98
0.0	26.53	33.20	32.87	39.40	33.00
$\bar{x}$	28.21	31.37	32.77	36.56	
$\bar{x}$ Var.	29.75		34.66		
$\bar{x}$ Method = PPI - 30.45					
POPI - 33.96					
			Test Weight Pounds/Bushel		
1.00	60.00	60.37	58.40	58.70	59.37
1.25	59.27	60.30	57.60	58.70	58.97
1.50	58.77	60.30	58.00	58.10	58.79
0.0	60.63	60.20	58.77	58.90	59.63
$\bar{x}$	59.57	60.29	58.19	58.85	
$\bar{x}$ Var.	59.98		58.40		
$\bar{x}$ Method = PPI - 59.93					
POPI - 59.45					
			Heads/ 3 Linear Feet		
1.00	34.33	38.90	32.20	32.43	34.47
1.25	32.70	43.00	31.23	35.23	35.54
1.50	27.00	38.47	32.77	31.50	32.43
0.0	43.23	51.87	33.23	34.33	40.67
$\bar{x}$	34.32	43.06	32.36	33.37	
$\bar{x}$ Var.	38.69		32.87		
$\bar{x}$ Method = PPI - 33.34					
POPI - 38.32					
			Plants/ 3 Linear Feet		
1.00	14.33	15.33	15.33	15.00	15.00
1.25	12.00	13.67	14.77	17.67	14.37
1.50	9.33	13.50	13.50	14.50	12.71
0.0	16.17	15.50	17.83	15.00	16.12
$\bar{x}$	12.96	14.50	15.21	15.54	
$\bar{x}$ Var.	13.73		15.38		
$\bar{x}$ Method = PPI - 14.08					
POPI - 15.02					

Table 1. (con't)

1/ Size of plot harvested
2/ PPI = Pre Plant Incorporated
POPI = Post Plant Incorporated

APPLICATION DATA:

Equipment = Herbicide applied with tractor mounted plot sprayer
Incorporated with Morris cultivator
Seeded with 12" International press drill

Date = 4/27/83

		PPI	POPI
Temperature =	air -	42°F	44°F
	soil -	43°F	54°F
Humidity =		60%	90%
Wind Speed =		0	3-4 mph
Cloud Cover =		P/C	P/C rain

Soil Type = Creston silt loam
Entire area sprayed with bromoxynil plus MCP 3/8 + 3/8 lbs ai/a

TITLE: Triallate Safner Study on Winridge Winter Wheat (1983)

PERSONNEL: Vern R. Stewart and Todd K. Keener

SUMMARY:

The safner MON 5000 was effective in providing higher than average yields when used in conjunction with normal or low rates of triallate. When higher rates of triallate were used there was no yield increase of winter wheat. The high rate of the safner appeared phytotoxic to winter wheat.

INTRODUCTION:

Prior to seeding, two lots of Winridge winter wheat were treated with 1/16 and 1/8 ounce of the safner MON 5000. This seed was planted in strips in soils that had been treated with several rates of triallate. The triallate was applied in a granular form perpendicular across the strips with an air spreader and incorporated 2 to 3-inches using a Morris cultivator. A check plot (no safner on seed) was also planted across triallate treated areas.

Head counts were made prior to harvest. Yields were obtained using a Hege combine from plots 12' x 4' (48 ft^2).

RESULTS:

Under weed free conditions (no wild oat as well as broadleaves) the safner at 1/16 oz/cwt resulted in higher yields in combination with triallate (1.5 lbs ai/a) or with no triallate. Yields from the remaining triallate treatments treated with the safner were less than those where there was no safner used. It is apparent that the safner does protect germinating wheat seedings from the high rates of triallate, but it also showed that the safner at 1/8 oz was phytotoxic.

Test weights were not significantly different for any treatment in comparison to the check. The higher test weights were obtained from the high rate of triallate.

The number of heads per foot of row were the greatest at the higher rate of triallate. The lower rate of the safner gave the highest numbers of heads per foot. The higher safner rate reduced head counts per foot.

Table 1. Summary of data fromtriallate safner study on winter wheat, Northwestern Agricultural Research Center, Kalispell, MT in 1983. Field No.:R-6 - Date Seeded: 9/23/82 - Size of Plot: 48 ft^2 1/

Rate Triallate	Safner Rate/Ounce 1/16	1/8	0	$\bar{x}$
		Yield Bushel/Acre		
0.0	97.17	83.04	90.40	90.21
1.5	99.45	85.36	96.86	93.89
2.0	90.86	93.30	95.21	93.12
2.5	96.08	93.52	97.81	95.80
3.0	83.31	90.76	101.80	91.96
$\bar{x}$	93.38	89.19	96.42	
		Test Weight Pounds/Bushel		
0.0	59.40	59.13	59.30	59.28
1.5	59.40	58.70	59.17	59.09
2.0	59.67	59.67	59.60	59.64
2.5	59.30	59.60	59.87	59.59
3.0	60.03	59.93	60.20	60.06
$\bar{x}$	59.56	59.41	59.63	
		Heads/3 Linear Feet		
0.0	101.00	76.57	110.0	95.86
1.5	95.90	96.23	91.90	94.68
2.0	97.77	90.80	79.97	89.51
2.5	113.70	94.23	66.10	91.33
3.0	130.20	85.47	105.00	106.00
$\bar{x}$	107.70	88.66	90.59	

1/ Area harvested

APPLICATION DATA:

Plot size = 12 x 20'
Equipment = (a) applied with an air spreader
(b) incorporated with a Morris cultivator to about 2½ to 3 inches
(c) grain seeded with an IHC 12' press drill at about 2 inches
Date = 9/22/83
Temperature = air - 58°F; soil - 70°F
Humidity = 62%
Soil Type = Creston silt loam

TITLE: Chemical weed control in established and new seeded alfalfa. (1983)

PERSONNEL: Vern R. Stewart and Todd K. Keener

SUMMARY:

Dormant Applications: Yields were not increased significantly by herbicide applications to established dormant alfalfa.

New Seeding: Post applications of sethoxydim, fluazifop-butyl, and Dowco 453 plus either 2,4-DB or bromoxynil provided comparable or better weed control and yields than EPTC in combination with a post application of 2,4-DB or bromoxynil.

INTRODUCTION:

Dormant: The technique of applying herbicides to dormant alfalfa provided an opportunity to use a wide range of contact and residual treatments which during the season could not be used. Several such herbicides were applied alone and in combinations to alfalfa just prior to breaking dormancy.

New Seeding: The standard treatment of EPTC (PPI) plus 2,4-DB (Post) was compared this year to several post (tank mix) applications. Several new grass herbicides were evaluated with 2,4-DB and bromoxynil in effort to achieve weed free alfalfa in new seedings.

All applications (PPI, Post or dormant) were made using a tractor mounted research type sprayer. Plots were all 10' x 24' (240 ft^2). Post applications were applied after crop emergence in relationship to the stage of growth of the crop and weed species. Pre plant treatments were applied to a prepared seedbed and then immediately incorporated three to six inches with a tandum disk.

Alfalfa was harvested with a Rehm forage harvester or Jeri Mower. Weed composition was determined using a 500 gram subsample taken from each plot harvest, separated by species, dried and weighed for determination of components.

Dormant Applications: Yields were not significantly increased by the application of herbicides to established stands of dormant alfalfa. The higher rates of metribuzin, glyphosate and hexazinone resulted in somewhat reduced yields. The highest rates of pronamide and terbacil however resulted in high yields when compared to the lower rates. Plot yields from the check, dinoseb (1.125 lb) and hexazinone (.5 lb) were the best for first and second cuttings. The best total yield was taken from the plot treated with dinoseb at 1.125 lb ai/a. The check was the second highest yield.

Height of alfalfa did vary early in the growing season according to chemical applications but prior to harvest was not significantly different from the check.

Although weed pressure was light good quackgrass control was detected in many treated plots. Table 1. Dandelions were effectively controlled with hexazinone at 1.0 lbs/a and metribuzin at .5 lb/a.

Results (con't)

New Seeded Alfalfa: Sethoxydim, Dowco 453, and fluazifop in combination with 2,4-dB or bromoxynil (post applications) resulted in 91% or higher alfalfa composition, with excellent grass and broadleaf control. Grassy weeds included wild oats, green foxtail and quackgrass. Broadleaf weeds in the test were; pigweed, fanweed and lambsquarter. The combination of sethoxydim or fluazifop (Post) with EPTC (PPI) resulted in forage with over 91% alfalfa, but were not as effective in controlling the broadleaf weed species. The grass herbicides used in combination with EPTC were very effective in the control of quackgrass. Slight phytotoxicity resulted with the application of both 2,4-DB and bromoxynil yet was not visible at harvest except for minimal height reduction.

Tank mixes of post emergence herbicides resulted in equal or higher yields and weed control when compared with the standard treatment of EPTC (PPI) plus 2,4-DB (Post).

Table 1. Agronomic data from the dormant herbicide application study on alfalfa. Northwestern Agricultural Research Center in 1983. Field R8A, plot size: 200 sq. ft.

Dates harvested: 1st cut 6/22/83 2cd cut 8/10/83

Treatment	Rate lb ai/A	YIELD Tons/A 1st cut	2cd cut	Total	HT. inches	% Weed Control 1/ QK	DL
Metribuzin	.50	2.37	1.06	3.43	29.7	91	86
Metribuzin	1.00	1.73	.70	2.43	28.6	96	75
Pronamide	.50	1.95	.93	2.88	30.6	75	71
Pronamide	1.0	2.41	.93	3.35	30.3	91	71
Glyphosate	.5 ae	1.80	.96	2.76	29.0	83	50
Glyphosate	1.0 ae	1.55	.82	2.37	30.3	40	66
Terbacil	.4	1.94	.69	2.64	29.7	75	57
Terbacil	.8	2.15	1.04	3.18	30.3	94	83
Diuron	1.8	2.32	.90	3.22	30.0	91	80
Hexazinone	.5	2.36	1.09	3.45	30.0	98	62
Hexazinone	1.0	2.24	1.15	3.40	29.6	99	96
Paraquat + X77 (.5%)	.5	2.25	.95	3.21	29.3	57	83
Paraquat + Metribuzin	.5 + .5	2.03	1.05	3.08	29.6	93	72
Dinoseb	1.125	2.70	.98	3.68	30.0	53	37
Check	--	2.46	1.21	3.67	29.6	0	0
$\bar{X}$		2.15	.964	3.11	29.8		
F 2/		1.89	1.45	1.56	.415		
S.E.X.		.227	.122	.339	.825		
L.S.D.		.657	.354	.479	1.17		
C. V. %		10.57	12.67	10.91	2.77		

1/ % Weed Control: QG = quackgrass (Agropyron repens)
DL = dandelion (Taraxacum officinale)

2/ F value for treatment comparison

Table 2. Agronomic data from the alfalfa herbicide study. Northwestern Agricultural Research Center, Kalispell, MT in 1983. Field R7A, size of plot was 200 sq. ft.

Date seeded: May 20, 1983 Date harvested: August 15, 1983

Treatment	Appln type	Rate # ai/A	YIELD hay	TONS/A 1/ alfalfa	Percent composition 2/ alfalfa	grass	brdlvs
EPTC	PPI	4.0	1.21b	1.18	97.3a	.1b	2.6
EPTC +	PPI	4.0	1.06b	1.02	96.7a	.2b	3.1
SETHOXYDIM	POST	.2					
EPTC +	PPI	4.0	1.26b	1.20	94.9a	.4b	4.7
SETHOXYDIM	POST	.4					
EPTC +	PPI	4.0	1.14b	1.08	94.4a	.7b	4.7
FLUAZIFOP	POST	.2					
EPTC +	PPI	4.0	1.13b	1.08	95.9a	0.0b	4.1
FLUAZIFOP	POST	.4					
EPTC +	PPI	4.0	1.21b	1.09	90.6a	2.1b	7.3
CGA 82725	POST	.2					
EPTC +	PPI	4.0	1.27b	1.10	86.1a	6.1b	7.8
CGA 82725	POST	.4					
EPTC +	PPI	4.0	1.04b	1.01	96.4a	3.5b	.1
DICLOFOP-M	POST	.75					
EPTC +	PPI	4.0	1.15b	1.01	88.1a	11.9b	0.0
2,4-DB	POST	1.0					
2,4-DB	POST	1.0	1.90	.49b	30.2b	69.7a	.1
SETHOXYDIM +	POST	.4	1.12b	1.02	91.3a	8.2b	.5
2,4-DB	POST	1.0					
SETHOXYDIM +	POST	.4	1.01b	.98	97.3a	1.8b	.9
BROMOXYNIL	POST	.25					
FLUAZIFOP-B +	POST	.4	1.01b	.98	96.7a	1.9b	1.4
2,4-DB	POST	1.0					
FLUAZIFOP-B +	POST	.4	.86b	.82	94.4a	3.7b	1.9
BROMOXYNIL	POST	.25					
CGA 82725 +	POST	.4	1.03b	.75	71.7	27.1	1.2
2,4-DB	POST	.25					
CGA 82725 +	POST	.4	1.13b	.74	68.1	30.5	1.4
BROMOXYNIL	POST	.25					
DICLFOP +	POST	.75	1.17b	.69	59.3	40.0	.7
BROMOXYNIL	POST	.25					
BROMOXYNIL	POST	.25	1.47	.47	38.3b	59.5b	2.2
DOWCO 453 +	POST	.25	1.03b	1.00	94.8a	2.0b	3.2
BROMOXYNIL	POST	.25					
DPX-Y6202 +	POST	1.0	1.07b	1.04	97.5a	2.5b	0.0
BROMOXYNIL	POST	.25					
DOWCO 453 +	POST	.25	1.18b	1.16	97.9a	1.8b	.3
2,4-DB	POST	1.0					
DPX-Y6202 +	POST	1.0	1.13b	1.10	97.0a	.4	2.6
2,4-DB	POST	1.0					
ETHALFLURALIN	PPI	1.0	1.55	1.09	70.5	19.0	10.5a
ETHALFLURALIN+	PPI	1.0	1.28b	.78	61.1	38.9	0.0
2,4-DB	POST	1.0					
ETHALFLURALIN+	PPI	1.0	1.10b	.71	65.1	34.8	.1
BROMOXYNIL	POST	.25					
CHECK	----	----	1.63	.94	60.6	35.8	3.6

Table 2 (con't)

	YIELD TONS/A 1/ hay	alfalfa	Percent composition 2/ alfalfa	grass	brdlvs
X	1.20	.94	82.0	15.5	2.5
F 3/	4.22**	3.74**	7.96**	8.58**	2.63**
S.E.X	.11	.10	6.94	6.86	1.68
C.V. %	9.03	10.94	8.47	44.29	67.13
L.S.D.	.30	.29	19.56	19.33	4.75

* Note: Only one harvest was taken, consisting of 48 sq. ft.

1/ Yield: hay = total dry matter from plots including all components
alfalfa = alfalfa component alone calculated at tons / acre

2/ % composition: determined by hand separation of a 500 gram subsample of which each plant species is weighed independently. Grass species were predominantly wild oats (Avena fatua), green foxtail (Setaria viridis), and quackgrass (Agropyron repens). Broadleaf weed species observed were fanweed (Thlaspi arvense), lambsquarter (Chenopodium album), and pigweed (Amaranthus retroflexus).

3/ F value for treatment comparison

** Indicates statistical significance at the .01 level

a/ Values significantly greater than the check at the .05 level

b/ Values significantly less than the check at the .05 level

Application Data:

	date	air temp	soil temp	wind	R.H.	weather
PPI	5-20	65 F	62 F	10mph	25 %	clear
POST	6-29	66 F	62 F	0mph	60 %	overcast

PPI treatments incorporated with tandem disc 3-6 " at 5-6 mph

Table 12. Alfalfa Herbicide Studs (cont'd)

Treatment	Appln type	Rate # ai/A	ALFALFA height 7-12	ALFALFA height 8-8	ALFALFA visor	ALFALFA std	Percent Weed Control OG	SET	FW	LQ	WO
EPTC	PPI	4.0	9.5b	23.9	8.6	89	76	100	66	99	95
EPTC + SETHOXYDIM	PPI POST	4.0 .2	8.8b	22.2	8.6	90	90	100	76	85	100
EPTC + SETHOXYDIM	PPI POST	4.0 .4	9.6b	22.4	9.6	91	95	100	49	90	100
EPTC + FLUAZIFOP	PPI POST	4.0 .2	8.6b	20.9	8.1	87	100	100	64	88	100
EPTC + FLUAZIFOP	PPI POST	4.0 .4	9.0b	21.4	8.6	89	99	100	59	69	100
EPTC + CGA 82725	PPI POST	4.0 .2	9.1b	20.2	8.6	88	70	100	60	100	100
EPTC + CGA 82725	PPI POST	4.0 .4	10.1b	21.4	8.8	90	51	100	69	80	100
EPTC + DICLOFOP-M	PPI POST	4.0 .75	9.1b	22.2	8.5	89	100	100	89	78	100
EPTC + 2,4-DB	PPI POST	4.0 1.0	8.1b	22.2	6.8	81	65	100	95	98	89
2,4-DB	POST	1.0	8.5b	19.9	7.6	89	0	0	95	99	0
SETHOXYDIM + 2,4-DB	POST POST	.4 1.0	7.6b	20.5	7.0	86	90	100	94	95	100
SETHOXYDIM + BROMOXYNIL	POST POST	.4 .25	7.9b	18.1	7.3	85	90	100	99	100	100
FLUAZIFOP-B + 2,4-DB	POST POST	.4 1.0	9.1b	19.7	7.3	87	60	98	94	98	100
FLUAZIFOP-B + BROMOXYNIL	POST POST	.4 .25	8.1b	19.2	8.0	90	83	100	99	98	100
CGA 82725 + 2,4-DB	POST POST	.4 .25	8.4b	20.7	7.4	90	18	100	94	96	100
CGA 82725 + BROMOXYNIL	POST POST	.4 .25	8.3b	20.0	8.1	91	24	100	94	91	69
DICLFOP + BROMOXYNIL	POST POST	.75 .25	8.4b	20.8	7.6	89	18	100	95	91	65
BROMOXYNIL	POST	.25	8.8b	20.1	8.5	92	0	0	98	100	0
DOWCO 453 + BROMOXYNIL	POST POST	.25 .25	8.8b	19.9	8.0	89	89	100	100	100	100
DPX-Y6202 + BROMOXYNIL	POST POST	1.0 .25	7.8b	17.5	7.4	87	99	100	95	98	100
DOWCO 453 + 2,4-DB	POST POST	.25 1.0	9.1b	19.3	7.8	89	95	100	94	100	100
DPX-Y6202 + 2,4-DB	POST POST	1.0 1.0	8.6b	20.1	7.4	89	97	100	98	99	100
ETHALFLURALIN	PPI	1.0	10.6	24.3	9.6	97	50	95	18	56	54
ETHALFLURALIN+ 2,4-DB	PPI POST	1.0 1.0	8.8b	22.3	7.5	86	37	78	93	100	64
ETHALFLURALIN+ BROMOXYNIL	PPI POST	1.0 .25	8.4b	19.4	7.5	86	32	80	100	100	54
CHECK	----	----	11.3	24.2	9.9	99	0	0	0	0	0

1/ Alfalfa measurements: height is given in inches on two dates (7-12-83 and 8-8-83). Vigor: 0-10 scale, 0 = dead plants, 10 = normal healthy plants. Alfalfa stand (std) ; ocular rating of percent stand

2/ % Weed Control: Grass species were predominantly:
WO = wild oats (Avena fatua)
SET = green foxtail (Setaria viridis)
QG = quackgrass (Agropyron repens)
Broadleaf weed species observed were:
FW = fanweed (Thlaspi arvense)
LQ = lambsquarter (Chenopodium album)

*/ Values significantly less than the check at the .05 level

Application Data:

	date	air temp	soil temp	wind	R.H.	weather
PPI	5-20	65 F	62 F	10mph	25 %	clear
POST	6-29	66 F	62 F	0mph	60 %	overcast

PPI treatments incoporated using a tandem disc 3-6", 1-5 mph

TITLE: Chemical weed control in lentils (1983)

PERSONNEL: Vern R. Stewart and Todd K. Keener

SUMMARY:

Post emergence herbicides in combination with metribuzin - Excellent green foxtail and wild oat control was obtained in lentils with the use of sethoxydim, fluazifop, Dowco 453 and CGA 82725. Broadleaf weed control was increased with the addition of sethoxydim, diclofop and CGA 82725 to metribuzin.

Herbicide evaluations on lentils - Several new grass herbicides were evaluated alone or in combinations and were found effective in the control of green foxtail and wild oat.

INTRODUCTION:

Post emergence herbicides in combination with metribuzin - Several grass herbicides were evaluated in combination with an uniform application of metribuzin at .125 lb ai/a. All applications were made to a solid seeded stand of lentils. Two preplant incorporated (PPI) treatments were applied previous to seeding and incorporated with a Vibra-shank. Seven Post treatments were applied at the optimum weed growth stages. Applications were made using a tractor mounted research-type sprayer with a volume of 26.86 gpa. Plot size was 10' x 20'

Herbicide evaluation on lentils - Various treatments along with standard combinations were tested on lentils in an effort to evaluate broad spectrum weed control. Applications were made as in the above study. See Tables 1 and 2 for application and weed score data.

RESULTS:

Post emergence herbicides in combination with metribuzin - Broadleaf weed control was generally poor due to heavy weed pressure and a less than adequate rate of metribuzin being applied for the soil type. Broadleaf weed control was increased with the addition of sethoxydim, diclofop and CGA 82725 with metribuzin.

Excellent green foxtail control was obtained in plots treated with sethoxydim (.5 lb ai/a), fluazifop-butyl (.25 and .5 lb ai/a), Dowco 453 (.125 and .25 lb ai/a) and CGA 82725 (.5 lb ai/a). Less effective control resulted from lower rates of some of the herbicides. The sequential treatment of sethoxydim did not provide better control of grasses than did the single application.

Good to excellent wild oat control was obtained with sethoxydim, fluazifop-butyl, diclofop, Dowco 453 and CGA 82725. CGA 82725 was weak at .125 lb ai/a rate for both grass species,and at the higher rate less effective than the other herbicides on wild oat. Table 1.

Herbicide evaluations on lentils - Top yields were harvested from plots treated with triallate 1.25 lbs ai/a plus dinoseb 2.5 lbs ai/a,

Results (con't)

sethoxydim .5 lb ai/a, and Dowco 453 .125 lb ai/a. There was a high population of broadleaf weeds consisting mostly of lambsquarter. No treatment was found to effectively control lambsquarter yet dinoseb plus metribuzin and pendimethalin plus R 40244 did offer partial control. Several treatments showed effective control of fanweed. Table 2.

Excellent green foxtail control was observed where sethoxydim, fluazifop-butyl, Dowco 453 and CGA 82725 (at the .5 lb rate only) were used. Wild oat were controlled with triallate 1.25 lbs ai/a plus metribuzin .125 lb ai/a, triallate 1.25 lb ai/a plus dinoseb 2.5 lbs ai/a, sethoxydim .5 lb ai/a, fluazifop-butyl .5 lb ai/a, diclofop .75 lb ai/a and CGA 82725 .5 lb ai/a. Difference in grassy weed control was obvious in comparing the high and low rates of all grass herbicides.

Table 1. Evaluation of post emergence grass herbicides on lentil yields and weed control with a uniform pre emergence surface application of metribuzin. Northwestern Agricultural Research Center, Kalispell, MT in 1983. Field R6A, size of plot 200 sq. ft.

Planting date: May 11, 1983 Harvest date: Sept. 19, 1983

Treatment	Rate lb ai/A	Appln. Type	Yield lbs/A	** % Weed Control 3/ ** LQ	SET	WO
DPX-Y6202	.5(oz)	Post	667.1a	54.8	22.5	60.0
DPX-Y6202	1.0(oz)	Post	642.5	37.5	35.0	48.8
Sethoxydim 1/	.5	Post	831.4a	68.8	100	100
Sethoxydim seq. 1/2/	.5 +.3	Post + seq.	816.8a	40.0	100	100
Fluazifop-butyl	.25	Post	679.7a	41.3	93.8	81.3
Fluazifop-butyl	.5	Post	751.9a	46.3	98.8	100
Diclofop	.75	Post	837.2a	66.3	85.5	96.3
Dowco 453	.125	Post	821.0a	52.3	90.0	91.3
Dowco 453	.25	Post	1035.7a	56.3	100	98.8
CGA 82725	.125	Post	717.0a	63.5	65.0	57.5
CGA 82725	.5	Post	791.1a	45.0	100	81.3
Difenzoquat	.75	Post	381.1	27.5	13.8	45.0
Triallate	1.25	PPI	705.4a	57.3	46.3	75.0
Propham	4.0	PPI	565.3	52.5	16.3	80.0
Metribuzin (alone)	.125	PES	596.0	23.8	10.0	47.5
Check (no metribuzin)	---	---	430.1	0	0	0
		$\bar{X}$	693.5			
		F 4/	1.99*			
		S.E.X	28.72			
		L.S.D.	219.95			
		C.V. %	15.90			

Table 1 (con't)

1/ Surfactant with sethoxydim 1 qt oil concentrate, with fluazifop-butyl X-77 at .25% v/v.
2/ Sequential treatment of sethoxydim 30 days prior to harvest. 1st application was four weeks post plant
3/ Percent weed contol: LQ = lambsquarter (Chenopodium album)
SET = green foxtail (Setaria viridis)
WO = wild oat (Avena fatua)
4/ F value for treatment comparisons
* Indicates statistical significance at the .05 level

Application Data:

	Appln.	Date	Air temp	Soil temp	Wind	R.H.%
Pre plant incorp (PPI)		5-11	52 F	53 F	0	10
Pre emerge surface (PES)		5-11	56 F	61 F	5	15
Post emergence (POST)		6-10	78 F	81 F	0-2	12
Sequential (SEQ)		7-15	55 F	57 F	0	48

Notes: Incorporation technique was a vibra-shank, O.M. of soil 2.8%, pH 6.4

Table 2. Evaluation of herbicide combinations on lentil yields and weed control. Northwestern Agricultural Research Center, Kalispell, MT in 1983. Field R-6. Size of plot: 200 ft^2.
Planting Date: May 11, 1983 Harvest Date: September 19, 1983

Treatment	Rate ai/a Lb or Oz	Application	Lentil[3] Yield Lbs/A	Lentil[3] Stand Red.	Lentil[3] Vigor	% Weed Control[4] LQ	% Weed Control[4] FW	% Weed Control[4] Setaria 7/9	% Weed Control[4] Setaria 8/4	% Weed Control[4] Wild Oats 8/4
Triallate	1.25	PPI	725.8	0	10.0	0	0	42.5	53.8	83.8
Triallate + metribuzin	1.25+.125	PPI/Post	493.5	5.0	9.8	25.0	95.0	61.3	71.3	95.0
Triallate + R40244	1.25+.5	PPI/PES	738.5	2.5	10.0	11.3	100.0	10.0	43.8	86.3
Metribuzin	.125	Post	337.9b	1.3	9.8	6.3	97.5	16.3	11.3	10.0
R40244	.5	PES	367.7b	7.5	9.8	11.3	100.0	0	0	0
R40244	.75	PES	450.5	3.8	10.0	6.3	100.0	5.0	17.5	26.3
Dinoseb	2.5	PES	578.7	6.8	9.8	13.8	70.0	8.8	12.5	36.3
Dinoseb + metribuzin	2.5+.125	PES/PES	530.0	2.5	9.8	25.0	92.5	3.8	18.8	20.0
Triallate + dinoseb	1.25+2.5	PPI/PES	874.4a	3.3	9.8	25.0	55.0	20.0	48.8	87.5
Dinoseb + metribuzin	2.5+.125	PES/Post	483.9	7.5	9.8	48.8	100.0	28.8	35.0	50.0
DPX-Y6202	.5 oz	Post	654.8	3.8	9.8	5.0	50.0	18.8	32.5	22.5
DPX-Y6202	1.0 oz	Post	461.6	8.8	9.8	0	65.0	30.0	46.3	32.5
Sethoxydim[1]	.5	Post	985.0a	6.3	9.8	17.5	50.0	98.8	100.0	100.0
Sethoxydim seq.[2]	.5+.3	Post+seq.	365.8b	3.8	10.0	0	50.0	98.8	100.0	100.0
Fluazifop-butyl[1]	.25	Post	613.3	5.0	10.0	0	35.0	75.0	91.3	56.3
Fluazifop-butyl[1]	.5	Post	566.4	10.8	9.8	5.0	50.0	98.8	99.5	95.0
Pendimethalin + R40244	.75+.5	PPI/PES	752.7	11.3	9.0	51.3	100.0	72.5	57.5	41.3
Pendimethalin	.75	PPI	683.6	6.8	10.0	43.8	50.0	63.8	78.8	61.3
Diclofop-methyl	.75	Post	736.2	1.5	10.0	12.5	52.5	95.0	97.5	96.3
Dowco 453	.125	Post	844.9	3.8	10.0	0	55.0	95.0	88.8	45.0
Dowco 453	.25	Post	592.2	5.0	9.5	0	87.5	100.0	100.0	96.3
CGA 82725	.125	Post	549.2	6.3	9.8	13.8	40.0	36.3	62.5	48.8
CGA 82725	.5	Post	638.6	7.5	9.8	6.3	27.5	97.5	99.8	86.3
AC 222,293[1]	.5	Post	10.6b	41.3	3.8	2.5	100.0	15.0	2.5	66.3
Oryzalin	.75	PES	457.0	8.8	9.8	26.3	45.0	5.0	22.5	33.8
Oryzalin + metribuzin	.75+.125	PES/PES	499.2	5.0	9.6	36.3	28.8	8.8	26.3	23.8
Check	0		636.7	0	10.0	0	0	0	0	0
$\bar{x}$[5]			574.1							
F[5]			2.757**							
S.E.X.			29.66							
L.S.D. (.05)			227.13							
C.V. %			19.84							

Table 2 . (con't)

Footnotes:

1/ Surfactant used with: sethoxydim = 1 qt oil concentrate/A
fluazifop-butyl = .25% V/V surf volume
AC 222,293 = .25% V/V surf by volume

2/ Sequential application of sethoxydim = 1st spray - 4 weeks post plant
2nd spray - 30 days pre harvest

3/ Lentil: Stand Red. = % stand loss due to chemical or mechanical injury
Vigor = 0-10 rates, 0 = dead plants, 10 = normal, healthy plants

4/ % Weed Control - LQ = lambsquarter (Chenopodium album)
FW = fanweed (Thlaspi arvense)
Setaria - green foxtail (Setaria viridis)
Wild Oats - (Avena fatua)

5/ F - value for treatment comparisons

** Indicates statistical significance at .01 level.

SPRAY APPLICATION DATA

Application	Date	Temperature Air	Temperature Soil	Wind (mph)	R.H.%
Pre plant incorporate (PPI)	5/11	52°F	53°F	0	10
Pre emergence surface (PES)	5/11	56°F	61°F	5	15
Post emergence (Post)	6/10	78°F	81°F	0-2	12
Sequential (sethoxydim)	7/15	55°F	57°F	0	48

GPA = 26.86
Nozzles = 8003
Incorporate technique = vibra shank
O.M. = 2.8%
pH = 6.4
Soil type = Creston silt loam
Area Harvested = 25 ft^2

TITLE: Chemical Weed Control in Chickpeas (1983)

PERSONNEL: Vern R. Stewart and Todd K. Keener

SUMMARY:

Herbicide treatments resulting in higher yields in chickpeas were those treatments which provided broad spectrum weed control and were not phytotoxic to the crop. Those treatments included ethalfluralin plus EPTC, profluralin, dinoseb sequential, metribuzin plus Dowco 453, metribuzin plus diclofop.

INTRODUCTION:

Twenty-nine treatments were applied to chickpeas using preplant incorporate, pre emergence surface, or post application techniques. The PPI treatments were applied prior to planting and incorporated 2 to 3 inches using a tractor mounted rototiller. UC-5 chickpeas were seeded using a research-type plot seeder. The seeding rate was 150 lbs/a. Plots were four rows spaced 1' apart and 18' long. Pre emergence herbicides were applied immediately after seeding. Post sprays were applied according to crop or weed stage of growth. All applications were made using a tractor mounted research-type sprayer. The ratings and observations were made throughout the season (Table 2). Yields were obtained by hand harvesting 15' of the 4-row plot. These harvest samples were allowed to air dry and threshed with a Vogel thresher.

RESULTS:

Fifteen treatments within the study provided significantly higher yields than the check. Of those treatments which yielded high and demonstrated good weed control were ethalfluralin (.75 lb ai/a) plus EPTC (2.0 lb ai/a) PPI, profluralin (.5 lb ai/a) PPI, dinoseb sequential (8.9 lbs ai/a) PES plus (2.0 lbs ai/a) Post, metribuzin (.125 lb ai/a) PES plus Dowco 453 (.5 lb ai/a) Post and metribuzin (.125 lb ai/a) PES plus diclofop (.75 lb ai/a) Post.

The addition of EPTC to treatments increased weed control with ethalfluralin but not with profluralin or trifluralin. Ethalfluralin, trifluralin, profluralin and EPTC alone all gave significantly high yields.

When metribuzin was combined with triallate, yields were reduced when compared to triallate alone. The combination of metribuzin plus dinoseb increased yields significantly and weed control was enhanced. The sequential application of dinoseb treatments were higher when compared to the 1982 crop study. This is related to weather and heat at application time. This year it was cool and overcast, whereas in 1982 it was hot and sunny.

Dowco 453 plus metribuzin gave excellent weed control and resulted in good yields. Metribuzin in combination with fluazifop was most effective at the higher rate of fluazifop. DPX-Y6202 did not perform well with metribuzin in yield or weed control, even at the higher rate. The combination of diclofop plus metribuzin had the highest yield with good weed control. Sethoxydim and difenzoquat offered good yields but the difenzoquat combination was weak on several weed species (Table 2). Metribuzin applied post emergence was more effective than a pre emergence surface application.

Table 1. Herbicide evaluations on garbanzo beans considering yields, plant vigor and weed control. Northwestern Agricultural Research Center, Kalispell, MT in 1983. Field R-9
Date Seeded: May 16, 1983 Date Harvested: September 27, 1983 Plot Size: 60 ft^2

Treatment	Rate Lb ai/a	Application	Yield Lbs/A	Plant Vigor[1]	% Weed Control[2]								
					Setaria								
					6/29	8/12	FW	BW	LQ	FF	QG	HB	WO
Triallate	1.25	PPI	270.8	10.0	21.6	62.5	33.3	33.3	16.6	0.0	98.3	63.3	100.0
Triallate + metribuzin	1.25 .125	PPI PES	204.1	10.0	41.6	46.7	56.6	93.3	98.3	20.0	93.3	65.0	100.0
Ethalfluralin	.75	PPI	278.8	10.0	96.6	78.3	90.0	95.0	96.6	100.0	71.6	96.6	100.0
Ethalfluralin + EPTC	.75 2.0	PPI PPI	317.5	10.0	96.6	98.0	93.3	98.3	100.0	100.0	96.6	100.0	100.0
Trifluralin	.5	PPI	253.4	10.0	91.6	90.0	85.0	96.6	100.0	96.6	63.3	90.0	78.3
Trifluralin + EPTC	.5 2.0	PPI PPI	252.1	10.0	95.0	88.3	98.3	100.0	100.0	100.0	91.6	100.0	100.0
Profluralin	.5	PPI	297.5	10.0	76.6	61.7	85.0	88.3	100.0	96.6	96.6	100.0	100.0
Profluralin + EPTC	.5 2.0	PPI PPI	238.8	10.0	96.3	93.3	83.3	90.0	90.0	100.0	96.6	98.0	66.7
Oxyfluorfen	.5	PES	122.7	9.0	16.6	10.0	98.3	98.3	65.0	98.3	93.3	100.0	66.7
Dinoseb	8.9	PES	72.0	10.0	0.0	0.0	98.3	91.6	86.6	100.0	66.6	93.3	66.7
Dinoseb + sequential	8.9 + 2.0	PES Post	294.8	10.0	25.0	25.0	100.0	96.6	100.0	33.3	73.3	50.0	100.0
EPTC	2.0	PPI	286.8	10.0	96.3	63.3	63.3	73.3	100.0	61.6	68.3	98.3	93.3
AC 222,293	.375	PES	173.4	10.0	0.0	13.3	46.6	68.3	23.3	50.0	83.3	70.0	70.0
Metolachlor	2.0	PPI	281.4	10.0	100.0	100.0	86.6	100.0	100.0	93.3	100.0	100.0	93.3
Pendimethalin	1.0	PPI	240.1	10.0	93.3	91.3	88.3	100.0	100.0	91.6	85.0	95.0	93.3
Metribuzin + Dowco 453	.125 .5	PES Post	292.1	10.0	100.0	100.0	98.3	63.3	80.0	0.0	100.0	93.3	100.0
Metribuzin + fluazifop	.125 .25	PES Post	208.1	10.0	98.3	85.0	40.0	41.6	36.6	3.3	96.6	60.0	98.3
Metribuzin + fluazifop	.125 .5	PES Post	260.1	10.0	95.0	90.0	85.0	60.0	96.6	33.3	100.0	56.6	98.3
Metribuzin + CGA 82725	.125 .25	PES Post	113.4	10.0	91.6	90.0	85.0	95.5	73.3	6.6	51.6	73.3	66.7
Metribuzin + DPX-Y6202	.125 .5 oz	PES Post	42.7	10.0	16.6	0.0	61.6	61.6	65.0	0.0	0.0	63.3	33.3
Metribuzin + DPX-Y6202	.125 1.0 oz	PES Post	170.8	10.0	68.3	25.0	46.6	61.6	75.0	60.0	65.0	100.0	100.0

Table 1. (con't)

Treatment	Rate Lb ai/a	Appli-cation	Yield Lbs/A	Plant[1] Vigor	% Weed Control[2] Setaria 6/29	Setaria 8/12	FW	BW	LQ	FF	QG	HB	WO
Metribuzin + diclofop	.125 + .75	PES Post	326.8	10.0	98.3	83.3	71.6	61.6	58.3	60.0	85.0	55.0	100.0
Metribuzin + sethoxydim	.125 + .4	PES Post	265.4	10.0	98.3	100.0	30.0	41.6	3.3	10.0	98.3	33.3	100.0
Metribuzin + difenzoquat	.125 + .75	PES Post	277.4	10.0	6.6	13.3	73.3	98.3	60.0	6.6	31.6	66.6	33.3
Metribuzin	.125	PES	182.8	10.0	0.0	0.0	33.3	36.6	51.6	16.6	93.3	55.0	100.0
Metribuzin	.125	Post	216.1	9.5	53.3	23.3	86.6	60.0	100.0	95.0	93.3	91.6	83.3
Dinoseb + metribuzin	8.9 + .125	PES PES	246.8	10.0	25.0	20.0	76.6	43.3	96.6	55.0	76.6	55.0	60.0
R 40244	.25	PES	113.4	10.0	3.3	10.0	53.3	60.0	56.6	38.3	60.0	76.6	67.0
Check	0		128.1	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	$\bar{x}$		223.3										
	F^3		1.724										
	S.E.$\bar{x}$		14.73										
	L.S.D. (.05)		115.85										
	C.V. %		26.40										

1/ Plant Vigor = Rated on scale 0-10. 0 = no plants (chemical or mechanical injury)
10 = normal healthy plants

2/ Weed Control: Setaria (Green Foxtail) (Setaria viridis) 2 ratings: 1st on 6/29/83, 2nd on 8/12/83
FW = Fanweed (Thlaspi arvense); BW = Wild Buckwheat (Polygonum convolvulus)
LQ = Lambsquarter (Chenopodium album); FF = False Flax (Camelina sativa)
QG = Quackgrass (Agropyron repens); HB = Henbit (Lamium amplexicaule)
WO = Wild Oat (Avena fatua)

3/ F - value for treatment comparison

APPLICATION DATA:

Application:	PPI	PES	Post
Date:	5/13	5/16	6/9
Air Temperature:	62°F	68°F	78°F
Soil Temperature:	68°F	64°F	84°F
Wind:	4-5 mph	7 mph	4-6 mph
Humidity:	0%	19%	18%

TITLE: Chemical Weed Control in Peppermint

PERSONNEL: Vern R. Stewart and Todd K. Keener

SUMMARY:

In a new planting of peppermint several herbicide combinations were tested. The combinations of sethoxydim or fluazifop as post applications with terbacil, oxyfluorfen or bromoxynil gave broad spectrum weed control.

INTRODUCTION:

Pre emergence (PRE),pre emergence incorporated (PEI), post (Post) and sequential (SEQ) herbicide applications were applied to a new seeding of peppermint in 1983. The PEI treatment was applied and then incorporated 2 to 3-inches using a roto-tiller. PRE treatments were surface applied the same day as PEI whereas the Post applications were timed according to growth stage of the weeds. All herbicides were applied with a research type tractor mounted sprayer. Spray boom heights were adjusted to accomodate crop and weed canopies. No harvest was made. See Table 1 for application data. Peppermint plant vigor ratings and weed scores were obtained throughout the season.

RESULTS:

Bentazon applications applied alone, in combination and sequentially provided fair to good broadleaf control with the sequential giving the greatest control. When fluazifop and sethoxydim were combined with 2,4-DB good wild oat and quackgrass control was obtained. Oxyfluorfen provided excellent broadleaf weed control and when combined with sethoxydim and fluazifop good grassy weed control was achieved.

The post application of terbacil provided slightly better weed control when compared to a PES application, especially on grasses.

All the grass herbicides tested with terbacil provided good broad spectrum weed control.

Oryzalin plus oxyflourfen or bentazon demonstrated good broadleaf weed control but was weak on grasses.

The 2,4-DB applications were quite phytotoxic to the existing mint plants. Broadleaf and grass weed control was marginal with this product.

Bromoxynil was injurious to the mint, but in combination with sethoxydim and fluazifop it provided excellent weed control.

Table 1. Evaluations of herbicides on peppermint. Northwestern Agricultural Research Center on the Vern Knoll Farm, Kalispell, MT, 1983.

Treatment	Rate	Appln.	Mint Visor	**** % Weed Control ****				
				TM	WO	BS	LQ	QK
Bentazon	2.0	Post	7.7	65	3	82	93	0
Bentazon	2.0 + 2.0	Post + Seq.	8.0	92	3	100	87	3
Bentazon + Sethoxydim	2.0 + .5	Post	9.2	63	97	88	78	67
Bentazon + Fluazifop	2.0 + 1.0	Post	7.0	43	100	77	70	98
Bentazon + CGA 82725	2.0 + .5	Post	7.8	40	83	57	53	8
Oxyflourfen	.75	Pre	10	100	43	100	97	18
Oxyflourfen + Sethoxydim	.75 + .5	Pre/ Post	9.8	100	100	100	100	60
Oxyfluorfen + Fluazifop	.75 + 1.0	Pre/ Post	8.7	100	100	97	98	87
Oxyfluorfen + CGA 82725	.75 + .5	Pre/ Post	9.0	100	70	100	95	43
Terbacil	1.5	Pre	10	100	32	100	83	47
Terbacil	1.5	Post	9.2	98	93	80	98	93
Terbacil + Sethoxydim	1.5 + .5	Post	7.7	100	100	93	100	98
Terbacil + Fluazifop	1.5 + 1.0	Post	7.0	100	100	82	98	98
Terbacil + CGA 82725	1.5 + .5	Post	5.7	98	97	50	93	73
Terbacil + Trifluralin	.75 + .75	Incorp	10	100	55	72	100	93
Oryzalin + Oxyfluorfen	1.5 + .75	Pre	10	100	58	100	100	60
Oryzalin + Bentazon	1.5 + 2.0	Pre/ Post	7.8	77	7	100	100	20

Table 1. Mint Herbicide Studs (cont'd)

Treatment	Rate	Appln.	Mint Vigor	**** % Weed Control **** TM	WO	BS	LQ	QK
Napropamide + Terbacil	3.0 + 1.5	Pre	10	98	50	88	92	22
2,4-DB	1.0	Post	1.7	85	0	12	75	0
2,4-DB + Sethoxydim	1.0 + .5	Post	1.7	73	98	23	73	32
2,4-DB + Fluazifop	1.0 + 1.0	Post	2.5	78	97	3	85	72
2,4-DB + CGA 82725	1.0 + .5	Post	2.0	67	32	27	68	0
Bromoxynil + Sethoxydim	1.0 + .5	Post	2.7	93	97	92	98	78
Bromoxynil + Fluazifop	1.0 1.0	Post	5.3	92	98	88	99	86
Check	---	---	10	0	0	0	0	0

1/ Application types Pre = pre emergence surface, Post = post emergence Post seq. = post sequential application (10 days after post appln.)

2/ Mint vigor: 0 - 10 scale, 0 = no mint, dead due to chemical or mechanical injury, 10 = normal healthy mint plants

3/ % Weed control: TM = tansy mustard (Descurainia pinnata)
WO = wild oats (Avena fatua)
BS = bedstraw (Galium aparine)
LQ = lambsquarter (Chenopodium album)
QK = quackgrass (Agropyron repens)

Application Data:

	Appln.	Pre	Post	Post seq.
	Date	4-29	6-22	7-1
	Air temp	60 F	63 F	65 F
	soil temp	48 F	70 F	70 F
	Wind (MPH)	0-2	0	0-2
	Humidity	13 %	30 %	25 %
	Weather	clear	clear	clear

* Note: Herbicide applications were not tank mixed but were applied independently.

TITLE: Spring Barley

PERSONNEL: Vern R. Stewart and Todd K. Keener
Cooperators - MAES, MSU, USDA-SEA-AR
Cooperative Extension Service

SUMMARY:

Andante was one of four barley varieties in the Intrastate Spring Barley Nursery which yielded significantly higher than the check variety, Purcell. Andante also had a significantly higher test weight and percent plump. Greater than 50% of the entries yielded above 100 bu/a.

INTRODUCTION:

In an effort to determine the adaptability of new and introduced spring barley varieties to Montana the Intrastate Spring Barley Nursery is grown annually in Kalispell under dryland conditions. Results from these nurseries accumulated over several year's testing are the proving ground for the new recommended spring barley varieties in Montana.

Off Station Nurseries are discussed by location.

RESULTS:

Four barley varieties yielded significantly higher than the check variety Purcell, which was recorded at 99.9 bu/a. Thirty-one of the fifty-six entries had harvests in excess of 100 bu/a. The yield varied from 76.7 bu/a (ES 12) to 124.9 bu/a (Steptoe). Steptoe as usual had the high yield but was significantly lower in test weight when compared to Purcell. Andante showed a test weight significantly greater than Purcell and as with Steptoe, MT 657399, and Lindy, had a significantly higher percent plump along with their good yields.

Test weights were about average for the location with the mean and Purcell both being 48.2 lbs/bu.

Heading dates and heights varied by variety with several entries demonstrating significant differences in comparison to Purcell.

Percent plumps were lower than normal. The variety Purcell was rated at 75.8% plump. With this low reading the majority of the entries had significantly higher percent plumps.

Leaf scald (Rynchosporium secalis) and leaf spot (Septoria spp) were moderate to heavy throughout this nursery. Nine varieties showed some resistance to scald while twelve varieties were resistant to leaf spot. Table 1.

Off Station Yield Nurseries - Results

Lake County - Yields were high in the Lake County nursery. Two varieties, MT 547123 and Klages, yielded significantly higher than the check variety, Ingrid. Although the high yield (108.9 bu/a from MT 547123) was not as high as the top yield last year, the means were equal. Test weights were a little light this year which is probably related to the moderate lodging recorded throughout the nursery. Six varieties had severe lodging with only one variety having 10% or less (Karla). Percent plump data was very light due to the condition of the nursery.

Missoula County - Stands and resulting yields were about average for the nursery on the Rodney Vannoy Farm. Two entries which yielded significantly high in comparison to Ingrid were Bridger-82 (79.5 bu/a) and Piroline (70.6 bu/a). Test weights and percent plump were low even for this location. Although lodging was not severe it was recorded in all but one plot (Menuet).

Ravalli County - Yields were very good this year on the Bailey Farm, yet a little lower than the 1982 season. No varieties were significantly different from Ingrid with the high reading being 118.1 bu/a and the mean was 105.7 bu/a. Test weights were low for this location and six varieties had significantly lower readings from Ingrid. These lower than normal test weights and percent plumps were a reflection of the moderate to severe lodging experienced in the study. This nursery was also harvested later in the season than is desireable.

Sanders County - Good yields were taken from the nursery at Paradise, with the high yield being 104.0 bu/a (Bridger-82). No varieties were significantly different from Ingrid which yielded 71.6 bu/a. The presence of moderate to severe lodging accounts for low test weights ($\bar{x}$ = 45.2 lbs/bu) and less than adequate percent plumps ($\bar{x}$ = 79.5%).

A Kalispell location summary for the off station nursery varieties is given in Table 7. Considering western Montana the varieties that performed well were MT 547123, Karla, Menuet, Bridger-82 and Klages.

SPRING BARLEY VARIETIES

SPRING BARLEY VARIETIES RECOMMENDED FOR WESTERN MONTANA

Six-row Type

1. Steptoe - dryland and irrisated
2. Horsford - dryland
3. Stepford - dryland and irrisated
4. Karla - irrisated or hish moisture

Two-row Type

5. Piroline - dryland and irrisated
6. Purcell - dryland
7. Summit - dryland and irrisated
8. Georsie - irrisated and hish rainfall
9. Insrid - irrisated
10. Lud - irrisated
11. Ershabet - dryland or irrisated
12. Menuet - hish rainfall or irrisated
13. Ridawn - dryland or irrisated
14. Clark - dryland feed barley with maltins potential under irrisation
15. Bridser 82 - irrisated or hish moisture
16. Lewis - dryland feed barley with maltins potential under irrisation
17. Gallatin - dryland or irrisated
18. Piston - irrisated

CHARACTERISTICS OF RECOMMENDED VARIETIES

1. Steptoe
   a. Six-row
   b. Hish yieldins ability
   c. Good lodsins resistance
   d. Early maturity
   e. Dryland or irrisated
   f. Larse kernal size
   s. Low test weisht

2. Horsford
   a. Six-row
   b. Low srain yieldins ability - primarily used for hay
   c. Good lodsins resistance
   d. Early maturity
   e. Dryland
   f. Medium kernal size
   s. Moderate test weisht

Recommended Spring Barley Varieties (cont'd)

3. Stepford

a. Adapted for hay production only
b. Hooded six-row
c. Large kernal size
d. Susceptible to stem rust

4. Karla

a. Six row type
b. High yielding ability
c. Very good lodging resistance
d. Early maturity
e. dryland or irrigated
f. Good shattering resistance
g. Moderate test weight

5. Piroline

a. Two-row
b. High yielding ability
c. Good lodging resistance
d. Mid-season maturity
e. Dryland or irrigated
f. Good kernal size
g. Good test weight

6. Purcell

a. Two-row
b. High yielding ability
c. Good lodging resistance
d. Mid-season maturity
e. Dryland
f. Large kernal size
g. Good test weight

7. Summit

a. Two-row
b. High yielding ability
c. Good lodging resistance
d. Mid-season maturity
e. Dryland or irrigated
f. Large kernal size
g. Good test weight

Recommended Spring Barley Varieties (cont'd)

8. Georgie
   - a. Two-row
   - b. High yielding ability
   - c. Good lodging resistance
   - d. Late maturity
   - e. Irrigated
   - f. Large kernal size
   - g. Good test weight

9. Ingrid
   - a. Two-row
   - b. High yielding ability
   - c. Good lodging resistance
   - d. Late maturity
   - e. Irrigated
   - f. Large kernal size
   - g. Good test weight

10. Lud
    - a. Two-row
    - b. High yielding ability
    - c. Good lodging resistance
    - d. Late maturity
    - e. Irrigated
    - f. Large kernal size
    - g. Good test weight

11. Ershabet
    - a. Two-row
    - b. High yielding ability
    - c. Fair lodging resistance
    - d. Mid-season maturity
    - e. Irrigated or dryland
    - f. Good test weight

12. Menuet
    - a. Two-row
    - b. High yielding ability
    - c. Good lodging resistance
    - d. Late maturity
    - e. High rainfall or irrigated
    - f. Medium kernal size
    - g. Good test weight
    - f. Susceptible to leaf rust and scald

13. Ridawn

a. Two-row
b. Adapted for hay production
c. Good yielding ability
d. Dryland or irrigated

14. Clark

a. Two-row
b. Dryland feed barley with malting potential under irrigation
c. High yielding ability
d. Moderate resistance to leaf spot and net blotch
e. Mid-season maturity
f. Good lodging resistance
g. Mid-size kernal

15. Bridger-82

a. Two-row type
b. High yielding ability
c. Good lodging resistance
d. Mid-season maturity
e. High moisture or irrigated
f. Good test wiesht

16. Lewis

a. Two-row type
b. Dryland feed barley with malting potential under irrigation
c. High yielding potential
d. Excellant straw strength
e. Mid-season maturity
f. Good lodging resistance
g. Good test weight

17. Gallatin

a. Two-row type
b. Feed barley potential
c. High yielding ability
d. Excellant strength
e. Early to mid season maturity
f. Good lodging resistance

18. Piston

a. Two-row type
b. High yielding potential under irrigation or high moisture
c. Good test weight
d. Mid-season maturity
e. Good lodging resistance
f. Susceptible to leaf scald

Table __1__. Agronomic data from the Dryland Intrastate Barley Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT, 1983. Field No. A-2, randomized block design , for replications. Size of plot: 32 sq. ft.

Date seeded: April 7, 1983 Date harvested: August 25,1983

	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEADING DATE	HEIGTH INCHES	% PLUMP	SCALD2/ % PLOT	SCALD2/ % LEAF
CI 15229	STEPTOE	124.86a	44.20b	166.00b	28.64	91.75a	.00b	.00
MT657399	STEPTOE/KLAGES	118.12a	46.23b	173.00a	33.27a	85.50a	.00b	.00
VD 23878	ANDANTE	117.56a	50.87a	172.25a	30.31	86.00a	57.50	31.25
NA 8	LINDY	116.53a	43.98b	166.00b	27.26	91.25a	.00b	.00
MT853320	HPN/UIT//UNION/Bz	115.67	47.45	169.00	34.74a	92.50a	12.50b	2.50
MT547123	HECTOR/KLAGES	112.98	49.27	171.25	31.20a	79.00	64.50	7.50
MT853287	HPN/UIT//FAIRFIELD	112.41	48.58	170.50	34.25a	90.50a	30.00	7.50
WP 1020	MT BLEND 1020	112.05	44.52b	166.75b	26.38	91.50a	.00b	.00
MT 41549	MT 547125/WA903775	111.81	49.15	169.50	33.86a	76.50	30.00	16.25
MT 41918	FAIRFIELD/HECTOR/KLA	111.75	48.45	171.50	30.61a	81.00a	43.50	13.75
CI 10421	UNITAN	111.25	44.70b	168.00	31.00a	91.50a	.00b	.00
VD 3	MENUET	111.23	50.20a	172.75a	28.35	90.75a	95.75	26.25
CI 15860	KARLA	111.05	46.00b	169.00	31.00a	83.50a	69.50	32.50
CI 15514	HECTOR	109.75	49.13	171.25	31.79a	79.50	.00b	.00
CI 15856	LEWIS	109.52	49.85a	171.75	30.12	81.25a	32.25	5.00
MT 4126	KIMBERLY//HECTOR/KLA	109.16	47.95	172.00a	27.36	74.75	67.25	15.00
MT853231	HPN/UIT//HECTOR	107.41	48.52	167.75	29.33	91.25a	22.50b	3.75
MT853284	HPN/UIT//FAIRFIELD	107.25	49.10	164.50b	30.12	89.50a	.00b	.00
CI 15865	AZURE	107.22	45.27b	168.25	31.99a	92.75a	25.00	10.00
MT312526	SUMMIT/HECTOR	107.02	49.85a	170.75	32.48a	81.50a	24.75b	7.50
BA 7937	BA 7937	106.69	47.70	175.25a	34.45a	83.00a	57.50	7.50
MT312492	SUMMIT/HECTOR	106.03	50.77a	170.25	31.30a	89.00a	72.00	25.00
WP 601	GUSTO	105.81	45.15b	171.00	19.49b	88.00a	7.50b	1.25
>MT313104	SUMMIT/HECTOR	104.27	49.80a	169.00	30.61a	83.00a	92.00	31.25
FM 1	TRIUMPH	103.77	48.98	175.00a	28.05	86.50a	32.25	16.25
NA 12	BRIDGER 82	102.69	49.30	173.75a	31.10a	87.75a	97.00	37.50
MT 41279	KIMBERLY/MT547143	102.31	48.55	170.50	28.05	84.00a	32.25	16.25
MT312613	SUMMIT/HECTOR	102.12	49.23	168.25	31.59a	83.50a	18.75b	3.75
CI 15478	KLAGES	101.44	48.88	172.50a	31.89a	86.75a	47.25	15.00
ES 13	SHORT BETZES	101.09	47.77	173.50a	27.07	75.00	92.25	23.75
MN 36	ROBUST	100.41	47.52	166.50b	30.22	94.75a	41.00	18.75
CI 16181	PURCELL 1/	99.94	48.20	169.75	28.05	75.75	73.25	28.75

02

Table 1. Intrastate Spring Barley (cont'd)

	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEADING DATE	HEIGTH INCHES	% PLUMP	SCALD2/ % PLOT	SCALD2/ % LEAF
VD 6779	VDH 067-79	99.34	49.83a	173.00a	26.18	89.75a	.00b	.00
VD 22872	PISTON	99.14	49.35	171.75	29.63	81.25a	97.00	27.50
VD 21778	BTT/ARAMIR//UNIVERSE	98.56	50.15a	173.25a	28.74	95.25a	87.25	35.00
TR 604	ABEE	98.14	50.58a	174.50a	30.91a	86.75a	62.25	12.50
MT731286	KLAGES/SUMMIT	97.12	48.70	170.75	30.51a	81.00a	24.75b	18.75
CI 9558	PIROLINE	96.80	49.55a	169.75	30.12	81.75a	94.25	33.75
SK 76333	HARRINGTON	96.12	47.88	171.25	30.41	82.00a	72.25	28.75
NA 18	NA 18	96.05	48.37	174.50a	31.69a	90.75a	67.50	15.00
WP 63	GUS	96.02	44.77b	168.75	22.05b	89.00a	24.75b	12.50
CB 2	BELLONA	95.73	51.33a	175.00a	29.04	91.00a	92.00	50.00
MT 41238	MT 547316/WA903775	95.14	49.27	168.75	30.71a	81.75a	43.50	15.00
CI 15857	CLARK	94.92	49.08	172.50a	31.89a	82.75a	92.00	17.50
MT853345	HPN/UIT//SUMMIT	94.80	45.45b	164.00b	28.15	82.00a	18.75b	2.50
VD 31578	VDH 315-78	94.75	49.40	169.50	26.57	90.25a	98.00	30.00
CI 10063	INGRID	93.59	50.02a	172.75a	29.82	84.50a	48.50	11.25
BA 80350	BA 80350	93.55	49.85a	174.75a	32.58a	75.00	68.50	16.25
VD 13078	CANOVA/MENUET	93.42	49.77a	171.00	29.04	85.75a	98.00	61.25
WP 501	WESTBRED 501	92.97	46.80b	169.50	18.90b	94.00a	.00b	.00
BA 79533	BA 79533	92.77	48.47	175.00a	32.28a	80.25a	22.50b	2.50
MT 729	SUMMIT	92.67	49.05	172.00a	31.59a	87.00a	97.00	32.50
CI 15769	GLENN	92.16	45.08b	167.75	31.59a	93.50a	27.50	3.75
CI 15773	MOREX	89.59	47.77	166.50b	33.66a	93.50a	22.50b	8.75
CB 1	APEX	83.86b	49.98a	173.00a	25.30b	85.25a	98.00	57.50
ES 12	OPAQUE GLENN	76.67b	40.05b	167.25b	27.95	90.25a	47.25	17.50
	X	102.41	48.18	170.60	29.74	85.95	47.18	18.95
	F 3/	2.58**	23.56**	13.95**	13.53**	13.32**	3.81**	1.41*
	S.E.X.	5.73	.46	.75	.86	1.51	17.46	22.40
	L.S.D.(.05)	16.01	1.30	2.10	2.42	4.22	48.75	62.55
	C.V. %	5.60	.96	.44	2.91	1.76	37.01	118.20

1/ Check variety

2/ Scald (Rynchosporium secalis), amount disease observed per plot and amount leaf area infected with disease

3/ F value for variety comparison

a/ Values significantly greater than the check at the .05 level

b/ Values significantly less than the check at the .05 level

* Indicates statistical significance at the .05 level

** Indicates statistical significance at the .01 level

Table 1. Intrastate Spring Barley (cont'd)

	VARIETY	% LODG.	LODG. SEVER.	LEAF SP 2/ % PLOT	LEAF SP 2/ % LEAF
CI 15229	STEPTOE	.00	.00	93.25a	26.25a
MT657399	STEPTOE/KLAGES	.00	.00	61.25	6.25
VD 23878	ANDANTE	.00	.00	37.50	3.75
NA 8	LINDY	.00	.00a	98.00a	25.00a
MT853320	HPN/UIT//UNION/Bz	20.00a	2.00	65.00a	5.00
MT547123	HECTOR/KLAGES	.00	.00	12.50	1.25
MT853287	HPN/UIT//FAIRFIELD	.00	.00	52.25	8.75
WP 1020	MT BLEND 1020	.00	.00	92.00a	13.75
MT 41549	MT 547125/WA903775	12.50	.50	68.50a	10.00
MT 41918	FAIRFIELD/HECTOR/KLA	.00	.00	35.00	3.75
CI 10421	UNITAN	.00	.00	88.25a	11.25
VD 3	MENUET	.00	.00	.00	.00
CI 15860	KARLA	.00	.00	22.50	2.50
CI 15514	HECTOR	2.50	.75	67.25a	8.75
CI 15856	LEWIS	.00	.00	62.50	7.50
MT 4126	KIMBERLY//HECTOR/KLA	3.75	.75	23.75	2.50
MT853231	HPN/UIT//HECTOR	.00	.00	66.25a	7.50
MT853284	HPN/UIT//FAIRFIELD	.00	.00	85.00a	6.25
CI 15865	AZURE	.00	.00	53.75	5.00
MT312526	SUMMIT/HECTOR	.00	.00	69.50a	27.50a
BA 7937	BA 7937	22.50a	2.25a	20.00	1.25
MT312492	SUMMIT/HECTOR	5.00	.50	20.00	1.25
WP 601	GUSTO	.00	.00	86.00a	12.50
MT313104	SUMMIT/HECTOR	.00	.00	48.50	16.25a
FM 1	TRIUMPH	.00	.00	73.25a	41.25a
NA 12	BRIDGER 82	.00	.00	.00	.00
MT 41279	KIMBERLY/MT547143	.00	.00	62.50	8.75
MT312613	SUMMIT/HECTOR	.00	.00	94.50a	28.75a
CI 15478	KLAGES	7.50	1.00	38.75	7.50
ES 13	SHORT BETZES	.00	.00	.00	.00
MN 36	ROBUST	.00	.00	97.00a	21.25a
CI 16181	PURCELL 1/	.00	.00	18.75	2.50
VD 6779	VDH 067-79	.00	.00	77.50a	8.75
VD 22872	PISTON	.00	.00	.00	.00
VD 21778	BTT/ARAMIR//UNIVERSE	.00	.00	.00	.00
TR 604	ABEE	.00	.00	30.00	2.50

Table 1. Intrastate Spring Barley (cont'd)

	VARIETY	% LODG.	LODG. SEVER.	LEAF SP 2/ % PLOT	LEAF SP 2/ % LEAF
MT731286	KLAGES/SUMMIT	.00	.00	65.00a	11.25
CI 9558	PIROLINE	12.50	2.00a	.00	.00
SK 76333	HARRINGTON	18.75a	1.00	17.50	1.25
NA 18	NA 18	.00	.00	22.50	2.50
WP 63	GUS	.00	.00	63.75	6.25
CB 2	BELLONA	.00	.00	.00	.00
MT 41238	MT 547316/WA903775	.00	.00	71.00a	15.00
CI 15857	CLARK	.00	.00	.00	.00
MT853345	HPN/UIT//SUMMIT	.00	.00	72.25a	12.50
VD 31578	VDH 315-78	.00	.00	.00	.00
CI 10083	INGRID	.00	.00	41.25	6.25
BA 80350	BA 80350	.00	.00	22.50	3.75
VD 13078	CANOVA/MENUET	.00	.00	.00	.00
WP. 501	WESTBRED 501	.00	.00	77.50	8.75
BA 79533	BA 79533	.00	.00	52.50	6.25
MT 729	SUMMIT	.00	.00	.00	.00
CI 15769	GLENN	.00	.00	67.25a	8.75
CI 15773	MOREX	.00	.00	99.00a	28.75a
CB 1	APEX	.00	.00	.00	.00
ES 12	OPAQUE GLENN	.00	.00	38.75	6.25
	$\bar{X}$	1.87	.19	45.21	8.08
	F 3/	1.10	1.13	4.05**	3.87**
	S.E.X.	4.94	.48	16.45	4.63
	L.S.D. (.05)	13.80	1.35	45.93	12.92
	C.V. %	263.55	252.53	36.38	57.27

1/ Check variety
2/ Leaf spot (Septoria spp.) , percent of plot and percent leaf area infected respectively
3/ F value for variety comparison
b/ Values significantly less than the check at the .05 level
** Indicates statistical significance at the .01 level

Table 2. Ten year summary of yields for the spring dryland intrastate barley nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT 1973-1983 (no data for 1980).

CI or State No.	Variety	1973	1974	1975	1976	1977	1978	1979	1981	1982	1983	$\bar{X}$	Sta. Yrs.	% Piroline
CI 10421	Unitan	62.1	75.2	62.9	101.9	55.6	94.5	73.4	90.0	66.6	111.3	79.4	10	106
CI 9558	Piroline	61.8	87.1	61.2	80.8	61.9	88.1	67.5	75.4	64.8	96.8	74.5	10	100
CI 15514	Hector	59.4	80.8	52.1	78.5	57.1	91.4	64.9	90.4	88.1	109.8	77.3	10	104
CI 15229	Steptoe	69.1	83.2	69.0	105.8	68.1	96.6	74.7	131.0	94.6	124.9	79.2	10	106
MT 729	Summit	62.9	77.8	44.6	93.3	67.6	86.3	78.5	76.9	85.8	92.7	76.6	10	103
CI 15478	Klages	62.1	82.2	51.0	96.0	63.1	93.4	71.5	83.1	87.2	101.4	69.0	10	93
CI 10083	Ingrid	53.6	82.0	45.4	83.5	62.3	86.6	65.2	79.1	87.6	93.6	74.0	10	99
CI 16181	Purcell				82.0	65.4	88.9	76.9	87.7	85.8	99.9	83.8	7	110
VB 3	Menuet					64.3	87.4	63.5	88.5	79.7	111.2	81.9	6	108
VB 22872	Piston						89.8	71.8	88.0	79.1	99.1	85.6	5	109
CI 15773	Morex						83.8	64.8	79.8	83.6	89.6	80.3	5	102
MT 547123	Hector/Klages							69.7	92.1	93.7	113.0	92.1	4	121
CI 15857	Clark							65.7	82.7	86.9	94.9	82.6	4	108
MT 853320	HPN/UIT/Union/BZ								97.0	81.2	115.7	98.0	3	124
NA 12	Bridger 82 (NA 12)								91.2	82.9	102.7	92.3	3	117
MT 657399	Steptoe/Klages F6								89.2	82.2	118.1	96.5	3	122
MT 313104	Summit/Hector								84.9	87.5	104.3	92.2	3	117
CI 15860	Karla (ID 4302)								78.7	84.8	111.1	91.5	3	116
FM 1	Triumph									93.1	103.8	98.5	2	122
WP 1020	Mont Blend 1020									89.4	112.1	100.9	2	125
MT 41279	Kimberly/Mt547143									89.0	102.3	95.7	2	118
MT 853231	HPN/UIT//HCR									88.9	107.4	98.2	2	121
VB 13078	Canova/Menuet									85.0	93.4	89.2	2	110
WP 501	WP 501									83.5	93.0	88.3	2	109
CI 15865	Azure									83.0	107.2	95.1	2	116
MT 853284	HPN/UIT//FLD									80.0	107.3	93.7	2	116
WF 63	Gus									79.6	96.0	87.8	2	109
VB 21778	BTT/Aramir//UNIVER.									78.0	98.6	88.3	2	109
VB 23878	Adante									77.0	117.6	97.3	2	129
MT 853345	HPN/UIT//SMT									70.5	94.8	82.7	2	102
NA 8	Lindy										116.5	116.5	1	120
MT 853287	HPN/UIT//Fairfield										112.4	112.4	1	116
MT 41549	MT 547125/WA 903775										111.8	111.8	1	115
MT 41918	Fairfield/Hector/Klages										111.8	111.8	1	115
CI 15856	Lewis										109.5	109.5	1	113
MT 4126	Kimberly//Hector/Klages										109.2	109.2	1	113
MT 312526	Summit/Hector										107.0	107.0	1	111

Table 2. (cont'd) Ten year summary of yields for the spring dryland intrastate barley nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT 1973-1983 (no data for 1980).

CI or State No.	Variety	1973	1974	1975	1976	1977	1978	1979	1981	1982	1983	X	Sta. Yrs.	% Piroline
BA 7937	BA 7937										107.0	107.0	1	111
MT 312492	Summit/Hector										106.0	106.0	1	110
WF 601	Gusto										105.8	105.8	1	109
MT 312613	Summit/Hector										102.1	102.1	1	105
ES 13	Short Betzes										101.1	101.1	1	104
MN 36	Robust										100.4	100.4	1	104
VD 6779	VDH 067-79										99.3	99.3	1	103
TR 60X	Abee										98.1	98.1	1	101
MT 731286	Klages/Summit										97.1	97.1	1	100
SK 76333	Harrington										96.1	96.1	1	99
NA 18	NA 18										96.1	96.1	1	99
CB 2	Bellona										95.7	95.7	1	99
MT 41238	MT 547316/WA 903775										95.1	95.1	1	98
VD 31578	VDH 315-78										94.8	94.8	1	98
BA 80350	BA 80350										93.6	93.6	1	97
CI 15769	Glenn										92.2	92.2	1	95
CB 1	Apex										83.9	83.9	1	87
ES 12	Opaque Glenn										76.7	76.7	1	79

Table 3. Agronomic data from the Offstation Spring Barley Nursery grown in Missoula County on the Rodney Vannoy farm, Greenough, MT. in 1983. Random block design, four replications. Plot size: 32 sq. ft.

Date planted: May 3, 1983 Date harvested: September 12,1983

	VARIETY		YIELD BU/A	TEST WT LBS/BU	HEIGTH INCHES	% PLUMP	LODG. SEVER. 2/	LODG. % 2/
NA 12	BRIDGER 82		79.52a	46.33	28.54	80.75	1.75	26.25
CI 9558	PIROLINE		70.75a	47.55a	34.55	81.00	2.75	45.00
SK 76333	HARRINGTON		69.14	44.60	31.40	80.25	2.50	48.75
MT 729	SUMMIT		65.22	46.85	31.59	74.25	1.00	12.50
VD 22872	PISTON		64.52	45.87	27.76	74.00	1.00	25.00
CI 16181	PURCELL		60.84	44.85	32.48	72.75	2.00	25.00
MT547123	HECTOR/KLAGES		60.70	46.75	29.82	85.00	.75	6.25
VD 3	MENUET		59.41	46.55	29.92	84.75	.00	.00
CI 15857	CLARK		58.50	44.80	31.50	76.75	2.50	46.25
CI 15478	KLAGES		58.30	41.83b	34.25	56.50b	2.00	30.00
CI 15769	GLENN		55.58	41.83b	24.70	74.00	4.00	67.50
CI 10083	INGRID	1/	55.27	45.90	31.40	76.00	1.00	22.50
CI 15514	HECTOR		53.97	45.58	34.35	78.00	4.25a	40.00
CI 15773	MOREX		51.44	43.60b	33.86	79.00	3.75	50.00
MN 36	ROBUST		49.22	44.45	33.37	85.50	4.25a	63.75
CI 15860	KARLA		47.80	42.73b	34.06	74.75	5.75a	65.00
	X		60.01	45.00	31.47	77.08	2.45	35.86
	F 3/		2.53**	10.32**	1.52	2.57**	2.01**	1.42
	S.E.X.		5.26	.55	2.25	4.30	1.12	17.39
	L.S.D.		14.99	1.57	6.41	12.24	3.18	49.52
	C.V. %		8.77	1.22	7.15	5.57	45.57	48.48

1/ Check variety

2/ Lodging notes: severity rated on 0-10 scale, 0 = no lodging , 10 = lodged heavy
lodging % = percent of plot lodged

3/ F value for variety comparisons

* Indicates statistical significance at the .05 level

** Indicates statistical significance at the .01 level

a/ Values significantly greater than the check at the .05 level

b/ Values significantly less than the check at the .05 level

Table 4. Agronomic data from the Offstation Spring Barley Nursery grown in Ravalli County on the Bob Bailey farm, Corvallis, MT. in 1983. Random block design, four replications. Plot size: 32 sq. ft.

Date planted: April 13, 1983 Date harvested: September 12,1983

	VARIETY	YIELD BU/A	TEST WT BU/A	HEIGTH INCHES	% PLUMP	LODG. SEVER. 2/	LODG. % 2/
MT547123	HECTOR/KLAGES	118.06	49.80	35.93	94.50a	3.25	73.75
CI 15478	KLAGES	115.00	48.50	40.35	91.25	3.25	71.25
VD 3	MENUET	113.61	50.02	37.30	95.00a	2.75	47.50
NA 12	BRIDGER 82	112.11	48.05b	35.04b	87.00	6.75a	87.50a
VD 22872	PISTON	111.16	48.80	35.93	82.50b	6.50	88.75a
CI 15514	HECTOR	110.91	49.17	40.94	90.25	6.50	91.25a
CI 15773	MOREX	110.31	45.97b	42.13a	94.50a	5.00	95.00a
CI 9558	PIROLINE	107.73	49.58	38.78	92.00	6.50	92.50a
CI 16181	PURCELL	106.72	48.58	35.04b	90.25	7.00a	91.25a
CI 15857	CLARK	105.59	46.77b	40.16	88.25	6.50	96.00a
SK 76333	HARRINGTON	102.73	46.90b	37.70	87.25	6.50	93.75a
CI 10083	INGRID 1/	100.08	49.27	38.39	88.00	4.50	62.50
CI 15769	GLENN	98.30	44.18b	38.39	91.75	5.00	91.25a
CI 15860	KARLA	96.80	44.87b	40.65	87.25	4.25	73.75
MT 729	SUMMIT	94.66	49.45	37.60	89.50	3.25	71.25
MN 36	ROBUST	87.12	47.98	43.01a	94.00a	4.50	70.00
	$\bar{X}$	105.68	47.99	38.58	90.20	5.13	81.08
	F 3/	1.42	30.10**	6.46**	5.32**	3.67**	2.79**
	S.E.X.	7.07	.32	.97	1.49	.78	8.49
	L.S.D.	20.13	.92	2.75	4.25	2.22	24.19
	C.V.%	6.69	.67	2.50	1.65	15.18	10.47

1/ Check variety

2/ Lodging notes: severity rated on 0-10 scale, 0 = no lodging , 10 = lodged heavy
lodging % = percent of plot lodged

3/ F value for variety comparisons

* Indicates statistical significance at the .05 level

** Indicates statistical significance at the .01 level

a/ Values significantly greater than the check at the .05 level

b/ Values significantly less than the check at the .05 level

Table 5. Agronomic data from the Offstation Spring Barley Nursery grown in Lake County on the Leroy Lake farm, Ronan, MT. in 1983. Random block design, four replications. Plot size: 32 sq. ft.

Date planted: April 13, 1983 Date harvested: August 29,1983

	VARIETY		YIELD BU/A	TEST WT BU/A	HEIGTH INCHES	% PLUMP	LODG. SEVER. 2/	LODG. % 2/
MT547123	HECTOR/KLAGES		108.94a	48.60	32.18	70.75	5.25	51.25
CI 15478	KLAGES		108.83a	46.50b	35.24a	65.00	4.75	67.25
NA 12	BRIDGER 82		106.34	47.35b	31.99	70.00	6.00	91.25a
VD 3	MENUET		104.23	49.05	30.51	74.75	6.25	41.25
MT 729	SUMMIT		101.08	48.35	33.27	57.25b	6.25	76.25
SK 76333	HARRINGTON		99.36	46.17b	32.58	66.25	7.25	85.75
CI 16181	PURCELL		99.16	46.65b	32.38	50.00b	8.25	96.00a
CI 15514	HECTOR		96.95	47.92	32.68	73.00	6.25	66.25
CI 9558	PIROLINE		96.92	47.95	34.94a	61.75	7.00	91.25a
VD 22872	PISTON		96.03	48.77	29.72	68.75	6.25	73.75
MN 36	ROBUST		95.75	48.45	34.25	81.25a	4.25	42.50
CI 15773	MOREX		95.13	46.92b	36.22a	79.50a	4.50	88.75a
CI 10083	INGRID	1/	94.86	48.73	31.79	67.50	5.25	58.75
CI 15857	CLARK		90.95	46.87b	34.74a	73.50	6.75	95.75a
CI 15860	KARLA		88.70	42.30b	31.69	63.00	2.75	10.00b
CI 15769	GLENN		87.42	44.85b	33.07	78.25a	7.00	86.25a
	$\bar{X}$		98.17	47.22	32.95	68.78	5.87	70.14
	F 3/		2.04*	24.29**	3.48**	8.30**	1.64	6.35**
	S.E.X.		4.52	.35	.94	2.88	1.06	9.63
	L.S.D.		12.89	1.01	2.68	8.20	3.03	27.44
	C.V. %		4.61	.75	2.86	4.19	18.10	13.73

1/ Check variety
2/ Lodging notes: severity rated on 0-10 scale, 0 = no lodging , 10 = lodged heavy
lodging % = percent of plot lodged
3/ F value for variety comparisons
* Indicates statistical significance at the .05 level
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

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Table 6. Agronomic data from the Offstation Spring Barley Nursery grown in Sanders County on the Norm Hermes farm, Paradise MT. in 1983. Random block design, four replications. Plot size: .32 sq. ft.

Date planted: April 28, 1983 Date harvested: September 13,1983

	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEIGTH INCHES	% PLUMP	LODG. SEVER. 2/	LODG. % 2/
MA 12	BRIDGER 82	103.95	45.02	35.14	77.75	5.25	60.00
CI 16181	PURCELL	96.61	44.65	36.42	75.50	5.50	77.50
CI 15478	KLAGES	91.44	44.80	37.20	74.75	3.50	52.50
VB 22872	PISTON	90.73	46.55a	35.33	76.00	6.25	70.00
CI 15773	MOREX	89.80	44.95	38.09	86.75a	8.25a	92.50a
MN 36	ROBUST	87.75	46.05	39.57a	86.25a	8.50a	93.75a
CI 15857	CLARK	86.31	45.40	37.80	80.25a	5.25	88.75
CI 9558	PIROLINE	84.87	45.50	37.40	80.50a	5.50	85.00
SM 76333	HARRINGTON	84.14	44.40	38.78	76.25	4.25	76.25
VB 3	MENUET	83.80	46.93a	36.12	86.75a	5.00	51.25
MT 729	SUMMIT	80.62	45.43	36.71	72.00	4.75	67.50
CI 15514	HECTOR	77.81	46.27	38.39	82.75a	5.75	78.75
MT547123	HECTOR/KLAGES	76.70	46.80a	35.83	82.50a	6.00	67.50
CI 15860	KARLA	74.45	42.93b	37.99	74.00	6.25	47.50
CI 10083	INGRID 1/	71.64	45.20	36.71	74.50	3.75	57.50
CI 15769	GLENN	62.94	42.10b	36.52	85.50a	9.00a	88.75
	$\bar{X}$	83.97	45.19	37.12	79.50	5.80	72.19
	F 3/	1.61	9.07**	1.79	8.01**	2.40*	1.85*
	S.E.X.	7.88	.43	.94	1.79	1.03	11.27
	L.S.D.	22.44	1.23	2.67	5.09	2.94	32.10
	C.V. %	9.38	.96	2.53	2.25	17.81	15.61

1/ Check variety
2/ Lodging notes: severity rated on 0-10 scale, 0 = no lodging , 10 = lodged heavy
lodging % = percent of plot lodged
3/ F value for variety comparisons
* Indicates statistical significance at the .05 level
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

Table 7. Agronomic data from the Intrastate Spring Barley Nursery grown in Flathead County on the NWARC, Kalispell, MT. in 1983. Random block design, four replications. Plot size: 32 sq. ft.

Date planted: April 7, 1983 Date harvested: August 25,1983

	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEIGTH INCHES	% PLUMP	LODG. SEVER. 2/	LODG. % 2/
NA 12	BRIDGER 82	102.69	49.30	31.10	87.75	.00	.00
CI 16181	PURCELL	99.94	48.20b	28.05	75.75b	.00	.00
CI 15478	KLAGES	101.44	48.88	31.89	86.75	1.00	7.50
VD 22872	PISTON	99.14	49.35	29.63	81.25	.00	.00
CI 15773	MOREX	89.59	47.77b	33.66a	93.50a	.00	.00
MN 36	ROBUST	100.41	47.52b	30.22	94.75a	.00	.00
CI 15857	CLARK	94.92	49.08	31.89	82.75	.00	.00
CI 9558	PIROLINE	96.80	49.55	30.12	81.75	2.00	12.50
SK 76333	HARRINGTON	96.12	47.88b	30.41	82.00	1.00	18.75
VD 3	MENUET	111.23	50.20	28.35	90.75a	.00	.00
MT 729	SUMMIT	92.67	49.50	31.59	87.00	.00	.00
CI 15514	HECTOR	109.75	49.13	31.79	79.50b	.75	2.50
MT547123	HECTOR/KLAGES	112.98	49.27	31.20	79.00b	.00	.00
CI 15860	KARLA	111.05	46.00b	31.00	83.50	.00	.00
CI 10083	INGRID 1/	93.59	50.02	29.82	84.50	.00	.00
CI 15769	GLENN	92.16	45.08b	31.59	93.50a	.00	.00
	$\bar{X}$	102.41	48.18	29.74	85.95	1.87	.19
	F 3/	2.58**	23.56**	13.53**	13.32**	1.10	1.13
	S.E.X.	5.73	.46	.86	1.51	4.94	.48
	L.S.D.	16.01	1.30	2.42	4.22	13.80	1.35
	C.V. %	5.60	.96	2.91	1.76	63.55	52.53

1/ Check variety
2/ Lodging notes: severity rated on 0-10 scale, 0 = no lodging , 10 = lodged heavy
lodging % = percent of plot lodged
3/ F value for variety comparisons
* Indicates statistical significance at the .05 level
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

TITLE: Spring Oats

PERSONNEL: Vern R. Stewart and Todd K. Keener
Cooperators - Feed Crops Committee, MAES, MSU
USDA-ARS

SUMMARY:

High winds and heavy rains caused severe lodging in the spring oat nursery again this year preventing harvest of yields. Ogle was the most resistant to lodging and was an early heading variety.

INTRODUCTION:

In an effort to determine the adaptability of new and introduced oat varieties to western Montana the Northwestern Uniform nursery has been grown in Kalispell for many years. Results from this nursery, accumulated over several years, are used in making oat variety recommendations.

RESULTS:

Again this year yields were lost to severe lodging. Five varieties headed earlier than Otana, the check variety (significantly different when compared in analysis). These varieties were Ogle, ID 766843, Random, NY 6083-21, and ID 783965. Later than Otana in heading, and differing significantly were Park, WA 6394 and Appaloosa.

Cascade was the tallest variety (56.8 inches) yet was not significantly taller than Otana. Six varieties were significantly shorter than Otana (Table 1).

Ogle was the only variety where lodging did not exceed 99% and was significantly less than in Otana.

SPRING OAT VARIETIES

SPRING OAT VARIETIES RECOMMENDED FOR WESTERN MONTANA

1. Cayuse - irrisated or dryland
2. Park - irrisated or hish moisture conditions
3. Basin - dryland
4. Otana - irrisated or hish moisture conditions
5. Border - irrisated
6. Monida - irrisated and dryland

CHARACTERISTICS OF RECOMMENDED VARIETIES

1. Cayuse

   a. Pale sreen plant color, yellow kernals at maturity, developed in New York
   b. Hish yieldins ablility
   c. Low test weisht
   d. Maturity - early to mid-season
   e. Very sood straw strensth
   f. Resistant to Victoria blisht and Helminthosporium blisht
   s. Tolerant to 'red leaf' disease of oats

2. Park

   a. White, plump, short kernals, developed by Idaho and Montana
   b. Hish yieldins ability
   c. Hish test weisht
   d. Maturity - mid-season
   e. Strons straw strensth
   f. Susceptible to Victoria blisht
   s. Resistant to prevalent stem rust races

3. Basin

   a. White, short, plump kernals, with occassional weak awns, developed in Montana
   b. Hish yieldins ability
   c. Hish test weisht
   d. Maturity - mid-season
   e. Strons straw strensth
   f. Resistant to loose and covered smut
   s. Resistant to most common stem rust races (not to races 7 and 7a)
   h. Excellant oat for combinins

Recommended Oat Varieties (cont'd)

4. Otana

a. Kernal white and plump
b. Dark blue-green foliage
c. High yielding
d. Excellant test weight
e. Medium to strong straw
f. Maturity mid-season
g. Resistant to Victoria blight

5. Border

a. Kernal white and plump
b. High yielding ability
c. Good straw strength
d. Good test weight
e. Mid-season maturity
f. Protein levels equal to Cayuse
g. Susceptible to red leaf

6. Monida

a. Kernal white and plump
b. High yielding ability
c. Good straw strength
d. Good test weight
e. Mid season maturity
f. Good protein levels

Table 1 Agronomic data from the Uniform Northwestern States Oat Nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT. in 1983. Field Y-5

Date seeded: April 18,1983 No harvest taken

	VARIETY	HEADING DATE	HEIGTH INCHES	LODGING %	1/ SEV.
WA 6159	CI 2874/CAYUSE	182.7	52.5	99.0	9.0
OT 308	S 7886	181.0	56.7	99.0	9.0
W 76121	FIDLER	182.0	53.3	99.0	9.0
CI 9266	CORBIT	182.7	50.7	99.0	9.0
NE776131	PIERCE	181.7	52.0	99.0	9.0
CI 6611	PARK	183.0a	53.1	99.0	9.0
OT 307	S 7884	180.7	55.1	82.7	8.3
W 78286	DUMONT	180.0	54.7	99.0	9.0
CI 9081	RANDOM	177.0b	53.3	99.0	9.0
ID783965	AURORA NYCRR COM	178.3b	49.1b	99.0	9.0
ID742300	BORDER	181.7	50.0	99.0	9.0
P 0408E1	PORTER	180.3	50.4	99.0	9.0
ID742608	CAYUSE/OTANA	181.0	51.1	99.0	9.0
CI 9408	NY 6083-21	178.0b	48.4b	99.0	9.0
WA 6394	MINN. II-22-22-/	183.7a	48.4b	99.0	9.0
CI 8263	CAYUSE	181.0	50.8	99.0	9.0
CI 9263	MENOMINEE	180.7	55.8	99.0	9.0
OT 726	CASCADE	180.3	56.8	99.0	9.0
ID751170	CAYUSE/OTANA	179.7	52.4	99.0	9.0
CI 9297	APPALOOSA	183.7a	50.0	99.0	9.0
ID 75861	CAYUSE/OTANA	180.7	49.9	99.0	9.0
CI 9409	NY A-11	179.7	46.7b	99.0	9.0
CI 9252	OTANA	181.0	53.5	99.0	9.0
ID766843	K71299/3/OTANA/2	176.7b	44.5b	99.0	9.0
CI 9401	OGLE	175.0b	47.0b	38.0b	3.7b
	$\bar{X}$	180.5	130.7	95.9	8.8
	F 1/	7.068	4.059	3.254	6.15
	S.E.X.	.811	3.947	6.929	.431
	L.S.D.	2.306	11.22	19.70	1.226
	C.V. %	.449	3.02	7.22	4.92

1/ Lodging notes: % = percent of plot lodged, severity = angle of lodging 0 = no lodging, 9 = lodged to ground

2/ F value for variety comparison

a/ Indicates values significantly greater than the check at the .05 level

b/ Indicates values significantly less than the check at the .05 level

TITLE: Spring Wheat

PERSONNEL: Vern R. Stewart and Todd K. Keener
Cooperators: Wheat Research Committee, MAES, MSU
USDA-ARS
Montana Wheat Research & Marketing Comm.

SUMMARY:

Advanced Yield Trial - The varieties MT 8289, Ward and NK 2631 all yielded above 100 bu/a, showed low levels of Septoria infection and were resistant to leaf rust, powdery mildew and lodging.

Western Regional Nursery - Sixteen spring wheat varieties significantly out-yielded Owens, the check variety. Most of those varieties were resistant to both leaf rust and powdery mildew.

INTRODUCTION:

In an effort to continually test new and improved spring wheat varieties in western Montana variety nurseries are evaluated annually at the Northwestern Agricultural Research Center. These nurseries, through accumulated years of testing, are the proving grounds for all Montana recommended spring wheat varieties.

RESULTS:

Advanced Yield Trial - Five varieties yielded significantly greater than Newana, the check variety (77 bu/a), with three of those topping 100 bu/a (MT 8289, Ward and NK 2631). Five varieties also yielded significantly less than Newana, among those being Lew, Fortuna and Thatcher.

Test weights ranged from 46.5 to 57.1 lbs/bu. Fourteen varieties were significantly higher in test weight with Ward being the only variety with a significantly higher yield also. Test weights were slightly below normal due to foliar diseases.

Lodging was moderate to severe in seven varieties. Any variety with lodging percent or severity greater than 19% and 1.56 respectively was significantly different when compared to Newana, which had no lodging. As would be expected more severe lodging was seen in plots with low yields (Lew, Fortuna, Thatcher and MT 8043).

Heading dates varied by variety and since Newana heads a little later than most varieties there were thirty-one entries which were significantly different in heading (earlier).

Leaf rust was light throughout the trial yet five varieties showed moderate to severe suceptibility to that disease. Marberg, Thatcher, MT 8228 and MT 8043 were heavily infested with rust.

Septoria was prevalent in this study and was recorded in every variety. Four varieties showing a significantly less reaction to Septoria, as compared to Newana, were Ward, Crosby, Vic and Butte.

Results (con't)

Powdery mildew was very light this year. Owens showed the highest level of infection (significantly greater in comparison to Newana) of mildew with Waverly and MT 8286 showing moderate reactions.

Western Regional Nursery - Sixteen varieties (ranging from 76.4 bu/a to 92.7 bu/a) yielded significantly higher than the check variety, Owens (57.8 bu/a). Only one variety yielded so low as to be significantly different from the check and that was Federation at 34.3 bu/a.

Test weights were generally low for this nursery with the average being 48.2 lbs/bu. Eight varieties had significantly higher test weights, seven of which also had better yields. Waverly, UT 541815, and Federation had significantly lower test weights.

Approximately half of the entries showed some lodging during the season with five varieties being severely affected.

Leaf rust was not as prevalent in this nursery yet was recorded at high levels in seven varieties, most of which were poor yielding varieties. Septoria was severe in this nursery and recorded in all varieties. The varieties showing the lowest Septoria infection were ID 247 and OR 750573 which had mild reactions. Eighteen varieties showed resistance to Powdery mildew. Of the remaining entries five had high susceptibility to powdery mildew (Table 2).

SPRING WHEAT VARIETIES

SPRING WHEAT VARIETIES RECOMMENDED FOR WESTERN MONTANA

Hard Red Varieties

1. Borah - non-irrisated and irrisated
2. Fortuna - dryland
3. Newana - dryland and irrisated
4. Pondera - dryland and irrisated
5. Marbers - dryland and irrisated

Soft White Variety

1. Owens - dryland and irrisated

CHARACTERISTICS OF RECOMMENED VARIETIES

Hard Red Varieties

1. Borah
   a. Bearded variety
   b. Very high yielding ability
   c. Semi-dwarf type
   d. Medium maturity
   e. Low to fair test weight
   f. Resistant to shattering
   g. Resistant to stripe rust
   h. Susceptible to leaf rust
   i. Resistant to stem rust

2. Fortuna
   a. Bearded variety
   b. Good yielding ability
   c. Medium to tall height
   d. Medium maturity
   e. High test weight
   f. Poor to fair lodging resistance
   g. Somewhat susceptible to shattering
   h. Resistant to most common races of stem rust
   i. Resistant to to most common races of leaf rust
   j. Fair to good milling and baking quality

Recommended Spring Wheat Varieties (cont'd)

3. Newana
   a. High yielding ability
   b. Semi-dwarf variety
   c. High test weight
   d. High lodging resistance
   e. Good shattering resistance
   f. Resistance to stem rust
   g. Moderately susceptible to leaf rust

4. Pondera
   a. High yielding ability
   b. Semi-dwarf variety
   c. High test weight
   d. Mid-season maturity
   e. Resistance to stem and stripe rust
   f. Moderately resistance to leaf rust

5. Marbers
   a. Good yielding ability
   b. Semi-dwarf variety
   c. Good test weight
   d. Mid-season maturity
   e. Resistance to stem rust
   f. Moderately susceptible to leaf rust
   g. Moderately resistant to stripe rust

Soft White Varieties

1. Owens
   a. Bearded variety from Idaho
   b. Very high yielding ability
   c. Semi-dwarf type
   d. Medium maturity
   e. Fair test weight
   f. Good straw strength
   g. Good shattering resistance
   h. Resistant to stem and stripe rust

Table ___. Agronomic data from the Spring Wheat Advanced Yield Trial grown on the Northwestern Agricultural Research Center, Kalispell, MT. in 1983. Field No. Y-5, randomized block design,four replications. Plot size : 32 sq.ft.

Date seeded: April 18,1983 Date harvested: September 16, 1983

	VARIETY	YIELD BU/A	TEST WT LBS/BU	% LODG.	LODG. SEVER.	HEAD DATE	HEIGTH INCHES
MT8289	TANAGER'S'-CROSSCM30	110.34a	55.18	.00	.00	177.25b	38.68
CI15892	WARD	102.26a	56.80a	.00	.00	176.75b	47.83a
NK2631	NK715	100.05a	54.62	.00	.00	181.50a	42.62a
CI17903	MCKAY	98.95a	53.85	.00	.00	179.50	39.67
MT8213	MS2315/MT7418	98.80a	55.80a	.00	.00	179.00	38.39
MT8177	KALIF/S6921	95.96	55.72a	.00	.00	179.00	39.76
OSLO	NA18374 NAPB	95.59	53.35	.00	.00	175.25b	38.29
CI17827	CROSBY	95.17	56.00a	30.00a	2.00a	177.25b	48.62a
ND582	ND527/COTEAU'S'//ERA	95.07	56.35a	.00	.00	178.00b	46.56a
WRF 8-1	MSFRS GERMPLASM CC A	94.96	56.00a	.00	.00	176.00b	38.68
CI17934	GUARD	94.32	56.05a	7.50	.50	174.75b	42.13a
CI17790	LEN	94.14	54.08	.00	.00	177.25b	40.45a
CI15930	OLAF	91.15	55.30	.00	.00	176.75b	40.75a
MT7836	4553/SHERIDAN	90.80	54.02	.00	.00	177.25b	40.16
CI17920	MARSHALL	90.69	54.77	.00	.00	179.00	38.58
WRF 8-30	MSFRS GERMPLASM CC A	89.26	55.60a	.00	.00	175.00b	38.78
MT781	ND6850/FORTUNA	89.19	57.08a	10.00	1.25	177.50b	49.02a
MT8202	MX2315/NORANA	87.56	54.15	.00	.00	177.75b	37.50
MT7926	ND681/MT6830	87.36	55.72a	7.50	2.00a	178.75b	46.56a
CI17910	ALEX	87.02	56.40a	28.75a	2.25a	179.00	47.64a
MT8233	CI15838/MT7418	86.81	54.72	.00	.00	179.25	39.67
CI17789	VIC	86.64	55.87a	6.25	.75	178.50b	50.00a
MT8266	PI134593/MT7440	86.21	53.17	.00	.00	175.75b	39.96
MT8017	FB434/MT7149	86.01	54.23	.00	.00	179.25	39.07
MT8207	MX2315/PONDERA	85.51	55.28	.00	.00	174.50b	37.89
CI17911	WAVERLY	83.42	47.10b	.00	.00	180.75	40.16
MT8282	PI1345931/MT7440	82.59	49.37b	.00	.00	177.25b	38.09
LLOYD	PI147a211	81.37	50.23b	.00	.00	181.25	34.15b
CI17904	OWENS	80.80	50.30b	27.50a	4.25a	179.25	39.57
MT808	JARAL'S'/NORANA	80.24	50.35b	.00	.00	177.75b	37.89
CI17438	CANDO	79.90	51.10b	.00	.00	180.00	33.86b
CI17420	NEWANA 1/	79.64	53.52	.00	.00	180.00	38.39
CI17828	PONDERA	77.01	55.20	.00	.00	177.25b	39.07
CI17681	BUTTE	76.01	55.75a	2.50	.75	175.50b	42.81a

Table 1 (con't)

	VARIETY	YIELD BU/A	TEST WT LBS/BU	% LODG.	LODG. SEVER.	HEAD DATE	HEIGTH INCHES
CI17935	CENTA	74.95	56.68a	27.50a	1.75a	174.50b	45.57a
MT8218	CI15838/MARBERG	74.71	50.87b	3.75	1.75a	177.50b	41.14a
MT8274	PI1345931/MT7336	72.96	52.80	.00	.00	174.75b	37.01
LEADER	CANADA	71.99	54.00	.00	.00	178.50b	39.57
MT807	JARAL'S'/NORANA	69.77	51.95	.00	.00	179.00	37.01
SD2861	EUREKA/PRODAX	69.76	49.83b	68.75a	5.25a	174.75b	39.07
MT814	NORANA/SHASHI	69.21	48.62b	48.75a	4.00a	179.00	37.80
MT8184	AU/MAYA74'S'	68.25	49.80b	.00	.00	178.25b	36.52
MT7819	4553/FORTUNA	64.76	19.10b	72.25a	6.00a	179.25	40.06
CI17829	MARBERG	63.37	52.48	2.50	.50	174.75b	39.57
CI17429	LEW	62.29b	54.38	73.75a	6.75a	181.50	47.93a
CI13596	FORTUNA	61.15b	53.43	72.50a	6.25a	178.50b	47.44a
CI10003	THATCHER	59.05b	52.93	43.75a	3.25a	178.25b	50.59a
MT8228	CI15838/MT7418	56.02b	52.17	.00	.00	176.75b	38.78
MT8043	PK176//SI/MT7149	54.00b	46.48b	55.00a	4.25a	179.00	41.73a
	$\bar{X}$	82.31	53.45	12.01	1.09	177.82	41.04
	F 2/	4.51**	15.85**	11.13**	11.66**	19.49**	39.19**
	S.E.X.	6.18	.68	6.76	.56	.43	.67
	L.S.D.	17.28	1.89	18.89	1.56	1.21	1.87
	C.V. %	7.51	1.26	56.28	51.18	.24	1.63

1/ Check variety
2/ F value for variety comparison
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

Table 2. Agronomic data from the Spring Wheat Advanced Yield Trial grown on the Northwestern Agricultural Research Center, Kalispell, MT. in 1983. Field No. Y-5, randomized block design, four replications. Plot size: 32 sq. ft.

Date seeded: April 18,1983 Date harvested: September 16, 1983

		***** see footnotes for disease ratings at end of table****							
VARIETY		RUST % PLOT	RUST SEV.	SEPT. % PLOT	SEPT. SEVER.	SEPT. STAGE	MILDEW % PLOT	MILDEW SEVER.	MILDEW STAGE
MT8289	TANAGER'S'-CROSSCM30	.00	.00	17.50b	6.25	6.00	.00	.00	.00b
CI15892	WARD	.00	.00	12.50b	7.50	4.50b	.00	.00	.00b
NK2631	NK715	.00	.00	41.25	10.00	6.00	.00	.00	.00b
CI17903	MCKAY	.00	.00	25.00	6.25	5.75	1.25	1.25	1.25
MT8213	MS2315/MT7418	.00	.00	67.50	11.25	7.00	5.00	1.25	1.50
MT8177	KALIF/S6921	.00	.00	63.75	7.50	7.25	15.00	6.25a	1.50
OSLO	NA18374 NAPB	.00	.00	70.00	13.75	7.25	1.25	1.25	1.25
CI17827	CROSBY	.00	.00	10.00b	6.25	5.25b	.00	.00	.00b
ND582	ND527/COTEAU'S'//ERA	.00	.00	61.25	13.75	6.75	.00	.00	.00b
WRP 8-1	MSFRS GERMPLASM CC A	.00	.00	56.25	6.25	7.25	.00	.00	.00b
CI17934	GUARD	.00	.00	45.00	6.25	6.50	.00	.00	.00b
CI17790	LEN	.00	.00	76.25	12.50	7.25	.00	.00	.00b
CI15930	OLAF	.00	.00	47.25	8.75	7.75	.00	.00	.00b
MT7836	4553/SHERIDAN	74.25a	15.00a	73.75	16.25	7.00	.00	.00	.00b
CI17920	MARSHALL	.00	.00	63.75	10.00	7.00	.00	.00	.00b
WRP 8-30	MSFRS GERMPLASM CC A	.00	.00	62.25	10.00	7.25	.00	.00	.00b
MT781	ND6850/FORTUNA	.00	.00	94.50a	32.50a	7.75	.00	.00	.00b
MT8202	MX2315/NORANA	.00	.00	48.75	8.75	6.25	.00	.00	.00b
MT7926	ND681/MT6830	.00	.00	42.50	7.50	6.50	18.75	1.25	2.00
CI17910	ALEX	.00	.00	57.50	11.25	7.50	.00	.00	.00b
MT8233	CI15838/MT7418	.00	.00	79.75	17.50a	7.00	.00	.00	.00b
CI17789	VIC	.00	.00	5.00b	3.75	3.75b	.00	.00	.00b
MT8286	PI134593/MT7440	.00	.00	91.25a	13.75	7.75	35.00a	6.25a	2.75
MT8017	FB434/MT7149	47.25a	2.50	87.50a	12.50	8.00	.00	.00	.00b
MT8207	MX2315/PONDERA	48.50a	3.75	94.50a	12.50	7.75	.00	.00	.00b
CI17911	WAVERLY	7.50	1.25	67.25	6.25	7.25	41.25a	5.00	4.00
MT8282	PI1345931/MT7440	.00	.00	57.50	11.25	7.00	23.75a	2.50	1.75
LLOYD	PI1476211	12.50	5.00	85.00a	11.25	7.75	.00	.00	.00b
CI17904	OWENS	.00	.00	32.50	6.25	6.50	75.00a	10.00a	7.50
MT808	JARAL'S'/NORANA	.00	.00	83.75a	13.75	7.00	.00	.00	.00b
CI17433	CANDO	.00	.00	94.50a	20.00a	7.75	.00	.00	.00b
CI17420	NEWANA 1/	.00	.00	32.50	7.50	6.75	1.25	1.25	2.25
CI17828	PONDERA	.00	.00	80.00	7.50	6.75	.00	.00	.00b
CI17691	BUTTE	.00	.00	16.25b	6.25	5.25b	.00	.00	.00b

Table 2 (con't)

VARIETY		***** see footnotes for disease ratings at end of table**** RUST % PLOT	RUST SEV.	SEPT. % PLOT	SEPT. SEVER.	SEPT. STAGE	MILDEW % PLOT	MILDEW SEVER.	MILDEW STAGE
CI17935	CENTA	.00	.00	12.50b	5.00	6.00	.00	.00	.00b
MT8218	CI15838/MARBERG	24.75a	5.00	57.50	7.50	6.25	.00	.00	.00b
MT8274	PI1345931/MT7336	.00	.00	99.00a	48.75a	8.00	.00	.00	.00b
LEADER	CANADA	.00	.00	67.25	10.00	7.50	.00	.00	.00b
MT807	JARAL'S'/NORANA	.00	.00	78.50	20.00a	7.00	.00	.00	.00b
SD2561	EUREKA/PRODAX	.00	.00	99.00a	35.00a	8.00	.00	.00	.00b
MT814	NORANA/SHASHI	.00	.00	71.25	12.50	7.00	.00	.00	.00b
MT8184	AU/MAYA74'S'	.00	.00	99.00a	38.75a	8.00	.00	.00	.00b
MT7819	4553/FORTUNA	20.00	1.25	81.00	12.50	7.25	.00	.00	.00b
CI17829	MARBERG	99.00a	45.00a	94.25a	11.25	8.00	.00	.00	.00b
CI17429	LEW	.00	.00	66.25	10.00	6.25	.00	.00	.00b
CI13596	FORTUNA	.00	.00	99.00a	17.50a	8.00	.00	.00	.00b
CI10003	THATCHER	99.00a	32.50a	84.75a	18.75a	7.75	23.75a	7.50a	2.75
MT8228	CI15838/MT7118	99.00a	60.00a	95.75a	20.00a	8.00	.00	.00	.00b
MT8043	PR176//ST/MT7149	99.00a	36.25a	96.75a	18.75a	8.00	.00	.00	.00b
	$\bar{X}$	12.87	4.23	64.60	13.24	6.96	4.92	.89	.58
	F 2/	13.59**	13.62**	6.56**	6.47**	3.99**	3.80**	2.17**	2.96**
	S.E.X.	8.06	3.37	10.61	3.53	.47	7.07	1.50	.29
	L.S.D.	22.54	9.42	29.66	9.86	1.32	19.75	4.19	2.23
	C.V. %	62.64	79.54	16.42	26.63	6.80	143.52	167.95	137.14

1/ Check variety
2/ F value for variety comparison
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

*** FOOTNOTES FOR DISEASE RATINGS ***

Leaf rust; % plot = percent plot infected with disease (Puccinia recondita)
Leaf rust, severity = average leaf area (percent) infected by the disease
Sept. % plot = percent plot infected with disease (Septoria spp.)
Sept. sever. = average leaf area (percent) infected by the disease
Sept. stage = stage of development of the disease; 1-9 scale; 1= crown infected, 9 = head infected
Mildew % plot = percent plot infected with disease (Erysiphe graminis)
Mildew sever. = average leaf area (percent) infected by the disease
Mildew stage = stage of development of the disease, 1-9 scale, 1= crown infected, 9 = head infected

Table 3. Agronomic data from the Western Regional Spring Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell,MT in 1983. Field No. Y-5, randomized block design, four replications. Plot size: 32 sq. ft.

Date seeded: April 18, 1983 Date harvested: September 20, 1983

VARIETY			YIELD BU/A	TEST WT LBS./BU	HEADING DATE	% LODGING	LODGING SEVER.	HEIGTH INCHES
WA7074	PTM70/WA6021,BRONS/K	2/	92.70a	51.70a	180.67	8.33b	1.67b	38.06
WA6920	POTAM70/WA6021,K7905	2/	91.85a	49.57	181.00	.00b	.00b	38.85
OR791432	HORK/YMH/KA//BB	2/	90.05a	49.47	180.67	.00b	.00b	34.38b
CI 17903	MCKAY	1/	87.57a	51.90a	180.33	.00b	.00b	41.21a
WA6917	POTAM70/WA6021,K7905	2/	86.65a	52.07a	180.67	1.67b	1.33b	40.55
ID247	TZPP/AN3//B61-136AB	1/	85.73a	52.13a	184.00a	.00b	.00b	41.08a
WA6918	POTAM70/WA6021,K7905	2/	83.28a	50.13	180.67	53.33	6.00	37.80
OR86558	ST5958/ARANA	1/	82.42a	50.57a	178.67b	.00b	.00b	35.56b
ID236	FBR/5/BBII/4/7*SFL/3	2/	81.23a	48.03	183.67a	.00b	.00b	44.49a
OR750573	CTK/CNO//EMU	1/	81.05a	48.53	181.67a	5.00b	1.00b	41.08a
UT2746	UTAH W498-165/BORAH	1/	80.97a	49.90	180.33	5.00b	.67b	39.11
WA7075	K73579/BORAH	1/	80.40a	50.70a	177.67b	5.00b	2.33b	38.71
WA6919	POTAM70/WA6021,K7905	2/	79.27a	48.73	180.67	.00b	.00b	40.16
ORS44421	HORK/YMH/KA//BB	2/	77.98a	47.83	179.33	.00b	.00b	37.66
WA6916	POTAM70/WA6021,K7905	2/	76.93a	51.43a	179.33	6.67b	2.00b	40.68
CI17911	WAVERLY	2/	76.43a	44.13b	182.00a	.00b	.00b	37.80
ID246	BBII/4/7*SF1/3/AS/FR	2/	74.00	47.00	179.33	.00b	.00b	39.63
ID250	ABERDEEN SELN	2/	73.57	49.23	185.67a	.00b	.00b	40.55
ORS6367	CTK/CNO//EMU	1/	71.38	47.90	184.33a	.00b	.00b	39.76
WA7076	K74153/WA6096//ATL66	1/	69.15	48.50	179.33	81.67a	5.67	37.66
ID227	ID0067*2/BB*5*RESEL.	2/	68.13	46.57	182.67a	.00b	.00b	39.50
WA7073	PTM70/WA6021,BRONS/K	2/	67.40	49.83	181.00	31.67	4.67	38.98
ID263	ABERDEEN SELN	1/	66.65	54.10a	181.00	.00b	.00b	44.09a
ID258	ABERDEEN SELN	1/	66.33	48.17	180.33	.00b	.00b	38.85
WA6831	POTAM70/WA6021,K7905	2/	65.77	45.47	180.33	21.67	4.00	38.45
ID249	ABERDEEN SELN	2/	64.53	45.40	183.00a	.00b	.00b	41.73a
ID248	ABERDEEN SELN	2/	64.32	45.83	181.67a	.00b	.00b	38.32
UT209	UTAH W498-259/PROSPU	1/	61.08	44.87	181.00	3.33b	1.00b	43.83a
ID174	ABERDEEN SELN	2/	60.50	45.57	180.33	23.33	2.33	41.73a
ID262	ABERDEEN SELN	1/	58.87	47.47	180.00	96.33a	9.00a	36.22
CI17904	OWENS	2/ 3/	57.82	47.40	180.00	45.00	5.67	38.45
UT541774	BANNOCK/738-274-1	1/	56.68	46.83	179.00	13.33b	4.33	41.21a
UT541842	BANNOCK/738-274-1	1/	56.55	47.77	178.00b	94.67a	8.33	41.08a
UT541954	BANNOCK/738-274-1	1/	52.87	44.77	179.33	5.00b	1.67b	40.55
ID238	BORAH/3/MRN//PJ'S'/3	1/	52.70	45.83	176.00b	79.67a	6.33	37.01
UT541815	BANNOCK/738-274-1	1/	52.58	44.27b	180.00	.00b	.00b	40.94a
CI4734	FEDERATION	2/	34.25b	43.33b	176.00b	36.67	4.33	48.69a
	X		71.07	48.24	180.59	16.68	1.95	39.85
	F 4/		4.29**	5.64**	28.77**	11.77**	5.98**	9.40**
	S.E.X.		6.41	1.10	.40	8.36	1.08	.87
	L.S.D. (.05)		18.08	3.10	1.13	23.56	3.03	2.44
	C.V.%		9.02	2.28	.22	50.10	55.03	2.17

1/ Hard red spring wheat variety
2/ Soft white spring wheat variety
3/ Check variety
4/ Fvalue for variety comparison
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

Table 4. Agronomic data from the Western Regional Spring Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1983. Field No. Y-5, randomized block design, four replications. Plot size: 32 sq. ft.

Date seeded: April 18, 1983 Date harvested: September 20, 1983

			*** see footnotes on disease ratings at end of table***							
	VARIETY		LF RUST % PLOT	LF RUST SEVER.	SEPT % PLOT	SEPT. SEVER.	SEPT. STAGE	MILDEW % PLOT	MILDEW SEVER.	MILDEW STAGE
WA7074	PTM70/WA6021,BRONS/K	2/	.00	.00	53.33	11.67	6.00	.00b	.00b	.00b
WA6920	POTAM70/WA6021,K7905	2/	.00	.00	89.67a	10.00	7.67	30.00b	3.33b	3.00b
OR791432	HORK/YMH/KA//BB	2/	.00	.00	46.67	11.67	6.33	20.00b	1.67b	2.33b
CI 17903	MCKAY	1/	.00	.00	36.67	10.00	6.67	.00b	.00b	.00b
WA6917	POTAM70/WA6021,K7905	2/	.00	.00	76.67	15.00	6.67	.00b	.00b	.00b
ID247	TZPF/AN3//B61-136AB	1/	.00	.00	21.67	6.67	6.00	84.67	10.00b	6.33
WA6918	POTAM70/WA6021,K7905	2/	.00	.00	66.67	8.33	6.67	20.00b	1.67b	2.00b
ORS6558	ST5958/ARANA	1/	.00	.00	70.00	8.33	7.00	20.00b	1.67b	3.00b
ID236	FBR/5/BBII/4/7*SFL/3	2/	.00	.00	63.33	6.67	7.00	.00b	.00b	.00b
OR750573	CTK/CNO//EMU	1/	.00	.00	28.33	10.00	5.67	.00b	.00b	.00b
UT2746	UTAH W498-165/BORAH	1/	.00	.00	78.33	10.00	7.00	.00b	.00b	.00b
WA7075	K73579/BORAH	1/	.00	.00	88.33a	15.00	7.33	.00b	.00b	.00b
WA6919	POTAM70/WA6021,K7905	2/	.00	.00	73.33	13.33	6.67	30.00b	1.67b	3.00b
ORS44421	HORK/YMH/KA//BB	2/	.00	.00	80.00	8.33	6.33	26.67b	3.33b	6.00
WA6916	POTAM70/WA6021,K7905	2/	.00	.00	63.00	15.00	7.33	.00b	.00b	.00b
CI17911	WAVERLY	2/	.00	.00	68.33	10.00	6.67	88.33	18.33	7.67
ID246	BBII/4/7*SF1/3/AS/FR	2/	26.67	1.67	66.67	11.67	7.33	.00b	.00b	.00b
ID250	ABERDEEN SELN	2/	.00	.00	91.33a	15.00	7.00	.00b	.00b	.00b
ORS6367	CTK/CNO//EMU	1/	.00	.00	86.67a	26.67a	7.67	.00b	.00b	.00b
WA7076	K74153/WA6096//ATL66	1/	.00	.00	65.00	10.00	6.33	53.33	3.33b	5.33
ID227	ID0067*2/BB'5'RESEL.	2/	.00	.00	40.00	8.33	6.67	.00b	.00b	.00b
WA7073	PTM70/WA6021,BRONS/K	2/	.00	.00	66.67	10.00	6.67	40.00	3.33b	6.00
ID263	ABERDEEN SELN	1/	96.00a	13.33a	66.00	18.33	7.67	53.00	10.00b	5.33
ID258	ABERDEEN SELN	1/	63.00a	5.00	97.67a	11.67	8.00a	25.00b	1.67b	3.00b
WA6831	POTAM70/WA6021,K7905	2/	.00	.00	85.00a	11.67	6.00	90.00	10.00b	8.33
ID249	ABERDEEN SELN	2/	66.00a	3.33	96.33a	23.33	7.67	83.00	6.67b	9.00
ID248	ABERDEEN SELN	2/	.00	.00	83.33	11.67	7.33	.00b	.00b	.00b
UT209	UTAH W498-259/PROSPU	1/	96.00a	10.00a	99.00a	48.33a	5.33	33.00b	3.33b	3.00b
ID174	ABERDEEN SELN	2/	.00	.00	96.33a	40.00a	8.00a	30.00b	1.67b	3.00b
ID262	ABERDEEN SELN	1/	60.00a	3.33	97.67a	25.00a	7.33	.00b	.00b	.00b
CI17904	OWENS	2/ 3/	.00	.00	51.67	6.67	6.00	96.00	21.67	9.00
UT541774	BANNOCK/738-274-1	1/	96.00a	18.33a	74.67	26.67a	8.00a	.00b	.00b	.00b
UT541842	BANNOCK/738-274-1	1/	99.00a	21.67a	96.33a	15.00	8.00a	.00b	.00b	.00b
UT541954	BANNOCK/738-274-1	1/	99.00a	50.00a	97.67a	53.33a	8.00a	30.00b	3.33b	5.67
ID238	BORAH/3/MRN//PJ'S'/G	1/	.00	.00	97.67a	33.33a	8.00a	10.00b	.00b	.00b
UT541815	BANNOCK/738-274-1	1/	99.00a	46.67a	99.00a	58.33a	8.00a	.00b	.00b	.00b
CI4734	FEDERATION	2/	99.00a	8.33	96.33a	18.33	8.00a	99.00	40.00a	8.00
	$\bar{X}$		24.32	4.91	74.47	17.66	7.03	26.00	3.96	2.73
	F 4/		16.83**	11.05**	3.34**	4.52**	1.55*	4.87**	8.93**	3.56**
	S.E.X.		9.75	3.54	11.64	6.20	.61	14.83	2.65	1.71
	L.S.D. (.05)		27.49	9.98	32.82	17.48	1.73	41.81	7.46	4.81
	C.V.%		40.10	72.12	15.63	35.12	8.71	57.04	66.77	62.48

Table 4 (con't)

1/ Hard red spring wheat variety
2/ Soft white spring wheat variety
3/ Check variety
4/ F-value for variety comparison
* Indicates statistical significance at the .05 level
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

*** FOOTNOTES FOR DISEASE RATINGS ***

Leaf rust, % plot = percent plot infected with disease (Puccinia recondita)
Leaf rust, severity = average leaf area (percent) infected by the disease
Sept. % plot = percent plot infected with disease (Septoria spp.)
Sept. sever. = average leaf area (percent) infected by the disease
Sept. stage = stage of development of disease, 1-9 scale, 1= crown 9 = head of plant
Mildew % plot = percent plot infected with disease (Erysiphe graminis)
Mildew sever. = average leaf area (percent) infected by the disease
Mildew stage = stage of development of disease, 1-9 scale, 1= crown 9 = head

Table 5. Summary of the Western Resional Spring Wheat Nursery yields grown at the Northwestern Agricultural Research Center, Kalispell, MT 1979-1983.

CI or State No.	Variety	1979	1980	1981	1982	1983	- X	Sta. yrs.	% Owens
CI 4734	Federation	78.2	45.2	42.4	59.3	34.3	51.9	5	57
CI 17904	Owens	114.8	93.9	73.5	114.7	57.8	90.9	5	100
CI 17903	Mckay		98.1	93.9	112.0	87.6	97.9	4	115
UT 541774	Bannock/738-274-1		92.2	65.1	111.3	56.7	81.3	4	96
WA 6831	Potam 70/WA 6021			95.0	109.1	65.8	90.0	3	110
ID 236	FLR/5/BBII/4/7*SFL/3/AS			74.2	131.3	81.2	95.6	3	116
ID 247	Complex Pedisree				129.8	85.7	107.8	2	125
WA 6919	Potam 70/WA 6021, K790				129.0	79.3	104.2	2	121
WA 6920	Potam 70/WA 6021, K790				127.6	91.9	109.8	2	127
WA 6918	Potam 70/WA 6021, K790				127.0	83.3	105.2	2	122
WA 6917	Potam 70/WA 6021, K790				126.6	86.7	106.7	2	124
WA 6916	Potam 70/WA 6021, K790				126.6	76.9	101.8	2	118
UT 209	Utah WA 498-256/Prospur				116.0	61.1	88.6	2	103
ID 246	Complex Pedisree				112.9	74.0	93.5	2	108
CI 17911	Waverly				106.7	76.4	91.6	2	106
ID 227	Complex Pedisree				99.7	68.1	83.9	2	97
UT 2746	Utah W498-165/Borah				89.5	81.0	85.3	2	99
ID 238	Complex Pedisree				85.3	52.7	69.0	2	80
WA 7074	PTM70/WA 6021.BRUNS/K					90.7	90.7	1	157
OR 791432	HORK/YMH/KA//BB					90.1	90.1	1	156
OR S6558	ST 5958/ARANA					82.4	82.4	1	142
OR 750573	CTK/CNO//EMU					81.1	81.1	1	140
WA 7075	K 73579/BORAH					78.0	78.0	1	139
OR S44421	HORK/YMH/KA//BB					78.0	78.0	1	135
ID 250	ABERDEEN SELN.					73.6	73.6	1	127
OR S6367	CTK/CNO/EMU					71.4	71.4	1	124
WA 7076	K74153/WA6096//ATL66					69.2	69.2	1	119
WA 7073	PTM70/WA 6021.BRUNS/K					67.4	67.4	1	117
ID 263	ABERDEEN SELN.					66.7	66.7	1	115
ID 258	ABERDEEN SELN.					66.3	66.3	1	115
ID 249	ABERDEEN SELN.					64.5	64.5	1	112
ID 248	ABERDEEN SELN.					64.3	64.3	1	112
ID 174	ABERDEEN SELN.					60.5	60.5	1	105
ID 262	ABERDEEN SELN.					58.9	58.9	1	102
UT 541842	BANNOCK/738-274-1					56.6	56.6	1	98
UT 541954	BANNOCK/738-274-1					52.9	52.9	1	98
UT 541815	BANNOCK/738-274-1					52.6	52.6	1	91

PROJECT TITLE: Winter Wheat Variety Trials (1983)

PERSONNEL: Leader: Vern R. Stewart
Cooperators: G. A. Taylor, P&SS, MSU
J. A. Hoffman, USDA-ARS, Logan, UT
Technician: Todd K. Keener
Cooperating Agencies:
Montana Wheat Research Committee
Montana Wheat Research & Marketing Comm.
Montana Cooperative Extension Service

SUMMARY:

Winrdige continues to perform well. It surpassed all other named hard red varieties in yield, test weight and disease resistance. MT77066 also performed well in comparison to other hard red winter wheat, but was more susceptible to lodging.

Luke continues to out-yield most of the white wheats in drier locations of northwestern Montana. In higher moisture areas Luke looses yield potential because of lodging. Daws, Crew and Lewjain which have stronger straw, yield more than Luke under higher moisture conditions. Dwarf smut evaluations were limited because there was not continuous snow cover during the winter. The open winter did provide an opportunity to determine the winter hardiness of varieties tested.

In the western Montana off station nurseries Winridge was the hard red winter wheat variety which performed best. Tyee, Luke, Lewjain and Stephens soft white varieties were high yielding lines. Lewjain and Luke were about equal for yield but Lewjain had a higher test weight. Winridge was higher in both yield and test weight when compared to Crest.

INTRODUCTION:

To determine the adaptability of new and introduced winter wheat varieties for Montana, the Western Regional Winter Wheat Nurseries are grown in several locations throughout the state. These nurseries are cooperative trials with the USDA-ARS in the Pacific Northwest. The main thrust of these variety trials is to find lines that are resistant to dwarf smut (Tilletia controversa Kuhn) and stripe rust (Puccinia striiformis West).

Off station variety testing provides evaluation of varieties against the varied growing conditions that exist in western Montana. Two nurseries were grown in the 1982-83 season consisting of 10 soft white and 6 hard red winter wheat varieties.

1983 Winter Wheat Nurseries:

Western Regional Hard Red Winter Wheat Nursery
(1) Kalispell
(2) Stillwater

1983 Winter Wheat Nurseries (con't):

Western Regional White Winter Wheat Nursery
(1) Kalispell
(2) Stillwater

Off Station Winter Wheat Trials
(1) Sanders County
(2) Lake County

RESULTS:

Western Regional Hard Red Winter Wheat Nursery - Kalispell

Yields were a little lower than the 1982 season. These high yields reflect a mild winter, good seasonal moisture, and the low incidence of plant diseases throughout the trial. The check variety, Crest yielded well below the mean at 76.1 bu/a. Seventeen varieties that were tested yielded significantly greater than Crest (Table 1).

Test weights were low in comparison to previous years. Only one variety had a test weight significantly less than Crest.

Although TCK Smut infection was very slight in the winter wheat studies this year all but five varieties showed some symptoms of the disease. The five lines demonstrating resistance to TCK were UT132569, UT132712, ID0217, ID0260 and ID0216.

Weather conditions at maturity were conducive to lodging. All but 11 of the varieties showed some degree of lodging. Severely lodged plots were lower in yield.

Western Regional Hard Red Winter Wheat Nursery - Stillwater

Yields for the Stillwater location were also less than the previous year, yet normal for this area. Four varieties yielded significantly more than the check variety, Crest. These were ID245 (81.95 bu/a), Winridge (80.41 bu/a), OR792 (79.41 bu/a) and UT132569 (79.34 bu/a).

Test weights averaged 57.14 lbs/bu with four varieties being significantly lower than the check. Test weights on the whole were less than those of previous years.

Winter kill was observed in several varieties but stand loss did not exceed 5% except for ID261.

Five varieties were significantly higher in lodging than Crest.

TCK smut was observed in only six varieties and did not occur above the .5% infection level.

The incidence of leaf rust (Puccinia recondita) was high and

Results (con't):

all varieties showed some infection. Those varieties showing some resistance were ID3518, Weston and UT125327. The rust infection came late in the season and therefore yields were not greatly effected. Table 2.

Western Regional White Winter Wheat Nursery - Kalispell

Five varieties yielding significantly more than Luke, the check, were ORCW8113 (128.89 bu/a), WA6698 (124.24 bu/a), OR8188 (123.21 bu/a), OR68007 (121.62 bu/a) and WA6912 (118.30 bu/a). The average yield for the nursery was 104.08 bu/a.

The only variety exceeding 60 lbs/bu for test weight was WA6996. Several of the varieties having significantly less test weights than Luke also had yields less than Luke.

Smut levels were not observed above 1% except in the case of Elgin at 1.38%. Ten varieties showed no signs of smut at all.

Lodging was not prevalent throughout the nursery, yet was severe in seven varieties. Table 3.

Western White Regional Winter Wheat - Stillwater

Luke was one of the highest yielding varieties this year at Stillwater. The average yield was 20 bushels less than last year and 10 bushels less than 1981. Sixteen varieties yielded significantly less than the check variety, Luke.

Fourteen varieties had test weights significantly greater than Luke yet none were above 60 lbs/bu. Table 4.

Winter kill was higher in the white winter wheats when compared to the hard reds. Most lines showed stand reductions because of winter injury. Stands varied from 52.5% to 99.7% survival.

WA6915, Kharkof and OR7996 were severely lodged.

Leaf rust was observed in all varieties and was very severe (above 75% infection) in seven of the varieties. ID7956 showed the greatest resistance to leaf rust having only 5% infection. Yields were not greatly effected by the disease because it occurred late in the season.

Off Station - Sanders County

Excellent yields were harvested from this nursery with yields ranging from 82.5 bu/a to 110.1 bu/a. The top four yielding varieties were white wheats with Tyee being the highest at 110.1 bu/a. Five out of the six hard red winter wheat varieties tested yielded significantly less than Luke.

Test weights averaged about 57.7 lbs/bu with only one variety exceeding 60 lbs/bu (Weston at 60.42 lbs/bu). Table 5.

Off Station - Lake County

The hard red winter wheat variety Winridge was highest in yield at this location. Next in yields were five soft white winter varieties which ranged in yield from 69 bu/a to 73 bu/a. Luke at this location was fourth in yield as it was in Sanders County. Table 6.

There were 11 varieties having test weights significantly less than Luke while Lewjain at 60.52 lbs/bu was significantly higher than Luke. Table 6.

WINTER WHEAT VARIETIES

WINTER WHEAT VARIETIES RECOMMENDED FOR WESTERN MONTANA

Hard Red Varieties

1. Crest - dryland
2. Winalta - dryland
3. Cheyenne - dryland
4. Winridge - dryland

Soft White Varieties

1. Luke - Dryland or irrigated

CHARACTERISTICS OF RECOMMENDED VARIETIES

1. Crest
   a. Bearded variety, developed in Montana
   b. High yielding potential in dwarf smut and stripe rust areas
   c. Tall type
   d. Maturity - early to mid-season
   e. Good test weight
   f. Weak straw strength
   g. Moderate shattering resistance
   h. Resistant to stripe rust
   i. Moderate resistance to dwarf smut
   j. Susceptible to stem rust and sawfly infestation
   k. Not extremely winter hardy
   l. Adequate milling and baking quality

2. Winalta
   a. Bearded variety
   b. Fair yielding
   c. Tall type
   d. Maturity - early to mid season
   e. Good test weight
   f. Weak straw strength
   g. Good shattering resistance
   h. Susceptible to dwarf smut and sawfly infestations
   i. Resistant to stripe rust
   j. Moderate rsistance to stem rust

Recommended Winter Wheat Varieties (cont'd)

3. Cheyenne

a. Bearded variety
b. Good yielding
c. Tall type
d. Maturity - early to mid season
e. Good test weight
f. Weak straw strength
g. Susceptible to shattering
h. Moderate resistant to stripe rust
i. Susceptible to dwarf smut, stem rust and sawfly infestation
j. Good milling and baking qualities

4. Winridge

a. High yielding ability
b. Tall type
c. Good test weight
d. Resistant to shattering
e. Resistant to lodging
f. Resistant to dwarf smut, stripe rust and cephalosporium stripe
g. Winter hardy
h. Acceptable protein, milling and baking qualities

Soft White Variety

1. Luke

a. Bearded variety
b. Good yielding
c. Semi-dwarf type
d. Maturity - mid season
e. Fair test weight
f. Poor to fair straw strength
g. Resistant to shattering
h. Resistant to dwarf smut and stripe rust
i. Foot rot tolerant
j. Good baking and milling quality for cake flours

Table 1. Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Northwestern Agricultural Research Center at Kalispell, MT. in 1983. Random block design, four replications. Field no. E-2.

Date seeded: September 21,1982 Date harvested: August 22,1983 Plot size: 32 sq.ft.

		YIELD BU/A	TEST WT LB/BU	HEADING DATE	MATURE DATE	HEIGTH INCHES	% 2/ SMUT	% LODG.	LODG. PREV.
WA 7049	LIND sel.B	108.59a	58.22a	160.00a	221.00	37.89	.25	.00b	.00b
WA 6820	GWB/127/GWB236//GWB2	104.22a	57.40a	154.50	216.00	33.96	.12	.00b	.00b
OR 792	TRIUMPH/LANCER,sel.1	101.66a	58.43a	158.25a	221.00	38.58	.12	13.75b	2.50b
CI 17902	WINDRIDGE	101.57a	59.77a	160.75a	224.00	43.01a	.12	1.25b	1.25b
ID 0261	BURT/CI13929//DLM/4/	101.16a	58.47a	161.50a	222.00	38.09	.62	.00b	.00b
ORCR8107	ALBA/GNS//FN/SONORA6	98.17a	59.23a	157.00a	223.00	44.98a	1.00a	18.75b	.50b
MT 77066	C61-9/WLT//CRT	97.30a	59.62a	160.75a	223.00	40.26	.12	23.75b	1.25b
CI 13844	WANSER	94.17a	57.93a	156.25a	218.00	41.44	.62	.00b	.00b
OR 7923	CLARIPEN/WA5836,sel.	93.06a	54.98	157.00a	216.00	28.44b	.37	24.75b	1.25b
CI 17727	WESTON	92.99a	60.45a	156.00a	221.00	43.80a	.12	25.00b	3.25b
UT125327	DLM/PI173438//CLM/3/	92.69a	57.55a	157.00a	221.00	35.43	.12	.00b	.00b
ID 3518	WA4765/3/BEZ//BURT/1	92.42a	55.75	164.75a	226.00	33.86b	.25	12.50b	1.25b
WA 7048	LIND sel.A	92.31a	57.02	158.50a	221.00	43.21a	.37	.00b	.00b
OR 7921	BEZ/SPRAGUE,sel.18-2	92.15a	57.08	157.50a	221.00	31.99b	.37	.00b	.00b
MT 77002	FRD/BEZ	92.14a	58.77a	155.00	218.00	40.65	.37	.00b	.00b
WA 6816	ID5012/WA5866	89.85a	55.52	160.25a	222.00	36.52	.50	.00b	.00b
UT132569	WRR/CI13837//PI17343	88.39a	56.15	161.00a	223.00	45.18a	.00	91.00	7.25
ID 0259	JEFF///II-60-155/CI1	85.72	58.25a	157.25a	216.00	43.60a	.12	72.00	4.75b
UT132712	KR/SVE//RDT///IT/4/F	85.67	57.23a	159.50a	222.00	42.91a	.00	72.00	5.75
ID 51022	BEZ//BURT/178383/3/A	83.27	57.27a	154.50	217.00	44.98a	.25	.00b	.00b
ID 51021	BEZ//BURT/178383/3/A	82.62	59.10a	154.00	221.00	42.62a	.25	.00b	.00b
ID 0242	SM4/TD//3*IT/PI17838	79.99	59.27a	159.25a	221.00	45.77a	.37	58.50b	5.50b
ID 0245	II.60-155/CI14106//W	78.87	57.40a	157.50a	216.00	39.37	.12	46.00b	4.75b
CI 13880	CREST 1/	76.10	55.35	154.50	222.00	37.89	.12	97.00	8.50
ID 0217	A667W-46/RANGER	74.11	59.10a	159.25a	221.00	42.81a	.00	66.25	4.00b
ID 0260	DLM/PI173438//CLM///	73.22	56.68	159.75a	222.00	48.23a	.00	99.00	8.00
CI 1442	KHARKOF	72.94	58.33a	161.25a	221.00	46.75a	1.62a	95.75	6.75
ID 0216	SM4/TD//3*IT/PI17838	69.05	53.35b	160.75a	223.00	46.16a	.00	99.00	8.50

Table 11. (con't)

	YIELD BU/A	TEST WT LB/BU	HEADING DATE	MATURE DATE	HEIGTH INCHES	% SMUT	% LODG.	LODG. PREV.
$\bar{X}$	89.02	57.63	158.34	.00	40.66	.30	37.72	2.68
F 3/	6.82**	6.87**	29.48**	.00	12.04**	2.36**	8.12**	9.33**
S.E.X.	4.02	.63	.49	.00	1.40	.23	13.39	1.00
L.S.D. (.05)	11.30	1.76	1.37	.00	3.95	.64	37.67	2.82
C.V. %	4.51	1.09	.31	.00	3.46	75.70	40.91	37.45

1/ Check variety
2/ % Smut = % TCK (Tilletia controversa Kohn) smut per plot by ocular ratins
3/ F value for variety comparison
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

Heading and maturity dates are number of days from January 1.

Table 2. Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Lance Claridge farm at Kalispell, MT in 1983. Random block design, four replications. Size of plot: 32 sq. ft.

Date seeded: October 1, 1982 Date harvested: September 15,1983

	VARIETY		YIELD BU/A	TEST WT LB./BU	% 2/ SURVIVAL	HEIGTH INCHES	LODGING %	LODGING SEVER.	% 3/ SMUT	LEAF RS SEVER.4/
ID 0245	II.60-155/CI14106//M		81.95a	57.45a	99.3	32.38	17.50	1.75	.00	45.00
CI 17902	WINDRIDGE		80.41a	57.63a	100.0	36.52a	2.00	.75	.00	15.00
OR 792	TRIUMPH/LANCER,sel.1		79.41a	57.65a	97.0	36.22a	8.75	2.75	.00	20.00
UT132569	WRR/CI13837//PI17343		79.34a	57.02	95.5	36.32a	70.75a	2.75	.00	47.50
ID 0291	BURT/CI12929//DLM/4/		76.99	56.30	95.0	30.41	5.00	1.50	.00	32.50
ID 3818	WA4765/3/BEZ//BURT/1		76.35	54.37b	100.0	32.09	2.50	.75	.25	5.00
ID 0260	DLM/PI173438//CLM///		73.81	58.95a	98.7	41.63a	99.00a	5.50	.00	62.50
WA 6816	ID5912/WA5866		72.75	55.90b	99.7	30.41	5.00	.50	.25	12.50
ORCR8107	ALBA/GNS//FN/BONORA6		72.25	57.93a	98.0	37.89a	2.50	.75	.00	42.50
ID 0259	JEFF///II-60-155/CI1		71.71	57.95a	99.7	30.31	51.75	3.50	.00	45.00
MT 77002	FRD/BEZ		71.42	57.73a	99.7	35.33a	7.50	1.00	.00	17.50
MT 77066	C81-9/WLT//CRT		70.36	57.75a	100.0	36.42a	17.50	2.50	.50	10.00
WA 7043	LIND sel.n		69.94	56.52	99.3	31.89	.00	.00	.00	62.50
WA 6820	GWB/127/GWB236//GWB2		67.76	57.45a	100.0	37.36	.00	.00	.00	27.50
UT132712	KR/GVE//RDT///IT/4/P		67.56	57.83a	100.0	36.12a	61.00a	3.25	.00	37.50
CI 17727	WESTON		67.55	58.98a	99.7	34.25a	3.25	.75	.00	5.00
ID 0242	SMA/TD//3*IT/PI17838		67.12	56.73	100.0	37.70a	37.50	4.00	.00	32.50
OR 7921	BEZ/SPRAGUE,sel.18-2		66.47	57.08	95.5	27.17	.00	.00	.00	5.00
WA 7047	LIND sel.e		66.10	56.63	98.7	30.71	.00	.00	.25	35.00
UT125327	DLM/PI173438//CLM/3/		65.16	56.50	100.0	33.66a	.00	.00	.00	5.00
OR 7925	CLARIFEN/WA5836,sel.		65.10	56.00b	98.0	25.00	.00	.00	.00	75.00
CI 13880	CREST	1/	64.15	56.73	99.7	27.85	27.50	1.50	.00	50.00
ID 0217	Ae87W-46/RANGER		63.91	58.05a	98.7	37.01a	53.50	3.50	.00	37.50
ID 0216	SMA/TD//3*IT/PI17838		62.36	55.87b	98.7	37.99a	80.25a	5.50	.00	17.50
CI 13844	WANSER		61.51	57.10	100.0	33.37a	2.00	.50	.00	30.00
CI 1442	KHARKOF		59.20	57.22	95.5	43.21a	93.25a	5.25	.25	12.50
ID 51021	BEZ//BURT/178303/3/A		54.09	58.15a	100.0	32.18	.00	.00	.00	60.00
ID 51022	BEZ//BURT/178303/3/A		53.50	56.58	100.0	37.11a	.00	.00	.25	30.00

Table 2 (con't)

VARIETY	YIELD BU/A	TEST WT LB./BU	% 2/ SURVIVAL	HEIGTH INCHES	LODGING %	LODGING SEVER.	% 3/ SMUT	LEAF RS SEVER.4
X	68.87	57.14	99.24	33.88	23.25	1.72	.06	31.34
F 5/	2.43**	14.68**	1.16	5.42**	10.02**	6.74**	.89	3.17**
S.E.X.	4.41	.26	1.05	1.87	10.09	.70	.14	11.13
L.S.D. (.05)	13.25	.72	2.94	5.25	28.39	1.96	.40	32.30
C.V. %	6.84	.45	137.87	5.51	43.40	40.51	219.19	35.52

1/ Check variety
2/ % plot surviving winter kill
3/ % smut = % TCK (Tilletia controversa Kohn) smut per plot by ocular ratins
4/ Average leaf rust infected area per plot. Leaf rust (Puccinia recondita)
5/ F value for variety comparison
**/ Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

Table _3__. Agronomic data from the Western Regional White Winter Wheat Nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT. in 1983. Random block design with four replications. Field No. E-2, plot size 32 sq.ft.

Date planted: September 21,1982 Date harvested: August 23,1983

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	MATURE DATE	HEIGTH INCHES	% 2/ SMUT	% LODG.	LODG. PREV.
ORCW8113	SFN//63189-66-71/BEZ	128.89a	57.50	159.50b	225.00	33.37	.37	.00	.00
WA 6698	SW92/6*0/3/T.SF/CTL/	124.24a	56.58	162.75	223.00	38.09	.00	.00	.00
OR 8188	HYS/NORCO//CAMA///SM	123.21a	57.60	160.50b	224.00	32.87	.12	.00	.00
OR 68007	HILL 81	121.62a	58.00	161.75b	223.00	37.89	.12	.00	.00
WA 6912	BVR/CI15923/NG9,VH07	118.30a	57.63	161.75b	225.00	34.06	.37	.00	.00
OR 7794	REW/LUKE sel.305	117.39	59.90a	160.50b	222.00	41.24a	.25	3.75	2.25a
WA 6696	DAWS/WA5829,VH079141	116.49	60.45a	161.75b	224.00	25.05b	.12	.00	.00
WA 7047	NORCO/VH72297,VH0807	115.75	55.40b	160.25b	222.00	33.66	.50a	.00	.00
CI 17149	DAWS	114.30	58.37a	162.75	225.00	35.53	.12	.00	.00
WA 6914	SCT/101//3469/PI1783	112.12	58.62a	160.75b	226.00	35.24	.12	.00	.00
OR 797	CI14482/NORD sel.E10	109.62	57.15	159.75b	217.00	34.84	.00	.00	.00
OR 7996	HYS/YAYLA//WA4995/3/	109.51	57.37	164.25	227.00	35.73	.00	24.75	1.00
CI 17596	STEPHENS	109.18	57.18	159.00b	223.00	32.87	.37	.00	.00
WA 6910	MARIS HUNTSMAN/VH745	109.09	57.45	162.75	224.00	35.53	.12	.00	.00
CI 17590	FARD	108.65	52.20b	159.75b	216.00	33.76	.12	.00	.00
ID745318	WA4765//BURT/PI17838	106.29	57.25	160.50b	223.00	35.14	.00	.00	.00
CI 17951	CREW	106.15	53.85b	162.50b	217.00	36.32	.00	.00	.00
CI 17909	LEWJAIN	105.99	57.77	164.50	228.00	32.48	.00	.00	.00
CI 13968	NUGAINES	105.95	58.65a	161.00b	224.00	32.97	.00	.00	.00
OR 835	1523DRC/RBS	105.06	57.60	164.00	226.00	35.43	.50a	.00	.00
WA 6915	SPRAGUE/LUKE//498,B7	103.44	55.87	161.50b	228.00	34.55	.00	6.25	.75
CI 14586	LUKE 1/	103.39	56.93	164.00	225.00	36.22	.00	22.50	.50
WA 6813	LUKE/VH76375	102.50	58.53a	162.00b	227.00	40.94a	.25	2.50	1.00
CI 17773	TYEE	98.82	51.85b	163.00	224.00	37.11	.00	.00	.00
OR CP04	1523DRC/RBS	96.72	57.30	164.75	225.00	34.25	.25	.00	.00
WA 6911	WA6240/NORCO,VJ08012	95.65	57.58	162.00b	232.00	32.28	.12	.00	.00
UC WW33	PHOENIX,WW33	94.51	57.20	153.00b	223.00	28.44b	.50a	.00	.00
ORCW8110	1523DRCdwf/YMH	88.18b	54.62b	163.00	222.00	34.25	.62a	.00	.00

Table 3. (cont'd)

			YIELD BU/A	TEST WT LB/BU	HEADING DATE	MATURE DATE	HEIGTH INCHES	% 2/ SMUT	% LODG.	LODG. PREV.
OR	7792	PAHA/OR6857 sel.204	87.61b	55.30b	161.50b	223.00	43.60a	.00	48.75a	4.50a
WA	7050	PI173467/GNS,sel.292	87.20b	51.17b	162.50b	218.00	32.58	.50a	.00	.00
CI	1442	KARKOF	86.15b	57.98	162.75	224.00	47.83a	.37	95.75a	7.75a
CI	11755	ELGIN	84.37b	55.30b	162.00b	216.00	44.68a	1.38a	50.00a	3.00a
WA	6819	CJFELUB/SPRAGUE3/	83.34b	53.02b	162.50b	222.00	35.04	.12	82.00a	7.50a
CI	13740	MORO	82.05b	54.20b	161.00b	222.00	43.01a	.00	31.00	2.00
OR	7956	DFC/68-23,OWW68109-1	81.00b	53.37b	164.25	228.00	34.74	.00	.00	.00
		X	104.08	56.48	161.71	.00	35.76	.21	10.49	.86
		F 3/	6.81**	19.00**	17.32**	.00	7.27**	2.91**	6.76**	12.87**
		S.E.X.	5.05	.51	.51	.00	1.64	.16	9.10	.55
		L.S.D.(.05)	14.16	1.44	1.44	.00	4.59	.46	25.53	1.54
		C.V. %	4.85	.91	.32	.00	4.57	77.21	86.75	63.37

1/ Check variety
2/ % Smut = % TCK (Tilletia controversa Kohn) smut per plot by ocular ratins
3/ F value for variety comparison
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

Heading and maturity dates are number of days from January 1.

Table 3a. Ten year summary of yields for the Western Regional White Winter Wheat Nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT 1974-1983.

CI or State No.	Variety	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	X	Sta. Yrs.	% Nusaines
CI 1442	Kharkof	27.7	37.4	61.1	50.7	16.9	78.1	55.5	40.7	59.7	86.2	51.4	10	66
CI 11755	Elgin	59.2	42.3	67.6	57.8	21.3	94.1	68.5	42.5	63.2	84.4	60.1	10	77
CI 13740	Moro	60.3	44.0	69.8	57.0	27.8	96.3	67.4	62.5	84.8	81.1	65.1	10	84
CI 13968	Nusaines	77.9	51.8	80.2	66.0	18.9	93.7	75.3	79.1	130.9	106.0	78.0	10	100
CI 17596	Stephens	81.2	52.3	82.1	60.6	23.4	100.2	99.3	79.8	119.0	109.2	80.7	10	104
CI 17590	Faro	85.4	53.5	74.9	65.2	25.4	94.2	80.6	66.5	124.9	108.7	77.9	10	100
CI 17419	Daws	89.0	56.3	92.8	68.7	22.9	--	--	90.9	130.8	114.3	83.2	8	109
OR 68007	Hill 81			92.1	75.5	25.1	94.4	100.4	84.0	133.3	121.6	90.8	8	112
CI 17909	Lewjain				70.2	34.2	104.8	109.7	85.3	130.5	106.0	91.5	7	112
ID 745318	WA4765//Burt/PI178383					25.3	99.4	105.9	75.9	132.2	106.3	90.8	6	105
CI 17951	Crew					30.1	102.9	93.1	72.6	118.2	106.2	87.2	6	104
CI 14586	Luke					30.0	114.2	--	83.1	140.5	103.4	94.2	5	91
CI 17773	Tyee						114.6	82.2	91.1	124.1	98.8	79.8	5	105
WA 6698	Allan Sel. A7815							107.7	54.0	122.3	124.2	102.1	4	103
OR 797	CI14482/Moro, Sel. E109							100.3	82.6	107.2	109.6	99.9	4	101
WA 6696	Daws/WA5829/VH078141							96.3	81.4	132.6	116.5	106.7	4	108
OR 7794	Rew/Luke/Sel., 305							91.9	79.8	112.0	117.4	100.3	4	101
WA 6913	Luke/VH76375								84.7	108.5	102.5	98.6	3	94
OR 7792	Paha/OR6857, Sel. 204								77.9	98.7	87.6	88.1	3	84
OR CW8113	SPN//63169-66-71/BEZ									138.5	128.9	133.7	2	113
WA 6912	BUR/CI15923/NGS,VH074									137.4	118.3	127.9	2	108
OR 7996	HYS/YAYLA/WA4995/3/									131.7	109.5	120.6	2	102
WA 6914	SCT/101//3469/178383									127.2	112.1	119.7	2	101
OR 7956	DCR/68,OWW68109-IM6,R									125.4	81.0	103.0	2	87
WA 6911	WA6240/NORCO,VJ08012									124.9	95.7	110.3	2	93
WA 6915	Sprague/Luke//498,B77									124.9	103.4	114.2	2	96
OR 835	1523 DRC/RBS									119.5	105.1	112.3	2	95
WA 6910	Maris Huntman/VH74521									118.9	109.1	114.0	2	96
OR CP04	1523 DRC/RBS									117.9	96.7	107.3	2	91
OR CW8110	1523 DRC DWT/YMH									99.5	88.2	93.9	2	79
WA 6819	CJ Club/Sprague									93.8	83.3	88.6	2	75
OR 8188	HYS/NORCO//CAMA///SM										123.2	123.2	1	116
WA 7047	NORCO/VH72297,VH0807										115.8	115.8	1	109
UC WW33	Phoenix, WW33										94.5	94.5	1	89
WA 7050	PI 173467/GNS, Sel 292										87.2	87.2	1	82

Table 4. Agronomic data from the Western Regional White Winter Wheat Nursery grown on the Lance Claridge farm at Kalispell,MT in 1983. Random block design, four replications. Plot size: 32 sq. ft.

Date seeded: October 1,1982 Date harvested: September 15,1983

	VARIETY		YIELD BU/A	TEST WT LBS/BU	% 2/ SURVIVAL	HEIGTH INCHES	LODGING %	LODGING SEVER.	% 3/ SHUT	LEAF RS4/ SEVER.
WA 7047	NORCO/VH72297,VH0807		96.32	55.70a	99.7	27.76	.00	.00	.25	40.00
OR 8188	HYS/NORCO//CAMA///SM		92.86	55.58a	96.3	27.95	.00	.00	.00	60.00
OR 68007	HILL 81		92.17	55.27	96.5	32.28a	.00	.00	.00	15.00
CI 14586	LUKE	1/	85.30	54.30	95.5	29.72	5.00	.25	.00	45.00
WA 7050	PI173467/GNS,sel.292		84.67	54.25	99.3	24.31b	.00	.00	.00	85.00a
OR 7794	REW/LUKE sel.305		84.30	57.18a	91.0	33.37a	13.75	2.00a	.00	45.00
ORCW8113	SPN//63189-66-71/BEZ		83.86	56.08a	92.7	28.84	.00	.00	.00	40.00
CI 17909	LEWJAIN		83.62	54.40	87.3	28.44	3.75	.50	.00	57.50
WA 6819	CJPELUB/SPRAGUE3/		83.26	54.05	98.0	29.92	2.50	1.50a	.00	45.00
CI 17951	CREW		81.60	54.62	96.7	28.05	.00	.00	.00	37.50
CI 17596	STEPHENS		80.39	55.58a	96.3	26.38b	.00	.00	.00	32.50
WA 6910	MARIS HUNTSMAN/VH745		80.12	54.15	85.2	28.44	2.50	.75	.00	10.00
OR 7792	PAHA/OR6857 sel.204		79.82	55.33a	94.7	32.09	.00	.00	.00	55.00
WA 6698	SW92/6*0/3/T.SP/CTL/		78.05	56.55a	91.2	29.82	.00	.00	.00	15.00
OR 797	CI14482/MORO sel.E10		75.09	55.18	89.5	30.31	.00	.00	.00	75.00
OR 835	1523DRC/RBS		73.40	53.45	69.2b	30.81	.00	.00	.00	22.50
OR 7956	DRC/68-23,OWW68109-1		72.85	50.83b	71.2b	30.71	.00	.00	.00	5.00
CI 13740	MORO		71.81	53.60	96.7	30.91	.00	.00	.00	72.50
ID745318	WA4765//BURT/PI17838		71.80	55.30a	80.5	29.33	.00	.00	.00	12.50
CI 11755	ELGIN		70.66b	54.43	90.7	31.79	.00	.00	.75	75.00
WA 6914	SCT/101//3469/PI1783		68.24b	55.40a	89.5	27.76	.00	.00	.00	52.50
CI 13968	NUGAINES		68.19b	55.38a	83.0	27.76	.00	.00	.00	60.00
CI 17149	DAWS		66.55b	55.97a	87.0	27.85	.00	.00	.00	37.50
CI 17590	FARO		66.51b	53.02b	92.3	25.49b	.00	.00	.00	82.50a
OR 7996	HYS/YAYLA//WA4995/3/		66.50b	54.05	52.5b	31.40	40.00a	3.00a	.00	35.00
CI 1442	KARKOF		65.85b	56.48a	96.5	46.36a	97.00a	6.75a	.25	10.00
WA 6696	DAWS/WA5829,VH079141		62.75b	56.65a	83.7	26.57b	.00	.00	.00	75.00
WA 6813	LUKE/VH76375		61.25b	54.85	87.5	33.66a	1.25	.25	.00	47.50
OR CP04	1523DRC/RBS		61.09b	52.70b	52.5b	28.44	.00	.00	.00	15.00

Table 4 . (con't)

	VARIETY	YIELD BU/A	TEST WT LBS/BU	% SURVIVAL 2/	HEIGTH INCHES	LODGING %	LODGING SEVER.	% SMUT 3/	LEAF RS SEVER. 4/
WA 6912	BVR/CI15923/NGS,VH07	57.92b	51.87b	66.2b	27.95	.00	.00	.00	31.50
WA 6911	WA6240/NORCO,VJ08012	52.84b	53.70	45.0b	29.23	.00	.00	.00	65.00
ORCW8110	1523DRCdwf/YMH	50.94b	52.83b	63.0b	27.95	12.50	.75	.00	22.50
CI 17773	TYEE	50.02b	53.27b	73.7b	27.85	7.50	.50	.00	92.50a
WA 6915	SPRAGUE/LUKE//498,B7	47.19b	52.27b	41.2b	27.17b	37.50a	3.25a	.00	47.50
UC WW33	PHOENIX,WW33	46.81b	56.42a	87.2	24.61b	.00	.00	.00	80.00a
	$\bar{X}$	71.85	54.59	83.44	29.47	6.38	.56	.23	45.69
	F 5/	6.68**	17.56**	7.97**	16.83**	17.12**	10.50**	1.00	5.44**
	S.E.X.	5.09	.35	5.71	.90	4.43	.42	1.27	10.53
	L.S.D. (.05)	14.27	.99	16.02	2.53	12.44	1.17	3.64	30.28
	C.V. %	7.08	.65	34.49	3.06	69.52	74.97	54.14	23.06

1/ Check variety
2/ % of plot survival from winter kill
3/ % smut = % TCK (Tilletia controversa Kuhn) smut per plot by ocular rating
4/ Leaf rust (Puccinia recondita) severity, average area of leaf surface infected per plot
5/ F value for variety comparisons
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level

A/

Table 5. Agronomic data from the off station winter wheat nursery grown on the Bob Stevens farm, Paradise, MT in 1982-83. Random block design, four replications.

Planting date: October 8,1982
Harvest date: August 17,1983
Size of plot: 32 sq. ft.

CI or state number	VARIETY	YIELD BU/A	TEST WT. LBS/BU	HEIGTH INCHES
CI 17773	Tsee	110.1	54.95b	37.50
OR 68007	Yamhill/Hyslop	106.0	56.75b	38.70
CI 17909	LewJain	102.2	59.05a	37.20
CI 14586	Luke 1/	101.4	58.22	36.83
OR 792	Triumph/Lancer	100.9	58.62	41.90a
CI 17590	Faro	100.8	55.25b	35.35
CI 17956	Stephens	99.7	56.65b	33.20b
WA 6696	Daws/WA5829,VH07	96.7	59.08a	34.45b
ID754318	WA4765//Burt/PI17	94.3	56.38b	35.15
CI 17149	Daws	91.1	57.85	33.28b
MT 77066	C 61-9/WLT/CRT	89.2b	58.70a	46.27a
WA 6911	WA6240/Norco,VJ.	89.1b	57.98	34.43b
CI 17902	Winridge	86.2b	58.58	45.48a
ID 3518	WA4765/3/Bez//Burt	84.5b	56.75b	33.20b
CI 13880	Crest	84.5b	57.85	40.75a
CI 17727	Weston	83.5b	60.42a	44.70a

SUMMARY STATISTICS:

OVERALL MEAN	95.04	57.69	38.02
F-RATIO TRTS	3.844**	75.12**	30.46**
SE TRT MEANS	4.259	.1695	.8153
CV (SE/MEAN)	4.481	.2938	2.144
LSD (0.05)	12.13	.4829	2.322

1/ . Check variety
2/ F-value for variety comparison
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level
** Indicates statistical significance at the .01 level

Table 6. Asronomic data from the off station winter wheat nursery srown on the Jaye Johnson farm, Lake County in 1982-83. Random block desisn with four replications.

Plantins date: October 6, 1982
Harvest date: Ausust 7,1983
Size of plot: 32 sq. ft.

CI or State Number			YIELD BU/ A	TEST WT. LBS/ BU	HEIGTH INCHES
CI 17902	WINRIDGE		73.15	59.15	33.77a
ID745318	WA 4765/BURT		72.77	56.75b	28.92
CI 17773	TYEE		72.70	54.50b	28.33
CI 14586	LUKE	1/	70.20	59.69	30.80
CI 17909	LEWJAIN		69.20	60.52a	29.20
CI 17596	STEPHENS		69.05	56.73b	29.13
MT 77066	C 61-9/WLT/CRT		68.05	58.33b	34.68a
CI 17419	DAWS		66.87	58.25b	29.33
OR 792	TRIUMPH/LANCER		66.63	59.55b	34.55a
WA 6696	DAWS/WA 5829		65.45	58.85b	29.85
OR 68007	YAMHILL/HYSLOP		65.10	56.97b	30.50
CI 13880	CREST		64.22	58.62b	33.35
CI 17590	FARO		64.02	54.60b	28.42
WA 6911	WA 6240/NORCO.		63.18	59.17	30.30
CI 17727	WESTON		60.95	60.10	34.72a
ID 3518	WA 4765/3/BURT		58.40	57.40b	27.75b

SUMMARY STATISTICS:

OVERALL MEAN	66.87	58.07	30.85
F-RATIO TRTS	1.331	53.51**	6.706**
SE TRT MEANS	3.689	.2453	.9624
CV (SE/MEAN)	5.516	.4224	3.120
LSD (.05)	NS	.6988	2.741

1/ Check variety
2/ F value for variety comparison
a/ Values sisnificantly sreater than the check at the .05 level
b/ Values sisnificantly less than the check at the .05 level
** Indicates statistical sisnificance at the .01 level

Table 7. Summary of data from winter wheat nurseries grown in western Montana in 1983.

C.I. or State NO.	Variety	Yield (bu/acre) 1	2	3	4	$\bar{x}$	Test Wt. (lbs/bu) 1	2	3	4	$\bar{x}$	Height (inches) 1	2	3	4	$\bar{x}$
CI 17773	Tyee	110.1	77.7	98.8	50.0	84.0	54.95	54.50	51.85	53.27	53.6	37.50	28.33	37.11	27.85	32.7
OR 68007	Yamhill/ Hyslop	106.0	65.1	121.6	92.2	96.2	56.75	56.97	58.00	55.27	56.7	38.70	30.50	37.89	32.38	34.8
CI 17909	Lewjain	102.2	69.2	106.0	83.6	90.3	59.05	60.52	57.77	54.40	57.9	37.20	29.20	32.48	28.44	31.8
CI 14586	Luke	101.4	70.2	103.4	85.3	90.1	58.22	59.68	56.90	54.30	59.3	36.83	30.80	36.22	29.72	33.4
OR 792	Triumph/ Lancer	100.9	66.6	101.7	79.4	87.2	58.62	59.55	58.43	57.65	58.6	41.90	34.55	38.58	36.22	37.8
CI 17590	Faro	100.8	64.0	108.7	66.5	85.0	55.25	54.60	52.20	53.02	53.8	35.35	28.42	33.76	25.49	30.8
CI 17956	Stephens Daws/ WA5829	99.7	69.1	109.2	80.4	89.6	56.65	56.73	57.18	55.58	56.3	33.20	29.13	32.87	26.38	30.4
WA 6696	VH07	96.7	65.5	116.5	62.8	85.4	59.08	58.85	60.45	56.65	58.6	34.45	29.85	25.05	26.57	29.0
ID 754318	WA4765// Burt PI17	94.3	72.8	106.3	71.8	88.1	56.38	56.75	57.25	55.30	56.4	35.15	28.92	35.14	29.33	32.1
CI 17149	Daws	91.1	66.9	114.3	66.6	84.7	57.85	58.25	58.37	55.96	57.6	33.28	29.33	35.53	27.85	31.5
MT 77066	C61-9/WLT/ CRT	89.2	68.1	97.3	70.4	81.3	58.70	58.33	59.62	57.75	58.6	46.27	34.68	40.26	36.42	39.4
WA 6911	WA6240/ Norco J.J.	89.1	63.2	95.7	52.8	75.2	57.98	59.17	57.58	53.70	57.1	34.43	30.30	32.28	29.23	31.6
CI 17902	Winridge	86.2	73.2	101.6	80.4	85.3	58.58	59.15	59.77	57.63	58.8	45.48	33.77	43.01	36.52	39.7
ID 3518	WA4765/3/ BEZ//Burt	84.5	58.4	92.4	76.4	77.9	56.75	57.40	55.75	54.37	56.1	33.20	27.75	33.86	32.09	31.7
CI 13880	Crest	84.5	64.2	76.1	64.2	72.2	57.85	58.62	55.35	56.73	57.1	40.75	33.35	37.89	27.85	35.0
CI 17727	Weston	83.5	61.0	93.0	67.6	76.2	60.43	60.10	60.45	58.98	60.0	44.70	34.72	43.80	34.25	39.2
	$\bar{x}$	95.04	66.87				57.69	58.07				38.02	30.85			
	F 5/	38.4**	1.33				75.12**	53.51**				30.46**	6.71			
	S.E.$\bar{x}$	4.259	3.69				.1695	.245				.815	.962			
	L.S.D.(.05)	4.481	5.52				.294	.422				2.14	3.12			
	C.V. %	12.13	10.51				.483	.699				2.32	2.741			

1/ Sanders County
2/ Lake County
3/ Kalispell, MT
4/ Stillwater Location
5/ F - value for variety comparisons

PROJECT TITLE: Dwarf Bunt Tillage Study (1983)

PERSONNEL: Vern Stewart, Jim Hoffmann (USDA)
Allen Taylor, Don Mathre (PSS-MSU)

SUMMARY:

The first year of tillage practices was completed this fall and winter wheat was seeded. Uniform emergence was observed in all plots with the no-till plots being one to two days later.

INTRODUCTION:

The primary objectives of this research are to study the long term effects of tillage and management practices on the incidence and perpetuation of dwarf smut and its effect on winter wheat yields.

Five different tillage methods are being evaluated over a 5 to 10 year period. They are described in Table 1. Wanser, a very susceptible wheat variety to dwarf smut was used in the study. In the fall of 1982 the plots for the 1983 seeding were marked out. All plots were inoculated using "smutty heads" collected in an adjacent field. Tillage operations and herbicide applications were made as described in Table 1.

Winter wheat (Wanser) was seeded in the fall of 1983. Plots for the 1984 seeding were laid out in an area in which Wanser wheat was grown in 1983.

RESULTS:

Herbicide used for weed control in the no-till and minimum-till plots was not as effective as we would have anticipated, however it was satisfactory. Uniform emergence was noted in all treatments, however the no-till plots were one to two days later. These observations were made in October, 1983.

Table 1. Description of techniques

1. Conventional Tillage I

   Fall plow (after harvest)
   Disk, rod weed, and harrow during fallow period
   Prepare seedbed for fall seeding

2. Conventional Tillage II

   Spring plow
   Disk, rod weed, harrow during fallow period
   Prepare seedbed for fall seeding

3. Minimum-Till

   Disk in fall, use herbicides to control weeds during season
   Disk, harrow and seed in fall

4. Claridge Technique

   Use one-way
   Disk following one-way, keep black during summer
   Rod weed to finish seedbed

5. No-till

   Control weeds using herbicides as needed during fallow period
   Seed with Melroe minimum-til drill

TITLE: Evaluation of Ethephon on Spring Barley Varieties (1983)

PERSONNEL: Vern R. Stewart and Todd K. Keener

SUMMARY:

Applications of the growth regulator ethephon did reduce lodging in three spring barley varieties. High rates of ethephon (.375 ai/a) plus surfactant reduced height and yields in some varieties, and reduced lodging. The addition of a surfactant to ethephon enhanced activity of the product which reduced height, peduncle length, percent plump and test weight. However, the treatments without surfactants did not adversely effect test weights, percent plump and peduncle length.

Significant differences were recorded between varieties in every parameter measured but there was no variety treatment interaction that was statistically significant.

INTRODUCTION:

Ethephon, a growth regulator, was evaluated in spring barley as an aid in the control of lodging. Ethephon was combined with various adjuvants to determine the effect of these products and their efficacy on three spring barley varieties (Clark, Ingrid, Menuet). The three varieties were planted in strips 12' wide, 100' long with a 12' International press drill. Chemical treatments were replicated four times in a strip plot design. Applications were made in the flag leaf stage of growth (stages 8-10) with a research type tractor mounted sprayer. Agronomic readings were made throughout the growing season. The experiment was harvested with a Hege plot combine.

RESULTS:

Climatic conditions during the 1983 growing season provided a good opportunity to evaluate ethephon. Two heavy rainstorms during the season caused severe lodging of most grain fields in the valley.

Varieties were statistically different in yields, with Menuet being the highest yielding variety. All treatments were higher in yields than the check, however the differences were not statistically significant. It was noted that the addition of the surfactant to ethephon (.375 lb ai/a) did reduced yields when compared with ethephon treatments without the surfactant.

Test weights were found to be statistically different because of the variety and treatment. Ethephon plus the surfactant reduce test weight below the check as much as 2.2 lbs/bu, with the higher rate of ethephon causing more reduction than the .25 lb ai/a. Ethephon used alone did not reduce test weights.

The percent plump between varieties was highly significant. It was also significant between treatments. The addition of the surfactant to ethephon caused a reduction in plumpness and the reduction was greater at the higher level of ethephon.

Results (con't)

The addition of the surfactant reduced heights significantly below the check. However, when ethephon was applied alone this was not seen. Ethephon at .375 lb ai/a plus surfactant resulted in a reduction in height below the check.

Early in the season lodging was significantly different between treatments. It was less in plots treated with ethephon at .25 and .375 lbs ai/a plus a surfactant. However, without the surfactant there was less lodging in the ethephon treated plots than the check, but the difference was non-significant. At the end of the season lodging difference could not be seen because of the effect of the wind and rain.

There was slight reduction in the length of the peduncles (length of stem from top of the flag leaf to bottom of the head) at .375 lb ai/a rate with and without the surfactant. However, these differences were not statistically significant.

Kernel counts were found to be significantly different between varieties. No differences were found between treatments in this experiment. Table 1.

Table __1__. Agronomic data from the Ethephon spring barley variety study, Northwestern Agricultural Research Center, Kalispell, MT in 1983. Strip plot design, four replications. Field Y-6. Plot size 48 sq. ft.

Date planted: May 22, 1983 Date harvested: August 26,1983

Treatment	Rate	YIELD for spring barley Menuet	Clark	Ingrid	X
Ethephon	.25	152.1	100.0	104.1	118.7
Ethephon	.375	153.1	105.8	109.2	122.9
Ethephon + surfactant	.25 + .5% v/v	147.4	102.0	106.2	118.5
Ethephon + surfactant	.375 + .5% v/v	144.7	95.0	97.3	112.3
Ethephon + sugar	.25 + 5.0	150.1	102.7	93.9	115.6
Ethephon + pinolene	.25 + 1 pt	153.9	97.2	95.7	115.6
Ethephon + Am. thiocyan.	.25 + 1.0	156.8	101.5	111.9	123.4
Check	---	138.8	92.0	101.6	110.8
	$\bar{X}$	149.6	99.5	102.5	(117.2)

Treatment	Rate	Test Weights for spring barley Menuet	Clark	Ingrid	X
Ethephon	.25	50.9	44.7	46.6	47.4
Ethephon	.375	50.5	44.8	46.5	47.3
Ethephon + surfactant	.25 + .5% v	50.0	43.2	46.1	46.4
Ethephon + surfactant	.375 + .5% v	49.3	41.6	44.4	45.1
Ethephon + sugar	.25 + 5.0	50.5	44.9	45.7	47.0
Ethephon + pinolene	.25 + 1 pt	50.7	44.4	45.9	47.0
Ethephon + Am. thiocyan.	.25 + 1.0	50.7	45.0	46.2	47.3
Check	---	50.3	45.5	46.0	47.3
	$\bar{X}$	50.4	44.3	45.9	(46.9)

Table 1. Ethephon on spring barley (cont'd)

Treatment *	Rate	% Plump for spring barley Manuet	Clark	Ingrid	X
Ethephon	.25	88.3	53.7	55.8	65.9
Ethephon	.375	90.8	54.3	63.5	69.5
Ethephon + surfactant	.25 + .5% v	88.3	46.8	56.0	63.7
Ethephon + surfactant	.375 + .5% v	82.3	42.0	46.8	57.0
Ethephon + sugar	.25 + 5.0	89.5	53.4	50.0	64.3
Ethephon + pinolene	.25 + 1 pt	90.0	47.0	55.0	64.0
Ethephon + Am. thiocyan.	.25 + 1.0	89.2	53.5	55.5	66.0
Check	---	87.8	59.8	50.3	65.8
	$\bar{X}$	88.2	51.3	54.1	(64.5)

Treatment *	Rate	Height for spring barley Manuet	Clark	Ingrid	X
Ethephon	.25	33.5	37.8	34.0	35.1
Ethephon	.375	33.0	38.8	33.8	35.2
Ethephon + surfactant	.25 + .5% v	31.3	37.3	34.0	34.2
Ethephon + surfactant	.375 + .5% v	32.0	35.8	33.5	33.8
Ethephon + sugar	.25 + 5.0	35.0	38.3	36.3	36.5
Ethephon + pinolene	.25 + 1 pt	34.0	37.5	36.5	36.0
Ethephon + Am. thiocyan.	.25 + 1.0	34.0	37.5	35.0	35.5
Check	---	34.5	40.0	37.3	37.3
	$\bar{X}$	33.4	37.9	35.1	(35.5)

Table 1. Ethephon on sprins barley (cont'd)

* Treatment	Rate	Lodsins severity for sprins barley 1/ Menuet	Clark	Insrid	X
Ethephon	.25	0.0	7.0	5.0	4.0
Ethephon	.375	0.0	7.6	4.3	4.0
Ethephon + surfactant	.25 + .5% v	0.0	5.0	1.3	2.1
Ethephon + surfactant	.375 + .5% v	0.0	3.5	3.0	1.6
Ethephon + susar	.25 + 5.0	0.0	7.0	5.3	4.1
Ethephon + pinolene	.25 + 1 pt	0.0	7.1	3.8	3.6
Ethephon + Am. thiocyan.	.25 + 1.0	0.0	6.6	3.8	3.5
Check	---	0.0	8.8	5.3	4.7
	$\bar{X}$	0.0	6.6	4.0	(3.5)

* Treatment	Rate	Lodsins % for sprins barley 2/ Menuet	Clark	Insrid	X
Ethephon	.25	0.0	61.3	31.1	30.8
Ethephon	.375	0.0	86.0	36.3	40.7
Ethephon + surfactant	.25 + .5% v	0.0	27.5	1.3	9.6
Ethephon + surfactant	.375 + .5% v	0.0	12.5	7.5	6.7
Ethephon + susar	.25 + 5.0	0.0	80.0	41.3	15.2
Ethephon + pinolene	.25 + 1 pt	0.0	66.3	11.3	25.9
Ethephon + Am. thiocyan.	.25 + 1.0	0.0	48.8	20.0	22.9
Check	---	0.0	94.8	51.3	48.7
	$\bar{X}$	0.0	59.7	25.0	(28.2)

Table ___1___. Ethephon on spring barley (cont'd)

Treatment *	Rate	Peduncle length for spring barley 3/ Menuet	Clark	Ingrid	X
Ethephon	.25	11.9	8.9	8.8	9.9
Ethephon	.375	11.1	5.8	7.3	8.1
Ethephon + surfactant	.25 + .5% v	11.1	8.6	8.8	9.5
Ethephon + surfactant	.375 + .5% v	9.5	7.6	9.4	8.8
Ethephon + sugar	.25 + 5.0	11.6	6.3	7.8	8.6
Ethephon + pinolene	.25 + 1 pt	12.1	7.8	7.5	9.1
Ethephon + Am. thiocyan.	.25 + 1.0	11.5	5.6	7.5	8.2
Check	---	12.4	7.1	8.1	9.2
	$\bar{X}$	11.4	7.2	8.2	(8.9)

Treatment *	Rate	Kernal count for spring barley 4/ Menuet	Clark	Ingrid	X
Ethephon	.25	24.6	20.6	21.1	22.1
Ethephon	.375	24.4	20.2	21.5	20.7
Ethephon + surfactant	.25 + .5% v	23.9	21.3	21.9	22.4
Ethephon + surfactant	.375 + .5% v	21.5	18.5	20.8	20.3
Ethephon + sugar	.25 + 5.0	23.6	19.2	20.8	21.2
Ethephon + pinolene	.25 + 1 pt	24.5	20.3	21.5	22.1
Ethephon + Am. thiocyan.	.25 + 1.0	23.7	20.3	21.8	21.9
Check	---	24.4	19.8	20.8	21.7
	$\bar{X}$	23.8	20.0	21.3	(21.7)

Table 1. (con't)

Footnotes for Ethephon study on spring barley (cont'd)

* Note: Surfactant used was X-77 at .50 % v/v , sugar applied in a spray solution at 5 # per acre , Pinolene (wetting agent)used at pt/ Am. thiocyan. = ammonium thiocyanate (a growth regulator) used a 1.0 lb/A.

1/ Lodging severity: 0-9 scale, 0 = no lodging, 9 = lodged 90° from perpendicular (grain lodged to ground).

2/ Lodging percent: percent of plot lodged

3/ Peduncle length: measurement of stem from flag leaf to base of head

4/ Kernel count: average number of kernels per head (10 heads counted at random).

Application Data:	Date	air temp	soil temp	wind	humidity	weather
		°F	°F			
	6-17-83	71	64	0-3mph	19 %	Prtly cldy