THIRTY-SIXTH ANNUAL REPORT

1984

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

4570 Montana 35
Kalispell, Montana 59901

Prepared by

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Professor of Agronomy and Superintendent

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Associate Professor, Agronomy

Todd K. Keener
Ag. Research Specialist I

Louise S. Prestbye
Ag. Research Technician II

ADMINISTRATION 750

The Administration Project at the Northwestern Agricultural Research Center includes expenses for the overall operation of the center, personnel and office equipment purchased. Recorded in this report is a record of staff and other employees as shown below.

Full-time Staff Members

Vern R. Stewart - Superintenden & Prof. of Agronomy began April 1952
Leon E. Welty - Associate Professor began January 1973
Oscar Buller - Farm/Ranch Hand II began January 1984
Jeanette Calbick - Secretary began September 1963
Gary Haaven - Agricultural Research Technician I began April 1982
Todd Keener - Agricultural Research Technician II began March 1978
- Agricultural Research Specialist I promoted April 1984
Louise Prestbye - Agricultural Research Technician II began May 1983

Student Employees

Kristi Carda (June 11 thru Septmber 12)
Randy Cowan (June 11 through September 10)
Roger Hybner (June 18 thru September 14)
Wanda Iverson (June 1 thru September 7)
Cliff Nichols (June 11 thru August 14)
Amy Wilcox (April 14 thru September 13)
Karl Woodmansey (June 11 thru August 15)

Part-time hourly employees

Brian Boltman
Linda Coy
Craig Fischer
Robbin Glazier
Robert Lentz
Robert Sharp
Glen Thompson
Glenn Wright

A telecommunications system was installed in the office. We now have a total of seven telephones, one at each desk and one in the computer room. There are three lines coming into the office with one line being used exclusively for the computer. This sytem has enhanced intercommunication between offices. The total cost was $2066 (G&C Funds)

To enhance making slides from the IBM-PC computer a Nikon FG 35 mm camera, Sigma 75-300 telephoto lens and case were purchased. This camera will also be used for taking pictures of field plots. Total cost $522 (State Funds)

ACTIVITIES FOR 1984:

Date	Activity	Staff	Location
January			
9	Advisory Committee Planning Meeting	Stewart	Missoula
13	Advisory Council	Stewart	Kalispell
19	N.W. & W. Agric. Res. Cnt. Adv. Comm.	Stewart	Allentown
		Welty	Allentown
20	Ag Chamber of Commerce	Stewart	Kalispell
30	Superintendent's Meeting	Stewart	Bozeman
February			
2	Planning Conference	Stewart	Bozeman
		Welty	Bozeman
8-9	Weed Science Society of America	Stewart	Miami, FL
14	WRCC-52	Stewart	Spokane, WA
		Welty	Spokane, WA
15	TCK Meeting	Stewart	Pullman, WA
17	Ag Chamber of Commerce	Stewart	Kalispell
20	Wild Oat Panel	Stewart	Kalispell
21	Equity Supply Breakfast meeting	Stewart	Kalispell
		Welty	Kalispell
22	Farm Show Banquet	Stewart	Kalispell
23	Farm Show	Stewart	Kalispell
		Welty	Kalispell
March			
7	Ag Chemical meeting	Stewart	Somers
9	County Agents Up-Dating Meeting	Stewart	Allentown
		Welty	Allentown
13-15	WSWS Meetings	Stewart	Spokane, WA
19	Ag Day Luncheon	Stewart	Kalispell
21-22	CSRS Review of P&SS	Stewart	Bozeman
23	Farmers Union - Monsanto Chem. Luncheon	Stewart	Kalispell
27	FFA Advisory Committee Meeting	Stewart	Kalispell
	Talk for FFA Chapter	Stewart	Kalispell
April			
24	FFA Banquest	Stewart	Kalispell
May			
11	Eastside Grange (Talk)	Stewart	Creston
June			
11	Stauffer Chemical Tour	Stewart	Washington & Idaho

Activities for 1984 (con't):

Date	Activity	Staff	Location
July			
18	Monsanto Chemical Tour	Stewart	Creston
20	Make radio and TV tapes	Stewart	Missoula
25	Field Day	Stewart	Creston
		Welty	Creston
	Fertilizer Advisory Meeting	Stewart	Kalispell
26	Dean's Statewide Advisory Council	Stewart	Creston
		Welty	Creston
27	Foundation Seed Committee	Stewart	Kalispell
27	Summer Staff Conference	Stewart	Creston
		Welty	Creston
September			
5	Fertilizer Advisory Committee Meeting	Stewart	Great Falls
27-28	Superintendent's Retreat	Stewart	Lewistown
October			
15	CARE Meeting	Stewart	Kalispell
		Welty	Kalispell
	CARE Meeting	Stewart	Eureka
16	CARE Meeting	Stewart	Plains
	CARE Meeting	Stewart	Ronan
17	CARE Meeting	Stewart	Missoula
November			
15	Potato Growers Seminar	Stewart	Kalispell
16	Ag Committee Chamber of Commerce	Stewart	Kalispell
26-29	Western Society of Crop Science	Stewart	Las Vegas, NV
December			
10-11	Research Center Association Meeting	Stewart	Lewistown
		Welty	Lewistown
10	Art Dubbs' Retirement Party	Stewart	Lewistown
		Welty	Lewistown
11	Promotion and Tenure Committee	Stewart	Bozeman
12	Variety Recommendation Meeting	Stewart	Bozeman
		Welty	Bozeman
	Superintendent's meeting	Stewart	Bozeman
21	Ag Committee Chamber of Commerce	Stewart	Kalispell

VISITORS:

Date	Visitor	Representing	Address
February			
23	Leland Driggs	Quirk Cattle Co.	Eureka
March			
8	Wanda Iverson	Job Applicant	Whitefish
9	Amy Wilcox	Job Applicant	Kalispell
	Virginia Wilbur	Job Applicant	Kalispell
17	Myron Mast	Farmer	Kalispell
23	Karl Woodmansey	Job Applicant	Great Falls
26	Lois & Al Hook	Farmers	Col. Falls
30	Nancy Callan	WARC-Horticulturist	Corvallis
April			
4	Ron DeYong	ASCS	Kalispell
6	Pat & Bill Larsen	Ag. Engineering - MSU	Bozeman
15	Jane & Tom Hoff		Kalispell
16	Charles McKinley	Farmer	Kalispell
17	Mark Lalum	Vo-Ag Teacher	Kalispell
May			
1	Cory Oftedahl	Job Applicant	Kalispell
9	Dan Burkhart	Granduate Student -MSU	Bozeman
	Ed Davis	Student	Bozeman
14	Phil Stricker	American Cyanimid	
21	Andy VanTeylingen	University Services-MSU	Bozeman
30	Gordon Westford	Union Carbide	Spokane, WA
	Al Luke	Union Carbide	Idaho Falls, ID
	Arne Hovin	Assoc. Dir. MAES-MSU	Bozeman
31	Jim Burton	Surveyor	Kalispell
June			
1	Mareike Reinhold	Plant Pathology-MSU	Bozeman
	Bernard Sally	Plant Pathology-MSU	Bozeman
	Art Jackson	Small Farmer	Swan Lake
	Katherine Doell	Small Farmer	Swan Lake
6	Tim Wiersum	SCS	Kalispell
7	Dan Burkhart	Graduate Student-MSU	Bozeman
15	Dr. & Mrs. Asleson	Retired	Bozeman
21	Dan Bitney	Insulation Co.	Kalispell
23	Clyde Pederson	Farmer	Kalispell
25	Dan Toya	Stauffer Chemicals	Blackfoot,ID
26	Susan Smith		Palo Alto,CA
	Bill Van	Equity Supply	Kalispell
29	Jim Adams	Monsanto	Great Falls
	Barkley Norby	Monsanto	Bismarck, ND

Visitors (con't)

July

1	Jim Buechle	Farmer	Kalispell
5	Phil Strickler	American Cyanamid	Fargo, ND
	Ted Parod	Pilot	Kalispell
	Hank Galpin	Pilot-Farmer	Kalispell
	Dr. Wyman Ryquist	Prof. of Agronomy	Lafayette, IN
	Mrs. Suneson	Retired	Polson
10	Brad Hagadorn	Daily Interlake	Kalispell
	Dewey Anderson	Cenex	Billings
12	Joan Speelman	Kalispell News	Kalispell
17	Mareika Reinhold	Plant Pathology-MSU	Bozeman
	Bernard Sally	Plant Pathology-MSU	Bozeman
	Katherine Lapp	Farmer	Kalispell
23	Morgan James	KCFW-TV	Kalispell
30	Bruce & Darlene Lyman	Travelers	Spokane, WA

August

5	Tom Holkeboer	U.S. Air Force	Atwater, CA
7	Dave Gill	Researcher	Geneva, NY
7	Steve Principio	Traveler	Cliften Sp.,NY
13	Harold Tutvedt	Farmer	Kalispell
	Dale Sonstelie	Farmer	Kalispell
	Walt Mangles	Farmer	Polson
15	Jim Morgan	Gustafson Chem.	Belgrade
	Will Kukart	Farmers Exchange	Stevensville
	Bob Smyth	Farmers Exchange	Stevensville
	Dewey Anderson	Cenex Seed	Billings
	Bill Vann	Equity Supply	Kalispell
	Dan Gorton	Equity Supply	Kalispell
	Bruce Huffine	Cenex	Polson
20	Any VanTeylingen	University Service-MSU	Bozeman
21	Al Luke	Union Carbide	Idaho Falls,ID
	Gordon Westford	Union Carbide	Spokane, WA
22	Art Jensen	American Cyanamid	Orinda, CA
	Janell Johnson	American Cyanamid	Twin Falls, ID
27	Jim Adams	Monsanto	Great Falls
	Barkley Norby	Monsanto	Bismarck, ND
30	Don Graham	Superintendent-WARC	Corvallis
31	Jo Clayton	Farmer	Bigfork
	Allen Taylor	Plant & Soil Science-MSU	Bozeman

September

12	Wes Tuma	Salesman	Kalispell
	Vickie Roath	Retired	Bigfork
	Bill Ambrose	Farmer	Kalispell
	John Sheldon	Farmer	Kalispell
13	Chuck Schweigert	Northrup King	Billings
17	Ray Ditterline	Plant & Soil Science-MSU	Bozeman
19	Jim Toft	Monsanto	Clinton

Visitors (con't)

October			
4	Jim Toft	Monsanto	Clinton
5	Dan Toya	Stauffer	Blackfoot,ID
19	Al Luke	Union Carbide	Idaho Falls, ID
24	Jay Yocum	Retired Farmer	Huntley, WY
November			
1	Walter Eisele	Farmer	Kalispell
7	Ken Hall	Pack & Co.	Kalispell
19	Jack Sonju	Sonju Seamless Raingutters	Kalispell
December			
6	Vonda Gould	Al Tell Communications	Kalispell
	Becky Sirucek	Al Tell Communications	Kalispell
14	Wayne Treweek	Treweek Construction	Kalispell
19	Andy VanTeylingen	University Services-MSU	Bozeman
27	Dale Sonstelie	Farmer	Kalispell
28	Julie Ruff	Former Employee	Houston, TX

GENERAL FARM 751

The General Farm Project supports all research projects. This includes capital items purchased and used in the total research program.

Items purchased in 1984 are as follows:

1. L275/4WD Kubota Tractor - Cost $6869 (State Funds)
2. Mohawk High Pressure Portable Washer - Cost $450 (State Funds)
3. John Deere Hay Baler - Cost $6099 (G&C and State Funds)
4. Three (3) - Bulk Flo Grain Tanks - Scafco/American Model 6602
   Cost - $1073 each for a total $3221 (State Funds)
5. Used International Self-propelled Combine, Model 715
   Cost $14200 (G&C and State Funds)
6. Portable Air Compressor (Emglo Portable Model L3A) Cost -
   $870 (G&C Funds)

PHYSICAL PLANT 752

The Physical Plant project covers anything that pertains to the maintenance of buildings and grounds at the research center.

In 1984 the remodeling of Residence I was undertaken. The living room was made into a bathroom and a dining area. The bathroom became a utility room. A new living room, 14' x 15', was added to the original structure. The kitchen was completely remodeled with new cupboards installed. New windows were installed in every room. The residence now measures 978 square feet. The remodeling was done by Gary Haaven, Ag. Res. Specialist and Oscar Buller, Farm/Ranch Hand II, employees at the research center.

Residence II had the front and back porches removed and concrete slabs were poured for floors. The existing roofs were retained to protect the concrete and provide shelter for the doors.

Both residences were resided and painted a light tan with dark brown trim. The Crops Research Building and Chemical Building were also painted.

An oil furnace was installed in the Crops Research Building and provides more heat for the central office. The sewer system was overhauled. The front storm door on the Crops Research Building was replaced with a dark brown, heavier, multipurpose door.

Gravel was added to the driveways.

A tool shed was built for the residents of Residence I from material left over from the other remodeling projects. The building is 8' x 12'.

All these improvements have enhanced the appearance of the research center and made the center more attractive for those passing by on Highway #35.

TABLE OF CONTENTS

Project No.		Page No.
	DISTRIBUTION	1
	CLIMATOLOGY	3
754	WEED CONTROL IN FARM CROPS	
	Chemicals used in herbicide studies 1983-84	15
	Chemical control of broadleaf weeds in small grains	17
	Broadleaf herbicide evaluation on spring barley	21
	Chorsulfuron/DPX-M6316 evaluation on spring wheat varieties	23
	Evaluation of new wild oat herbicides in Newana spring wheat	25
	The effect of preplant incorporated triallate (Fargo) on seven spring wheat varieties	27
	Evaluation of triallate (Fargo) applications and seeding depths on Newana spring wheat, 1984	31
	Semi-dormant herbicide applications to alfalfa	34
	Evaluation of herbicides on a new seeding of alfalfa	38
	Evaluation of several herbicide combinations in a new seeding of alfalfa	42
	Evaluation of herbicides on lentil yields and weed control	46
756	SMALL GRAIN PRODUCTION	
	Spring Barley	49
	Spring Oats	61
	Spring Wheat	67
	Winter Wheat	77
	Dwarf Bunt Tillage Study	87
	Small Grains Production (Growth Regulator)	89
	DuPont Growth Regulator Study	93
758	MISCELLANEOUS AND PULSE CROP PRODUCTION	
	Pulse and Oil Seed Variety Trials	95
	Nitrogen Economy Study	111

DISTRIBUTION OF THE
1984 NORTHWESTERN AGRICULTURAL RESEARCH CENTER REPORT

Copies	
2	Office of Director, Montana Agricultural Experiment Station
1	Plant and Soil Science Department
2	Renne Library - Montana State University
3	Research Staff at Northwestern Agricultural Research Center
11	County Extension Agents in Northwestern Montana

Program Coordinator - Bill Peterson
Deer Lodge - Kimberly Thompkins
Flathead - Darrell Fenner
Granite - Lyle Niederklein
Lake - G. Edward Bratton
Lincoln - Robert Wilson
Mineral - Wilfred Huot
Missoula - Gerald Marks
Powell - David Streufert
Ravalli - G. Robert Johnson
Sanders - Donald Nicholson

2	Northwest Montana Banks

First Interstate Bank of Kalispell
Western Montana National Bank - Missoula

1	Agricultural Stabilization and Conservation
1	Farmers Home Administration
1	Flathead Chapter Future Farmers of America
1	Soil Conservation Service
1	Federal Land Bank Association
5	Feed Mills

Co-op Supply Inc. - Ronan
Equity Supply Company - Kalispell
Farmers Union Exchange - Kalispell
Kalispell Feed & Grain Supply Inc. - Kalispell
Western Seed & Supply Company - Ronan

CLIMATOLOGICAL DATA
NORTHWESTERN AGRICULTURAL RESEARCH CENTER

Kalispell, MT

Northwestern Agricultural Research Center employees began recording the weather data in 1949 for the National Climatic Center, Ashville, NC. At 8:00 a.m. the maximum and minimum air temperature, soil temperatures (4" and 8") and precipitation are recorded.

Summary of the 1983-84 Crop Year

Days from September 1, 1983 through August 31, 1984 are included in this summary.

The overall mean temperature for this period was 43.0 degrees F with the average for all years recorded being 43.3 degrees F. December was the coldest month with a mean average temperature of 11.1 degrees F. Average over the years for December is 26.0 degrees F. The coldest day recorded was December 25 with 29 degrees below zero. After the cold spell in December the temperatures warmed up and averages for January, February and March were above normal. The remainder of the year was quite normal. The warmest day of the year was July 27 with 97 degrees F.

Precipitation was almost the same as the long term average of 19.44 inches. Total average precipitation recorded for this period is 19.93 inches. In May we received the most precipitation with 2.91 inches. This year the hay did not get wet before it was baled.

The last killing frost was June 2 which is about six days later than average. The first killing frost in the fall was September 13 which is average at this recording station. Therefore, there was a shorter growing season this year of 103 days whereas the average is 111 days.

Included in this report are several tables giving the weather for the crop year, September 1983 through August 1984. Also, you will find a detailed description of the weather since recording first began. Table 1 is a summary of climatic conditions for September 1983 through August 1984 (crop year). Summary Tables 2 through 5 give the average, minimum and maximum temperatures and total precipitation for the crop years 1949-50 through 1983-84. Table 6 gives the daily precipitation for September 1983 through August 1984. Tables 7 and 8 list the frost free periods and maximum and minimum temperatures for 1950 through 1984. Tables 9 and 10 include the average temperatures and precipitation for calendar years 1950 through 1984.

Table 1. Summary of climatic data by months for 1983-84 crop year (September thru August) and averages for the period 1949-83 at the Northwestern Agricultural Research Center, Kalispell, MT.

ITEM	Sept. 1983	Oct. 1983	Nov. 1983	Dec. 1983	Jan. 1984	Feb. 1984	Mar. 1984	Apr. 1984	May 1984	June 1984	July 1984	Aug. 1984	Total or Average
Precipitation (inches)													
Current Year	1.70	1.13	1.96	2.57	0.80	2.19	1.81	1.93	2.91	2.07	0.31	0.55	19.93
Avg. 1949 to 1983-84	1.49	1.36	1.43	1.71	1.58	1.18	1.11	1.41	2.21	2.87	1.46	1.63	19.44
Mean Temperature (F)													
Current Year	50.4	42.9	36.6	11.1	27.6	32.4	38.3	42.2	48.7	56.4	65.3	64.6	43.0
Avg. 1949 to 1983-84	53.7	43.5	32.9	26.0	21.9	28.3	33.5	42.9	51.5	58.2	64.0	63.0	43.3

Last killing frost in spring

1984	June 2 (32 degrees F)
Avg. 1949-84	May 26

First killing frost in fall

1984	September 13 (30 degrees F)
Avg. 1949-84	September 13

Frost Free Period

1984	103 days
Avg. 1949-84	111 days

Maximum summer temperature: 97 degrees F on July 27, 1984

Minimum winter temperature: 29 degrees F below zero on December 25, 1983

In this summary 32 degrees 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, 1984

Average temperature by month and year
Degrees Fahrenheit

YEAR	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	MEAN
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	25.2	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
1983-84	50.4	42.9	36.6	11.1	27.6	32.4	38.3	42.2	48.7	56.4	65.3	64.6	43.0
MEAN	53.7	43.5	32.9	26.1	21.9	28.3	33.5	42.9	51.5	58.3	64.0	63.0	

Mean temperature for all years = 43.29

Table 3. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1984

Average maximum temperature by month and year
Degrees Fahrfenheit

YEAR	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	MEAN
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	56.3
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	56.7
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
1983-84	65.1	56.0	43.7	19.9	34.6	40.8	46.8	54.2	60.4	69.1	82.8	83.3	54.7
MEAN	68.7	55.4	40.4	32.8	29.4	36.6	43.3	54.6	64.8	71.7	80.3	79.6	

Mean temperature for all years = 54.8

Table 4. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1984

Average minimum temperature by month and year
Degrees Fahrenheit

YEAR	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	MEAN
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
1959-51	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
1983-84	35.6	29.7	29.5	2.4	20.6	24.0	29.9	30.2	37.1	43.6	47.8	46.0	31.4
MEAN	38.6	31.6	25.3	19.3	14.4	20.0	23.7	31.1	38.1	44.7	47.7	46.4	

Mean temperature for all years = 31.7

Table 5. Summary of precipitation records at the Northwestern Agricultrual Reserch Center on a crop year basis, September 1, 1949 thru August 31, 1984.

Total precipitation in inches by month and year

YEAR	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	MEAN
1949-50	1.03	1.05	1.67	0.92	2.62	1.13	2.31	0.84	0.15	3.90	3.12	0.75	19.49
1950-51	0.52	2.30	1.16	2.48	0.94	1.29	0.62	2.32	3.77	2.26	1.03	2.86	21.55
1951-52	1.49	5.62	1.01	3.31	1.03	0.98	0.97	0.17	1.32	3.95	0.56	0.69	21.10
1952-53	0.13	0.05	0.60	0.98	1.84	1.14	0.98	2.07	2.00	3.31	T	1.62	14.72
1953-54	0.71	0.03	0.87	1.30	2.65	0.79	0.83	0.79	1.52	2.98	2.91	3.79	19.17
1954-55	1.09	0.54	1.00	0.43	1.00	1.31	0.44	0.82	1.18	1.86	3.08	0.00	12.75
1955-56	1.64	1.89	1.97	2.38	1.76	1.53	0.87	1.28	1.06	4.20	2.13	3.21	23.92
1956-57	1.16	1.10	0.53	0.96	1.47	1.14	0.75	1.22	1.75	2.51	0.52	0.78	13.89
1957-58	0.10	1.59	0.96	1.76	1.56	2.67	0.97	1.47	2.20	2.56	0.84	0.58	17.26
1958-59	1.99	1.16	2.90	2.77	1.95	1.33	0.75	1.62	4.10	1.75	T	0.91	21.23
1959-60	4.22	3.36	4.32	0.34	1.67	1.10	1.01	1.23	3.27	0.69	0.13	2.43	23.77
1960-61	0.55	1.44	1.72	1.24	0.65	1.46	1.96	2.26	4.02	1.45	0.76	0.64	18.15
1961-62	3.40	1.22	1.77	2.09	1.33	1.15	1.59	0.96	2.59	1.15	0.11	0.72	18.08
1962-63	0.58	1.85	1.31	0.91	1.69	1.21	0.85	1.07	0.57	5.00	1.44	2.10	18.58
1963-64	1.46	0.75	0.95	1.70	1.46	0.41	1.57	0.87	3.33	3.86	3.01	1.64	21.01
1964-65	2.27	0.85	1.62	3.62	2.25	0.64	0.24	2.55	0.81	2.30	1.15	4.74	23.04
1965-66	1.72	0.21	1.31	0.55	1.42	0.67	0.53	0.76	1.18	6.57	2.49	1.64	19.05
1966-67	0.79	1.34	3.33	1.68	1.50	0.62	1.27	0.99	1.30	2.53	0.02	0.01	15.38
1967-68	0.91	1.88	0.62	1.16	0.79	1.15	0.68	0.57	3.92	2.22	1.00	3.42	18.32
1968-69	4.51	2.39	1.59	3.12	3.05	0.75	0.69	1.39	1.19	5.21	0.70	0.09	24.68
1969-70	1.54	1.90	0.31	1.14	3.10	0.89	1.49	0.76	1.97	4.37	3.08	0.44	20.99
1970-71	1.79	1.38	1.75	0.99	1.84	0.77	0.69	0.58	2.45	4.42	1.31	1.11	19.08
1971-72	0.94	0.87	1.70	1.62	1.10	1.65	2.11	0.95	1.48	3.28	1.77	0.98	18.45
1972-73	1.38	1.84	0.80	2.19	0.52	0.56	0.70	0.45	1.13	2.14	0.01	0.63	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	0.62	20.35
1974-75	0.80	0.12	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	0.85	1.39	0.91	1.12	0.34	1.92	1.90	2.49	1.49	3.42	19.97
1976-77	0.96	0.62	0.73	0.86	0.83	0.71	1.40	0.41	2.90	0.52	3.60	1.50	15.04
1977-78	2.84	0.56	1.62	4.10	2.15	0.99	0.72	2.54	3.56	2.63	3.90	3.34	28.95
1978-79	1.90	0.15	0.96	0.91	1.70	1.45	0.82	2.33	2.67	1.23	0.40	1.79	16.31
1979-80	1.03	1.75	0.50	1.03	1.53	2.03	0.97	1.88	5.48	3.89	1.08	2.45	23.62
1980-81	1.20	0.83	0.78	2.58	1.81	1.85	2.17	1.75	3.86	4.70	1.17	0.96	23.66
1981-82	0.77	0.56	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	0.75	1.39	1.60	0.93	0.85	1.71	2.41	1.20	2.96	3.66	1.16	20.99
1983-84	1.70	1.13	1.96	2.57	0.80	2.19	1.81	1.93	2.91	2.07	0.31	0.55	19.93
MEAN	1.49	1.36	1.43	1.71	1.58	1.18	1.11	1.41	2.21	2.87	1.46	1.63	

Mean precipitation for all crop years = 19.43

Table 6. Precipitation by day for crop year, September 1, 1983 through August 31, 1984. Northwestern Agricultural Research Center, Kalispell, MT.

DATE	SEPT. 1983	OCT. 1983	NOV. 1983	DEC. 1983	JAN. 1984	FEB. 1984	MAR. 1984	APR. 1984	MAY 1984	JUNE 1984	JULY 1984	AUG. 1984
1			0.08		T		0.01		0.01			
2	0.30		0.11						0.08			
3	T		0.01	0.05	0.20		T		0.27			0.07
4	0.01	0.11	0.06		0.01		0.01		0.19			0.17
5	0.14	0.04	0.01		T			0.02	0.14	0.12		0.01
6	0.06		0.01	0.13				0.13	0.06	0.04		0.09
7	T		0.22	0.04	0.05			0.13	0.15	0.04	0.05	
8	0.05			0.40	0.02			0.22		0.02		
9	0.10	0.17		T				0.25		0.45		
10	0.02	0.33		0.34				0.03		0.10		
11	0.69		0.52	0.08	0.05		0.42	0.02	0.03			
12	0.14		0.06		0.05	T	0.05		0.11			
13	T		0.08	0.02	0.15		0.03	0.03				0.09
14	T	T				0.08	0.14		T			
15		0.03	0.14	0.02			T		0.38			
16		T			0.08	0.05	T		0.27	0.05		T
17		0.02		0.07		0.03	T	0.01				
18	0.08	0.28	0.05	0.01			0.10	0.38				T
19	0.03		0.05	0.60				0.29				0.05
20		T	0.12					0.40	0.29	0.03		
21		0.09	0.14		0.04	0.02	0.05		T	0.12		
22		0.02			0.02	0.28	0.48			1.09		
23		0.04	0.02	T	0.05	0.15		0.02	0.11	0.01		
24			0.02		0.05	T	0.04		0.08			0.02
25			0.22		0.01	1.50	0.20		0.17			
26			T	0.14		0.08	0.10		0.04			
27			0.04	0.22	0.01		0.14		0.30		0.09	
28	0.08		T	T	0.01				0.01		0.03	
29							0.04				0.01	
30				0.45							0.13	
31				T					0.22			0.05
TOTAL	1.70	1.13	1.96	2.57	0.80	2.19	1.81	1.93	2.91	2.07	0.31	0.55

Table 7. Frost free period at the Northwestern Agricultural Research Center from 1950 thru 1984.

YEAR	DATE LAST FREEZE	TEMPERATURE DEGREE 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
1984	June 2	32	Sept. 13	30	103
Mean for years	May 26	30	Sept. 13	30	111

Table 8. Temperature extremes at the Northwestern Agricultural Research Center, Kalispell, MT from 1950-1984.

YEAR	MINIMUM DATE	MINIMUM TEMPERATURE DEGREES F	MAXIMUM DATE	MAXIMUM 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	97
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
1984	Jan. 18	-14	July 27	97

Table 9. Summary of temperature records at the Northwestern Agricultural Research Center, January 1950 thru December 1984.

AVERAGE TEMPERATURE BY MONTH AND YEAR
DEGREES FAHRENHEIT

DATE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	MEAN
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	43.0
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	44.2
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
1984	27.6	32.4	38.3	42.2	48.7	56.4	65.3	64.6	49.5	40.0	32.6	20.6	43.2
MEAN	21.9	28.3	33.5	42.9	51.5	58.3	64.0	63.0	53.5	43.4	32.7	25.9	

Mean temperature for all years = 43.3

Mean temperature for all years =

Table 10. Summary of precipitation records at the Northwestern Agricultural Research Center, Kalispell, MT, January 1950 thru December 1984.

	Total Precipitation (inches) by Months and Years												
DATE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1950	2.62	1.13	2.31	0.84	0.15	3.90	3.12	0.75	0.52	2.30	1.16	2.48	21.28
1951	0.94	1.29	0.62	2.32	3.77	2.26	1.03	2.86	1.49	5.62	1.01	3.31	26.52
1952	1.03	0.98	0.97	0.17	1.32	3.95	0.56	0.69	0.13	0.05	0.60	0.98	11.43
1953	1.84	1.14	0.98	2.07	2.00	3.31	T	1.62	0.71	0.03	0.87	1.30	15.87
1954	2.65	0.79	0.83	0.79	1.52	2.98	2.91	3.79	1.09	0.54	1.00	0.43	19.32
1955	1.00	1.31	0.44	0.82	1.18	1.86	3.08	--	1.64	1.89	1.97	2.38	17.57
1956	1.76	1.53	0.87	1.28	1.06	4.20	2.13	3.21	1.16	1.10	0.53	0.96	19.79
1957	1.47	1.14	0.75	1.22	1.75	2.51	0.52	0.78	0.10	1.59	0.96	1.76	14.55
1958	1.56	2.67	0.97	1.47	2.20	2.56	0.84	0.58	1.99	1.16	2.90	2.77	21.67
1959	1.95	1.33	0.75	1.62	4.10	1.75	T	0.91	4.22	3.36	4.32	0.34	24.65
1960	1.67	1.10	1.01	1.23	3.27	0.69	0.13	2.43	0.55	1.44	1.72	1.24	16.48
1961	0.65	1.46	1.96	2.26	4.02	1.45	0.76	0.64	3.40	1.22	1.77	2.09	21.68
1962	1.33	1.15	1.59	0.96	2.59	1.15	0.11	0.72	0.58	1.85	1.31	0.91	14.25
1963	1.69	1.21	0.85	1.07	0.57	5.00	1.44	2.10	1.46	0.75	0.95	1.70	18.79
1964	1.46	0.41	1.57	0.87	3.33	3.86	3.01	1.64	2.27	0.85	1.62	3.62	24.51
1965	2.25	0.64	0.24	2.55	0.81	2.30	1.15	4.74	1.72	0.21	1.31	0.55	18.47
1966	1.42	0.67	0.53	0.76	1.18	6.57	2.49	1.64	0.79	1.34	3.33	1.68	22.40
1967	1.50	0.62	1.27	0.99	1.30	2.53	0.02	0.01	0.91	1.88	0.62	1.16	12.81
1968	0.79	1.15	0.68	0.57	3.92	2.22	1.00	3.42	4.51	2.39	1.59	3.12	25.36
1969	3.05	0.75	0.69	1.39	1.19	5.21	0.70	0.09	1.54	1.90	0.31	1.14	17.96
1970	3.10	0.89	1.49	0.76	1.97	4.37	3.08	0.44	1.79	1.38	1.75	0.99	22.01
1971	1.84	0.77	0.69	0.58	2.45	4.42	1.31	1.11	0.94	0.87	1.70	1.62	18.30
1972	1.10	1.65	2.11	0.95	1.48	3.28	1.77	0.98	1.38	1.84	0.80	2.19	19.53
1973	0.52	0.56	0.70	0.45	1.13	2.14	0.01	0.63	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	0.62	0.80	0.12	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	0.85	1.39	20.03
1976	0.91	1.12	0.34	1.92	1.90	2.49	1.49	3.42	0.96	0.62	0.73	0.86	16.76
1977	0.83	0.71	1.40	0.41	2.90	0.52	3.60	1.50	2.84	0.56	1.62	4.10	20.99
1978	2.15	0.99	0.73	2.54	3.56	2.63	3.90	3.34	1.90	0.15	0.96	0.91	23.76
1979	1.70	1.45	0.82	2.33	2.67	1.23	0.40	1.79	1.03	1.75	0.50	1.03	16.70
1980	1.53	2.03	0.97	1.88	5.48	3.89	1.08	2.45	1.20	0.83	0.78	2.58	24.70
1981	1.81	1.85	2.17	1.75	3.86	4.70	1.17	0.96	0.77	0.56	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	0.75	1.39	1.60	19.62
1983	0.93	0.85	1.71	2.41	1.20	2.96	3.66	1.16	1.70	1.13	1.96	2.57	22.24
1984	0.80	2.19	1.81	1.93	2.91	2.07	0.31	0.55	2.15	2.25	1.40	1.29	19.66
MEAN	1.58	1.18	1.11	1.41	2.21	2.87	1.46	1.63	1.52	1.39	1.42	1.72	

Mean annual precipitation for 35 years = 19.50

CHEMICALS USED IN HERBICIDE STUDIES 1983-84, 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
	AC 263,499	no chemistry available	Am. Cyanamide
Acifluorfen	Tackle	5[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoic acid	Rhone-Poulenc
Barban	Carbyne	4-chloro-2-butynyl-m-chloro-carbanilate	Velsicol
Benefin	Balan	N-butyl-N-ethyl- , , -trifluoro-2,6-dinitro-p-toluidine	Elanco Prods.
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 Poulenc
Chlorsulfuruon	Glean	2-chloro-N[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)aminolcarbonyl]benzenesulfonamide	DuPont
Cyanazine	Bladex	2-[[4-chloro-6-(ethylamino)-s-triazin-2-yl]amino]-2-methylpropionitrile	
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
Haloxyfop-m	Verdict	Methyl 2-(4-((3-chloro-5-(trifluoromethyl)-2-pyridinyl)oxy)phenoxy) propanoate	Dow
DPX-T6376	Ally	Methyl-2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)aminolcarbonyl]aminolsulfonyl]benzoate	DuPont
DPX-Y6202	Assure	2-[4-[(6-chloro-2-quinoxalinyl)oxy]-phenoxy]-propionic acid ethyl ester	DuPont
DPX-M6316	DPX-M6316	No chemistry available	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 (PP005)	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
Metribuzin	Sencor or Lexone	4-amino-6-tert-butyl-3-(methylthio)-as triazin-5(4H)one	Mobay DuPont
Oryzalin	Surflan	3,5-dinitro-N-N-dipropylsulfanilamide	Elanco
Paraquat	Paraquat	1-1'-dimethyl-4,4'-bipyridium ion	Chevron
Pronamide	Kerb	3,5-dichloro(N-1,1-dimethyl-2-propynyl) benzamide	Rohm and Haas
Fluorchloidone	Racer	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
Sulfosate	SC-0224	Trimethylsulfonium carboxymethylamino methylphosphonate	Stauffer
	SC 0574	no chemistry available	Stauffer
	SC 1084	no chemistry available	Stauffer
Terbacil	Sinbar	3-tert-butyl-5-chloro-6-methyluracil	DuPont
Triallate	Fargo	S-(2,3,3-trichloroallyl)diisopropylthio-carbamate	Stauffer
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

PROJECT TITLE: Chemical control of broadleaf weeds in small grains

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT.
Research Specialist, Todd K. Keener, NWARC
Cooperators, Chemical Company Representatives

SUMMARY:

Two studies were conducted in Newana spring wheat to evaluate recently released herbicides and application techniques on broadleaf weeds in small grains. The first study was a comparison of chlorsulfuron, 2,4-D,and the new experimental compound DPX - T6376 at low rates. In the second study many new experimental compounds at various rates were tested in an evaluation for broadleaf weed control in spring wheat.

RESULTS:

Experiment 1. Chlorsulfuron, DPX - T6376, and 2,4-D comparisons.

DPX - T6376 at low rates was very effective in controlling the following broadleaf weeds: pigweed (Amaranthus retroflexus), henbit (Lamium amplexicauli), lambsquarter (Chenopodium album), wild buckwheat (Polygonum convolvulus), field pennycress (Thlaspi arvense), and night flowering catchfly (Silene noctiflora). Chlorsulfuron also performed well in respects to total broadleaf weed control. 2,4- D at .5 and 1.0 # ai/A was weak on pigweed, henbit, and night flowering catchfly. Yields, test weights, and height did not vary significantly according to treatments. The two highest yields were harvested from plots treated with .06 and .09 oz ai/A of DPX - T6376. One reason for the yields not varying significantly and being slightly lower was a high incidence of wild oats not successfully controlled with a diclofop application. Table 1.

Experiment 2. Broadleaf herbicide study.

R 40244, R 40244 + chlorsulfruon, chlorsulfuron, and DPX - M6316 provided good to excellent broadleaf broadleaf weed control (chickweed, henbit, field pennycress, nightflowering catchfly, and wild buckwheat) in Newana spring wheat.

Bentazon alone performed equal to, or better than, 2,4-D and better than the combinations with 2,4-D. MCPA, while weak against chickweed, henbit, and nightflowering catchfly provided excellant broadleaf weed control when combined with bentazon and cyanazine. Bentazon plus bromoxynil gave more control of chickweed than bromoxynil alone.

Yield, test weights, and height did not vary significantly among treatments. The highest yield was harvested from the treatment of bentazon + 2,4-D at .5 + .4 lb ai/A. Lower than normal yields were harvested from all plots due to a heavy wild oat infestation . Table 2.

Table 1. Agronomic data from the Chlorsulfuron, DPX, 2,4-D comparison study.

Treatment	Rate oz ai	Yield Bu/A	Test Wt. lbs/Bu	Height Inches	Weed Control 1/ PGW	HEN	LQR	WBW	FPC	NFC
DPX T6376	.03	59.1	59.0	32.0	100	100	100	91	100	100
DPX T6376	.06	74.2	58.2	32.0	100	100	100	96	100	100
DPX T6376	.09	70.8	59.0	33.0	100	100	100	84	100	99
DPX T6376	.125	55.4	58.2	33.0	100	100	100	99	100	100
Chlorsulfuron	.1875	56.9	58.7	33.0	100	100	100	98	100	100
Chlorsulfuron	.25	54.7	58.4	33.0	100	100	100	99	100	100
2,4-D	.5(lb)	53.3	58.8	31.0	49	55	100	98	100	79
2,4-D	1.0(lb)	56.4	58.8	32.0	88	76	100	88	100	68
CHECK	------	62.7	59.6	34.0	0	0	0	0	0	0
	X	60.4	58.7	32.5	81.8	81.3	88.9	83.4	88.9	82.8
	F 2/	1.74	1.26	1.49						
	S.E.X.	169.3	.39	.68						
	C.V.%	9.33	.66	2.08						
	L.S.D.	16.4	1.14	1.97						

1/ Weed scores are ocular ratings of percent control:
PGW = pigweed, HEN = henbit, LQR = Lambsquarter, WBW = Wild Buckwheat, FPC = Field pennycress, NFC = Night flowering catchfly

2/ F value for treatment comparison

Application data: date 6-11-84, air temp 56 F, soil temp 54 F, wind 0-2mph cloud cover partly cloudy, 26.86 gpa, 32 psi, 2.64 mph speed of tractor, plots 10' x 14', planted 5-4-84

Weed stages at application:
PGW - 1 " tall HEN - 4 to 8 lvs, 1-1 1/2 " tall
LQR - 6 to 8 lvs, 1- 1 1/2 " tall
WBW - 2 true lvs FPC - 1 to 3 diameter
NFC - 4 to 6 lvs 1-1 1/2 " diameter

Table 2. Agronomic data from the broadleaf herbicide study

Treatment	Rate lb ai	Yield Bu/A	Test Wt. lbs./Bu	Height Inches	****	Weed control 1/			****
					CKW	HEN	FPC	NFC	WBW
R 40244	.25	49.7	58.9	31.0	90	100	100	59	99
R 40244 + bromoxynil	.25+ .25	56.7	59.2	32.0	98	100	100	100	100
Bromoxynil	.375	57.6	59.6	31.0	5	74	100	100	100
R 40244 + chlorsulf.	.25 .06oz	40.3	58.5	31.0	100	100	100	100	98
Chlorsulf.	.06	53.2	59.7	32.0	99	100	100	100	99
DPX M3616	.25oz	54.8	59.0	33.0	98	95	100	100	100
DPX M6316	.5 oz	58.2	59.1	31.0	100	86	75	74	100
Bentazon + O.C.	.75	63.5	59.6	32.0	86	65	100	91	98
Bentazon + 2,4-D	.5+ .4	77.0	59.8	33.0	75	54	100	95	100
MCPA	.5	57.4	59.6	30.0	73	66	100	43	100
2,4-D	.5	53.0	59.2	32.0	43	53	100	43	100
Bentazon + bromoxynil	.5 .375	46.8	58.7	31.0	95	75	100	98	100
Bentazon + MCPA + cyanazine	.5 + .25 + .1	51.6	59.3	31.0	95	95	100	96	100
Bromoxynil+ MCPA	.375+ .375	63.5	59.5	31.0	20	63	78	84	100
CHECK	----	50.7	59.2	32.0	0	0	0	0	0
	X	55.6	59.2	32.0	70	76	91	80	93
	F 2/	1.59	1.70	.816					
	S.E.X.	200.9	.292	2.08					
	C.V.	12.03	.493	6.52					
	L.S.D.	19.09	.843	5.95					

20

1/ Weed scores are ocular ratings of percent control:
CKW = Chickweed, HEN = Henbit, WBW = Wild Buckwheat,
FPC = Field pennycress, NFC = Night flowering catchfly
2/ F value for treatment comparison

Application data: date 6-11-84, air temp 56 F, soil temp 54 F, wind 0-2mph
cloud cover partly cloudy, 26.86 gpa, 32 psi, 2.64 mph speed
of tractor, plots 10' x 14', planted 5-4-84
Weed stages at application:
CKW - 1 " tall HEN - 4 to 8 lvs, 1-1 1/2 " tall
WBW - 2 true lvs FPC - 1 to 3 diameter
NFC - 4 to 6 lvs 1-1 1/2 " diameter

PROJECT TITLE: Broadleaf herbicide evaluation on spring barley

YEAR/PROJECT: 1984/754

PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT.
Research Specialist, Todd K. Keener, NWARC
Cooperators: Chemical Company Representatives

SUMMARY:

Different rates of R 40244 and application types were evaluated in Ingrid spring barley for weed control and possible phytotoxicity. Other combinations of acifluorfen plus bromoxynil and bromoxynil plus MCPA were compared to bromoxynil applied alone for broadleaf weed control.

RESULTS:

The higher rates of R 40244 were seen to effect yields negatively and significantly so with 1.0 # ai/A at the PES (pre emergence surface) application. Test weights were also significantly reduced at the higher rates of R 40244 (PES) and all three PES applications significantly reduced percent plump. Acifluorfen plus bromoxynil did not significantly effect yields, test weights or percent plump when compared to the check.

Very good broadleaf weed control was observed in all treatments. R 40244 (PES) was a little weak on both wild buckwheat as well as bedstraw yet seemed to to control these weeds when applied POST. Bromoxynil plus MCPA performed as well or better than the bromoxynil plus acifluorfen applications (depending on the rate used in comparison).

Table 1. Agronomic data from the broadleaf herbicide study on spring barley grown on the Northwestern Agricultural Research Center in 1984.

Date planted: June 4, 1984 Date harvested: September 21, 1984

Treatment	Rate ai/A	Appln type	Yield Bu/A	Test lb/Bu	Plmp %	Ht. (in)	% 1/ thin	**** % Weed Control 2/ *** CW	HB	NFC	BW	BS	LQ
R 40244	.375	PES	44.1	46.8	70b	25	16	100	100	100	25	50	75
R 40244	.50	PES	37.7	45.9b	64b	25	27a	100	100	100	48	68	100
R 40244	1.0	PES	17.8b	40.6b	65b	23	69a	100	100	81	53	55	100
R 40244	.375	POST	46.2	47.5	80	25	16	100	100	79	85	99	100
Acifluor.+ bromoxy.	.06 .25	POST	50.9	47.0	76	27	10	100	100	89	96	100	100
Acifluor.+ bromoxy.	.125 .25	POST	49.3	47.3	78	28	3	100	100	68	100	100	100
Acifluor.+ bromoxy.	.25 .25	POST	50.9	46.8	75	25	6	99	100	74	95	100	100
Bromoxynil	.25	POST	49.0	46.9	77	26	9	100	100	83	100	100	100
Bromoxynil+ MCPA	.375	POST	49.3	47.4	79	25	4	100	100	91	98	100	100
Check	---	----	44.6	47.0	79	26	5	0	0	0	0	0	0

	Yield Bu/A	Test lb/Bu	Plnt %	Ht. (in)	% 1/ thin	**** CW	HB	% Weed Control 2/ *** NFC	BW	BS	LQ
$\bar{X}$	43.9	46.0	74.1	25.4	15.8	89.8	90.0	78.9	69.9	77.1	87.5
F 3/	4.53**	38.5**	7.07**	1.3	24.2**						
S.E.X	113.2	.333	2.21	1.3	4.09						
C.V.	10.74	.72	2.98	4.9	26.0						
L.S.D.	13.7	.97	6.41	3.62	11.7						

1/ % thin = ocular rating on percent of plot thinned by chemical treatment or other factors (mechanical or climatic)

2/ % weed control = ocular ratings on broadleaf weed control. Weeds rated: CW = chickweed (Stellaria media) HB = henbit (Lamium amplexicauli) NFC = night flowering catchfly (Silene noctiflora) BW = wild buckwheat (Polygonum convolvulus) BS = bedstraw (Galium aparine) LQ = lambsquarter (Chenopodium album)

3/ F value for treatment 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

Application data:	Appln type	Date	Temp air	Temp soil	Wind MPH	R.H. %	Weather	Barley stage
	PES	6-11	63	58	0-3	23%	cloudy	pre-em
	POST	6-26	77	67	0	19%	clear-hot	full tiller

Evaluation dates: height 8-1-84 % stand 8-1-84 Weed control 8-8-84

Soil type Kalispell fine sandy loam pH 8.3 OM% 6.2

PROJECT TITLE: Chorsulfuron / DPX-M6316 evaluation on spring wheat varieties.

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT
Research Specialist, Todd K. Keener
Cooperators, Chemical Company Representatives

SUMMARY:

Fall or early spring applications of chlorsulfuron is a choice to farmers for the next season's weed control because of the long residual activity of the herbicide. To determine if spring wheat varieties would be effected by herbicide application method or rates five spring wheat varieties were planted into soils which had been treated in early spring. A new experimental herbicide (DPX-M6316) was also tested on these varieties as a post application at two rates.

RESULTS:

The early spring applications of chlorsulfuron and post emergence applications of DPX-M6316 resulted in no significant differences between treatments. Varietal differences were found in plant and head counts as well as in yields. See table 1. Owens,Newana, Borah, Olaf, and Cando were tolerant to higher than normal rates of each herbicide (chlorsulfuron or DPX-M6316) and also the timing of applications.

Table 1. Agronomic data from the chlorsulfuron/DPX-M6316 evaluation on spring wheat grown on the Northwestern Agricultural Research Center in 1984.

Date planted: April 27,1984 Date harvested: August 27, 1984

Treatment	Rate oz ai	Yield ******** Owens	New	Olaf	Borah	Cando	X	Test Wt. ******** Owens	New	Olaf	Borah	Cando	X
Chlorsulf.	.25	66.2	67.6	50.4	59.0	48.1	58.3	60.6	61.0	60.4	60.3	62.6	60.1
Chlorsulf.	.50	76.3	65.2	51.9	56.3	50.9	60.2	60.2	60.7	59.8	60.3	62.2	60.7
DPX-M6316	1.0	75.1	61.5	51.6	62.6	46.2	59.4	60.2	60.7	60.0	60.4	62.4	60.7
DPX-M6316	2.0	72.1	61.2	54.0	60.2	49.2	59.3	59.8	60.3	59.9	60.3	61.9	60.4
Check	---	70.4	63.4	54.4	56.0	47.9	58.4	60.0	60.8	60.3	60.3	61.7	60.6
	mean	72.0 a	63.8 ab	52.4 bc	58.8 bc	48.4 c		60.2	60.7	60.1	60.3	62.2	

Table 2. Agronomic data from the chlorsulfuron/DPX-M6316 evaluation on spring wheat

Treatment	Rate oz ai	***** Plants/3 ft of row ***** Owens	New	Olaf	Borah	Cando	X	***** Heads/3 ft of row ***** Owens	New	Olaf	Borah	Cando	X
Chlorsulf.	.25	22.2	26.8	27.1	21.1	13.6	22.1	44.8	47.5	44.8	47.3	29.5	42.8
Chlorsulf.	.50	22.5	24.6	25.6	22.2	13.2	21.6	44.5	49.8	51.8	47.5	30.5	44.8
DPX-M6316	1.0	22.7	25.4	26.5	21.4	12.8	21.7	54.3	51.3	52.3	49.5	26.3	46.7
DPX-M6316	2.0	24.4	24.5	25.2	21.7	13.8	21.9	43.3	51.0	58.0	49.3	27.5	45.8
Check	---	24.6	22.9	25.5	22.2	12.3	21.5	44.3	53.3	53.5	43.8	26.0	44.2
mean		23.3 bc	24.8 ab	26.0 a	21.7 c	13.1 d		46.2 a	50.6 a	52.1 a	47.5 a	28.0 b	

Table 3. Agronomic data from the chlorsulfuron/DPX-M6316 evaluation on spring wheat

Treatment	Rate oz ai	***** Height (inches) ***** Owens	New	Olaf	Borah	Cando	X
Chlorsulf.	.25	28.7	30.0	30.0	28.0	24.4	28.2
Chlorsulf.	.50	28.0	28.0	28.0	27.6	22.8	26.9
DPX-M6316	1.0	31.9	30.0	31.0	28.7	22.8	28.9
DPX-M6316	2.0	26.0	28.7	30.3	26.8	26.0	27.6
Check	---	25.2	28.7	26.8	26.8	22.8	26.1
	mean	28.0	29.1	29.2	27.6	23.8	27.5

Numbers across the mean columns followed by a common letter are not siginficantly different at the 5% probability level according to the Multiple Range Test.

Spring wheat varieties were Owens, Newana, Olaf, Borah, Cando. Planted 4-27-84

Application data:

Appln type	Date	Temp air	Temp soil	Wind MPH	R.H. %	Weather
Preplant	4-3	52	58	3-5	19	Cloudy
Post	6-7	58	57	3	33	Prtly cldy

Evaluations taken: Plant counts 6-27-84, head counts 7-30-84, Height 7-30-84

Soil type: Kalispell fine sandy loam, pH 7.7, OM % 4.2.
Hoelon was applied (.75 #/A) 5-21-83

PROJECT TITLE: Evaluation of new wild oat herbicides in Newana spring wheat.

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader,Vern R. Stewart, Northwestern Agricultural Research Center,Kalispell, MT.
Research Specialist, Todd K. Keener,NWARC
Cooperators: Chemical Company Representatives

SUMMARY:

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

Two new wild oat herbicides and three combinations of current wild oat herbicides with fluorchloridone (Racer) were evaluated in Newana spring wheat for wild oat control. One series of treatments (SC-0574) was applied pre-emergence surface (PES), seven were applied post emergence (POST) to the crop and weeds and one treatment was applied post plant incorporated (POPI). Applications were made using a tractor mounted research-type sprayer with a volume of 26.86 gpa to plots 10' X 14'.

RESULTS:

Wild oat (Avena fatua) populations were high in this experiment. At the final weed rating made 7-20-84 all three AC 222,293 treatments had control of 93% or better. At .375# or .5# ai/A AC 222,293 had 99.5% and 100% wild oat control respectively. The combination of fluorchloridone with diclofop, difenzoquat,and barban did not enhance wild oat control yet yields were higher in the combinations treatments with diclofop and difenzoquat. Lower than normal yields, test weights, and vigor in the barban plots are a result of an excessive rate.

All of the AC 222,293 and diclofop treatments were significantly higher in yield than the check and had test weights of 60 lbs/bu or better. SC 0574 showed very little herbicide activity against wild oats.

Application data:	Appln type	Date	Temp Air	Temp Soil	Wind MPH	RH %	Sky	Wild Oat Stage
	POPI	5-7	59	58	6-7	23	CLEAR	--
	PES	5-7	59	58	6-7	23	CLEAR	--
CARBYNE		5-22	58	56	4	15	CLEAR	1-2 lf
HOELON/AVENGE		6-1	50	51	0-3	28	CLEAR	3-4 lf

Date planted May 4, 1984 Date harvested Sept 5, 1984 Variety: Newana

Equipment: Research type tractor-mounted sprayer, 26.86 gpa (251.1 l/h), 32 PSI at boom, 8003 nozzles, 20 inch spacing, 17-19" height , ground speed 2.6 MPH

Evaluation dates: Wild oat and vigor rating 7-20-84
Heigth 8-1-84

Table 1 . Agronomic data from the Wild Oat Herbicide Study. NWARC

Treatment	Rate # ai/A	Appln. Type	Yield Bu/A	Test Wt lbs/Bu	Vigor 1/	Ht Inches	Wild Oat % Control
SC 0574	2.0	PES	34.33	58.48	10.0	31.8	2.8
SC 0574	3.0	PES	56.98	58.13	10.0	30.8,	18.8a
SC 0574	4.0	PES	44.72	58.15	10.0	31.0	6.5
AC 222,293	.25	POST	70.80a	60.33	10.0	30.0	93.5a
AC 222,293	.375	POST	76.56a	60.52	10.0	31.1	99.5a
AC 222,293	.5	POST	72.36a	60.48	9.9	29.5	100
R 40244 + DICLOFOP	.25+ .75	POST	79.32a	60.00	9.9	31.3	86.8
R 40244 + DIFENZOQUAT	.25+ .75	POST	53.65	59.08	9.6	30.8	62.5
R 40244 + BARBAN	.25 1.0	POST	39.03	54.35b	6.6b	30.5	61.5
DICLFOP	.75	POST	66.63a	60.22a	9.9	31.3	80.0
DIFENZOQUAT	.75	POST	43.92	58.33	10.0	31.0	60.0
BARBAN	1.0	POST	59.74	58.13	8.6b	31.8	65.0
TRIALLATE	1.0	POPI	61.51a	59.55	10.0	31.3	58.8
CHECK	---	----	43.86	59.10	10.0	30.3	0.0
		X	56.97	58.92	9.60	30.9	56.8
		F 2/	7.00**	4.92**	20.16**	.5	30.3**
		SEX	166.7	.725	.208	.829	6.51
		CV	9.74	1.23	2.16	2.68	11.46
		LSD	15.88	2.08	.594	2.36	18.6

1/ Vigor notes 0-10 scale 10 = normal healthy plants, 0 = dead plants
2/ F value for treatment comparisons
a/ Indicates values significantly greater than the check at the .05 level
b/ Indicates values significantly less than the check at the .05 level

PROJECT TITLE: The effect of preplant incorporated triallate (Farso) on seven spring wheat varieties.

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT
Research Specialist, Todd K. Keener, NWARC
Cooperators, Chemical Company Representatives

SUMMARY:

The label instructions for the use of triallate (S-(2,3,3-trichloroallyl) diisopropylthiocarbamate) in spring wheat for western Montana requires that seeding follow application and double harrow incorporation. Because this method does not always provide effective wild oat (Avena fatua) control a study was designed to measure the effect of triallate applied preplant incorporated on seven spring wheat varieties.The triallate was applied to a sandy loam soil then incorporated with a field cultivator consisting of sweeps, a rod, and a harrow. Triallate applications were made using a research-type, tractor mounted sprayer in 27 gpa to plots 10 ft x 14 ft. Spring wheat varieties were seeded in randomized strips across treatments with a nursery type seeder. A test site was selected which was wild oat-free.

RESULTS:

The effect of triallate was immediately noticed in respect to varieties with the higher rates of triallate delaying the emergence of all the spring wheats by 1.5 to 2.0 days. Plant counts were reduced significantly as the rate of triallate was increased. There were significant differences recorded in varieties concerning stand counts. Olaf, Owens, and Len were the more tolerant of varieties. Heads counts were reduced significantly with the higher rates of triallate. The number of heads per foot varied between varieties with Borah and Newana showing the greatest reduction. Reduction in height was not significant as we evaluated it in this study. There were significant differences found in yields among varieties due to the rate of triallate. Yield from the plot treated with 2.0 lbs ai of triallate was significantly different from the other triallate treatments. All treatments were significantly less in yield than the check. The only significant difference in yields between varieties was with Owens, which was the highest yielding variety. Test weights did not vary significantly due to the rate of triallate, however the varietal differences were apparent as would be expected. In laboratory analysis of grain samples it was noted that protein levels increased as the level of triallate was increased.

Table 1. Agronomic data from the triallate (Fargo) variety study. 1984

*** YIELD (Bu/A) ***

VARIETY >	Borah	Alex	Lew	Len	Newana	Olaf	Owens	Mean
Fargo rate								
1.0 lb	31.4	34.3	33.5	34.0	32.9	35.7	41.3	34.7
1.5 lb	32.1	34.6	30.9	32.7	32.9	35.3	42.9	34.5
2.0 lb	24.4	28.1	25.3	34.8	25.9	33.7	36.6	29.8
Check	43.6	34.9	37.5	37.8	38.2	38.9	45.0	39.4
Mean	32.9	33.0	31.8	34.8	32.5	35.9	41.4	

*** TEST WIEGHTS (lbs/Bu)***

VARIETY >	Borah	Alex	Lew	Len	Newana	Olaf	Owens	Mean
Fargo rate								
1.0 lb	56.2	57.4	58.8	58.0	58.2	55.9	57.3	57.4
1.5 lb	56.2	56.7	57.0	58.3	58.2	56.8	57.5	57.2
2.0 lb	56.4	54.9	57.0	58.4	57.3	56.7	57.9	56.9
Check	55.9	56.9	59.2	57.5	59.1	56.2	57.6	57.5
Mean	56.2	56.5	58.0	58.1	58.2	56.4	57.6	

*** PERCENT STAND ***

VARIETY >	Borah	Alex	Lew	Len	Newana	Olaf	Owens	Mean
Fargo rate								
1.0 lb	43.8	57.5	50.0	87.5	50.8	92.5	81.3	66.2
1.5 lb	34.5	33.8	34.5	70.0	39.0	81.3	65.0	51.1
2.0 lb	21.3	22.5	28.3	60.0	31.3	60.3	51.3	39.3
Check	100	100	100	100	100	100	100	100
Mean	49.9	53.4	53.2	79.4	55.3	83.5	74.4	

*** PLANTS/ 3 FT ***

VARIETY >	Borah	Alex	Lew	Len	Newana	Olaf	Owens	Mean
Farso rate								
1.0 lb	11.6	17.9	14.3	21.3	12.5	19.5	17.8	16.4 b
1.5 lb	7.6	11.4	9.1	19.9	9.5	17.6	14.6	12.8 c
2.0 lb	5.5	7.5	6.2	17.9	8.2	14.7	13.3	10.4 d
Check	20.4	26.3	27.8	26.1	23.7	26.3	21.4	24.6 a
Mean	11.3	15.8	14.3	21.3	13.4	19.5	16.8	

*** HEADS / 3 FT ***

VARIETY >	Borah	Alex	Lew	Len	Newana	Olaf	Owens	Mean
Farso rate								
1.0 lb	38.7	45.7	35.1	54.8	36.7	59.5	45.3	45.1
1.5 lb	29.2	39.4	29.5	45.3	32.7	56.2	39.5	38.8
2.0 lb	26.4	34.8	39.4	47.3	22.4	52.3	40.1	37.5
Check	49.0	50.0	47.4	49.0	44.9	61.2	47.8	49.9
Mean	35.8	42.5	37.9	49.1	34.2	57.3	43.2	

*** HEIGHT (INCHES) *** 1 Replication

VARIETY >	Borah	Alex	Lew	Len	Newana	Olaf	Owens	Mean
Farso rate								
1.0 lb	27	34	38	31	32	31	28	31.6
1.5 lb	26	35	33	31	29	28	33	30.7
2.0 lb	26	38	34	30	28	28	32	30.8
Check	27	41	34	30	29	29	31	31.6
Mean	26.5	37.0	34.8	30.5	29.5	29.0	31.0	

30

*** EMMERGENCE DATES ***

VARIETY >	Borah	Alex	Lew	Len	Newana	Olaf	Owens	Mean
	127	126	127	126	127	126	126	126.4

* NOTE * Emmersence senerally varied accordins to triallate rate. Emmersence date was posponed:

1 - 2 days with 2 lb. Farso rate
1.5 days with 1.5 lb. Farso rate
1.0 day with 1.0 lb Farso rate

PROJECT TITLE: Evaluation of triallate (Fargo) applications and seeding depths on Newana spring wheat, 1984

YEAR/PROJECT: 1984/764

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT.
Research Specialist, Todd K. Keener, NWARC
Cooperators, Chemical Company Representatives

SUMMARY:

The followins trial was initiated to study the effect of high rates of triallate applied preplant and post plant incorporated to areas above and below the seedins zone. Four rates of triallate were applied pre-plant incorporated (PPI) and one rate post plant incorporated (POPI) to prepared seedbeds into which Newana spring wheat was seeded. Applications and incorporations were carried out as required by label instructions for preplant and post plant incorporations. Sprayins and seedins were both accomplished usins research-type, tractor mounted equipment. Newana spring wheat was seeded at 60 lbs/acre across the treated areas either in the triallate treated zone (shallow seeded) or below the treated zone (deep seeded). The weed populations were controled usins the appropriate herbicide spray sivins weed-free srowins conditions.

RESULTS:

Crop emmersence besan 10 days after seedins and was noted first in the shallow seeded plots at lower rates of plots treated POPI. As expected the deeper seeded plots were delayed in emmersence with only a slisht difference beins seen in the plot treated with higher rates of triallate.

Plant counts made early in the season showed a decrease in plant numbers as the triallate rate increased. Significant differences were noted within each seedins depth accordins to treatments. No significance difference was found between the seedins depths. The POPI treatment showed the highest plant counts of the triallate treated areas.

Data recorded for head counts showed an inverse trend towards increased triallate rates, except in the POPI treatment, which had the highest averase number of heads per square foot. Again the averase heads per seedins depth did not vary significantly.

Percent stands did vary sisnificantly with deep seeded plots havins sreater stand density than the shallow treated plots. This is the only data which showed any significant difference in seedins depths. There were marked differences noted amons treatments and rates (see table 2).

The hisher PPI rates of triallate contributed to significantly less yields in comparison to the other treatments. All other differences were nonsignificant, however the POPI treatment appeared to be least injurious and yielded the highest. Seedins below the triallate zone resulted in slightly higher yields.

Test weights were highest in the check and POPI treatments. The significant differences that were recorded can be seen in table 2.

Heights are recorded in table 3.

Although the deep seeded areas had delayed emmersence, less plants and fewer heads per square foot, and a significantly less stand, the yields were slightly hisher (although not statistically significantly) and the test weights were equal. The POPI treatment performed best overall amons the treatments and even though not significantly sreater in yield than the check it proved best amons the treatments for test weights.

Table 1. Triallate application and seeding depth study on Newana spring wheat

Rate zone>	Plants/3 ft IN	BELOW	X	Heads/3 ft IN	BELOW	X	Emmersence date IN	BELOW	X
.75 PPI	20.4	17.9	19.2b	51.9	50.8	51.4abc	125	127	126.0
1.0 PPI	16.6	14.9	15.8c	52.4	43.0	47.7bc	125	127	126.0
1.5 PPI	13.0	13.0	13.0d	47.0	44.3	45.6c	126	127	126.5
2.0 PPI	10.5	9.7	10.1e	36.4	34.8	35.6d	126	127	126.5
1.0 POPI	24.0	20.3	22.1a	55.4	57.1	56.2a	125	127	126.0
CHECK	26.1	21.0	23.5a	51.4	56.1	53.7ab	125	127	126.0
mean	18.4	16.1		49.1	47.7		125.3	127.0	

Table 2. Triallate application and seeding depth study on Newana spring wheat

Rate zone>	Yield bu/arce IN	BELOW	X	Test Wt. lbs/bu IN	BELOW	X	% Stand IN	BELOW	X
.75 PPI	32.0	33.8	32.9a	56.0	56.1	56.0c	90.0	86.3	88.1b
1.0 PPI	34.9	35.2	35.0a	56.2	55.7	56.0c	80.0	77.5	78.8c
1.25 PPI	32.1	32.8	32.5a	56.1	56.9	56.5bc	73.8	67.5	70.6d
2.0 PPI	27.8	25.8	26.8b	56.4	55.4	55.9c	56.3	46.3	51.3e
1.0 POPI	34.7	35.2	34.9a	57.8	57.3	57.4ab	98.8	98.8	98.8a
CHECK	33.7	36.0	34.8a	57.9	57.5	57.7a	100	100	100a
mean	32.5	33.1		56.7	56.5		83.1a	79.4b	

Table 3. Triallate seeding study

Rate zone>	HEIGHT (Inches) IN	BELOW	x
.75 PPI	25.6	27.8	26.8
1.0 PPI	28.0	26.5	27.3
1.25 PPI	27.3	27.0	27.1
2.0 PPI	26.3	27.3	26.8
1.0 POPI	27.0	28.0	27.5
CHECK	26.0	26.8	26.4
mean	26.7	27.1	

APPLICATION DATA

Appln.	PPI	POPI
Date	4-24	4-27
Temp, air	52 F	35 F
Temp,soil	57 F	46 F
Wind, mph	3-5	6
Rel. Hum.	19%	26%
Clouds	prtly	prtly
Soil	dry	dry

Seeded April 25, 1984 60# Newana / acre Harvested 8-23-84
Seeding depths: shallow (in zone) 1- 1 1/4 inches
deep (below zone) 2 1/4 - 2 1/2 inches
Previous crop - Thor alfalfa
Seedbed preparation: 2 discings, cultivated, packed
Soil type Flathead fine sandy loam 2.7% OM pH 7.1

34

PROJECT TITLE: Semi-dormant herbicide applications to alfalfa.

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT
Research Assistants, Louise Presby and Todd K. Keener, NWARC
Cooperators, Chemical Company Representatives

SUMMARY:

Several herbicides and combinations of herbicides were applied in early spring to an established stand of alfalfa which was just breaking dormancy (3rd trifoliate, 1 1/2 inches tall). The main objective was to test currently labeled dormant, or semi-dormant herbicides (metribuzin, pronamide, terbacil, and dinoseb) in comparison to newly released, or replacement herbicides (hexazinone). Also several grass specific herbicides were combined with a standard dormant herbicide treatment (metribuzin) for evaluation of early application effectiveness. Treatments were applied using a tractor mounted, research -type sprayer with a volume of 26.86 gpa to plots 10' x 20'.

RESULTS:

Effective weed control and excellant yield responses were observed in areas treated with hexazinone,terbacil,or metribuzin combined with haloxyfop. Hexazinone contributed to yields equal to the terbacil treated plots. Metribuzin plus haloxyfop gave good residual control of all weed species through the second cutting of hay. Grass control, to some measure, was observed with all the new grass herbicides (fluazifop, sethoxydim, haloxyfop, DPX-Y6202).

Percent compostion data was acquired by hand separation of individual species of a sub-sample for each plot harvested. These separations were dried and then weighed for determination of percent composition

Two cuttings (harvest) were made this season. Species separation were completed only on the first cutting.

Note that the first cutting hay yields for the check, dinoseb, and chlorsulfuron are the highest yet contained low percentages of alfalfa due to poor weed control. Likewise this holds true for the total yield figure for SSH 0860, dinoseb and the check. Again, these yields were high but contained a high percentage of weed species.

Table 1. Agronomic data from the dormant alfalfa herbicide study grown on the Northwestern Agricultural Research Center, Kalispell, MT. Field No. P-2.

Harvest: 1st Cut - June 27, 1984 2nd Cut - September 7, 1984

Treatment	Rate lb ai/A	% Composition 1/ Alf.	Grass	Brdlf	*1st CUT* T/A Hay	T/A Alf.	2nd T/A Hay	Total T/A Hay
Metribuzin 75df	.5	72.4	27.5	.1	1.65b	1.20	1.14	2.79b
Pronamide 50wp	1.0	83.7	14.3	2.0	1.64b	1.38	1.17	2.82b
Glyphosate 3ec + S	.25ae	79.7	20.3	0	1.61b	1.38	1.14	2.74b
Terbacil 80wp	.8	91.8	8.2	0	1.77b	1.62	1.15	2.92b
Hexazinone 90sp	.5	91.8	8.2	0	1.62b	1.49	1.15	2.78b
Paraquat 2e	.5	62.5	37.1	.4	1.80b	1.13	1.05	2.85b
Paraquat+metribuzin	.5+.5	89.7	10.3	0	1.57b	1.41	1.09	2.65b
Glyphosate+metribuzin	.25ae+.5	74.5	25.5	0	1.54b	1.15	1.15	2.68b
SC 0224+metribuzin	.25+.5	82.5	17.5	0	1.53b	1.26	1.02	2.55b
SC 0224	.25	69.2	30.8	0	1.80b	1.25	.96	2.76b
Chlorsulfuron 75df	.06oz	65.1	34.9	0	1.92	1.25	1.06	2.99b
Chlorsulfuron	.25oz	64.6	35.4	0	1.74b	1.12	1.03	2.78b
Dinoseb 3ec	1.125	60.2	38.5	.3	1.93	1.16	1.19	3.12
SSH 0860 75wp	1.0	61.7	38.3	0	1.85b	1.14	1.15	3.00
Metribuzin+fluazifop	.25+4	80.4	19.6	0	1.60b	1.29	1.15	2.74b
Metribuzin+sethoxydim	.25+.4	80.7	18.8	.5	1.72b	1.39	1.05	2.77b
Metribuzin+haloxyfop	.25+.4	91.4	8.6	0	1.66b	1.52	1.14	2.81b
Metribuzin+DPX-Y6202	.25+.4	78.0	22.0	0	1.55b	1.21	1.12	2.67b
SC 1084	.25+1.0	77.1	20.3	2.6	1.65b	1.27	1.15	2.81b
Check	-	51.2	46.8	2.1	2.09	1.07	1.17	3.26
x		75.4	24.2		1.71	1.28	1.11	2.82
F 2/		1.54	1.50		4.02**	.85	1.14	3.32
S.E.x		9.50	9.48		.075	.16	.06	.09
C.V. %		12.60	39.0		4.39	12.65	5.24	3.24
L.S.D.		NS	NS		.22	NS	NS	.26

1/ Species composition by hand separation of a 500 gram subsample of which each plant species is weighed independently. Grass species was predominantly quackgrass. Broadleaf weeds were shepherd's purse, field pennycress, dandelion and common plantains.

2/ F-value for treatment comparison

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

** Indicates statistical significance at .01 level.

Table 2. Agronomic data from the dormant alfalfa herbicide study grown on the Northwestern Agricultural Research Center, Kalispell, MT. Field No. P-2.

Harvest: 1st Cut - June 27, 1984 2nd Cut - September 7, 1984

Treatment	Rate lb ai/A	Alfalfa 1/ % Std	Alfalfa 1/ Vigor	Alfalfa Height(") 5-9	Alfalfa Height(") 7-26	% Weed Control 2/ 5-9 Brdlvs	5-9 Blue	Quackgrass 5-9	Quackgrass 6-29
Metribuzin 75df	.5	99	9.6	8.3	22.2	100	100	48	40
Pronamide 50wp	1.0	95	9.5	8.7	23.1	33	60	43	87
Glyphosate 3ec + S	.25ae	40b	3.5b	4.7b	22.7	83	100	57	43
Terbacil 80wp	.8	93	9.5	8.0	23.5	100	100	50	85
Hexazinone 90sp	.5	95	9.6	8.0	22.6	100	100	56	73
Paraquat 2e	.5	92	8.8	8.0	20.9	67	68	20	2
Paraquat+metribuzin	.5+.5	88	8.5	7.0b	22.6	98	100	77	67
Glyphosate+metribuzin	.25ae+.5	62b	4.3b	4.7b	23.7	100	100	32	52
SC 0224+metribuzin	.25+.5	70b	7.0b	6.6b	22.0	100	97	67	33
SC 0224	.25	47b	4.3b	5.3b	22.6	82	90	47	27
Chlorsulfuron 75df	.06oz	82	9.0	7.3b	23.3	40	0	0	0
Chlorsulfuron	.25oz	50b	3.8	4.7b	21.6	100	63	20	5
Dinoseb 3ec	1.125	93	9.8	8.3	23.0	8	25	17	7
SSH 0860 75wp	1.0	95	9.8	8.7	22.6	87	70	25	10
Metribuzin+fluazifop	.25+4	90	9.0	7.7	26.4	100	100	92	58
Metribuzin+sethoxydim	.25+.4	90	9.5	7.0b	23.2	100	100	0	48
Metribuzin+haloxyfop	.25+.4	90	9.1	8.0	23.9	100	100	96	92
Metribuzin+DPX-Y6202	.25+.4	92	9.5	8.3	22.8	100	100	85	41
SC 1084	.25+1.0	92	9.3	8.3	24.0	7	23	42	38
Check	-	91	9.4	8.3	22.7	0	0	0	0
-									
x		82.2	8.1	7.3	23.0	72.3	74.8	47.2	40.4
F 3/		16.7**	23.1**	18.2**	.90				
S.E.x		4.43	.46	.33	2.05				
C.V. %		5.38	5.66	4.45	5.06				
L.S.D.		12.67	1.32	.93	NS				

1/ Alfalfa % STD = ocular percentage rating of % stand of alfalfa * Note and compare to 91% stand in check. Vigor notes on 0-9 scale: 0 = no plant growth due to chemical or mechanical kill; 9 = normal, healthy stand.

2/ Weed control given in percent per weed species: Broadleaves mainly were:
Shepherds purse - Capsella bursa-pastor
Field pennycress - Thlaspi arvense
Dandelion - Taraxacum officinale
Plantain - Plantago major
Grass species were:
Annual bluegrass - Poa annua
Quackgrass - Agropyron repens

3/ F-value for treatment comparison

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

** Indicates statistical significance at .01 level.

APPLICATION DATA:

	All compounds except SC1084	SC1084
Date:	3/27/84	4/3/84
Air Temperature:	44 degrees F	52 degrees F
Soil Temperature:	49 degrees F	50 degrees F
Relative Humidity:	40%	17%
Wind (mph):	0-3	2-4
Weather:	Sunny-warm	Cloudy

Volume: 26.86 gpa
PSI: 32
Research type tractor mounted sprayer

CROP & WEED STAGES: Alfalfa - 3rd trifoliate, 1 1/2" tall
Clover - 3-5 trifoliate, 2" tall
Quackgrass - 3" tall
Broadleaves - seedlings to 10 leaves

No crop oils or surfactants used
Fluaziflop formulation - Fusilade 4E - ICI
Metribuzin formulation - Lexone 75 DF - DuPont
Dinoseb formulation - Pre-merge 3 - Dow

Soil Type: Creston silt loam - pH = 7.9, O.M. = 6.0
Variety: Thor

Evaluation dates: Height 7-26-84
Vigor, % stand, 1st weed control 5-15-84
Quackgrass rating 6-29-84

PROJECT TITLE: Evaluation of herbicides on a new seeding of alfalfa.

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT
Reseach Specialist, Todd K. Keener, NWARC
Cooperators, Chemical Company Representatives

SUMMARY:

This experiment included new formulations of fluazifop, bromoxynil, fluorochloridone, as well as other treatments . The herbicides were applied either preplant incorporated (PPI), pre-emergence surface (PES) or post emergence(POST)to newly seeded alfalfa. The preplant incorporated treatments were applied to a partially prepared seedbed and then immediately incorporated 2-6 inches with a tandem disk. A seedbed was then built and alfalfa was seeded with the subsequent pre-emergence and post treatments applied accordins to the crop or weed stage of growth. All herbicides were applied using a research type tractor mounted sprayer.

The weed population in the experiment consisted mainly of broadleaf weeds. The scores for the broadleaf weeds were recorded by percent control while the grasses , which were less frequent, were given a 1 (little grass present) to 3 (high grass population) rating. The test was irrigated three times during the growing season. Weed scores were obtained July 31, 1984.

One cutting of alfalfa was taken from 40 sq. ft. plot areas within each treatment using a Rhem plot harvester to determine yields.

RESULTS:

The bromoxynil formulations provided excellant broadleaf weed control at all the rates tested. Fluorchloridone applied PES was much more injurious to the alfalfa than the PPI applications, which did not significantly reduce the yields or noticeably reduce the height. Acceptable-to-good weed control was observed in the PES plots where fluorchloridone was used. Several combination treatments with fluorchloridone (PPI and PPI/PES) provided good broadleaf weed control and were not as phtotoxic as the single PES applications. The new broadleaf herbicide AC 263,499 was tested as a post application for broadleafs and provided very good control at the three higher rates tested with no phytotoxic symptoms observed. A new formualtion of fluaziflop (PP005) was tested at several rates and appeared to effectively deminish the incidence of grass species.

The yield from the bromoxynil treatment (.5 lb ai/A) was the highest in the test and significantly greater than the check. Fluorchloridone at .5 lb ai/A was the lowest yielding treatment.

Table 1. Agronomic data from the alfalfa herbicide study grown on the Northwestern Agricultural Center, Kalispell, MT in 1984. Field No. Y-4.

Alfalfa planted: May 16, 1984 Date Harvested: August 2, 1984

Treatment	Appln.	Rate	Yield T/A	Height Inches
Bromoxynil(AXF1050)	Post	.25	1.11b	24.6
Bromoxynil(AXF1050)	Post	.375	1.64	24.7
Bromoxynil(AXF1050)	Post	.5	1.90a	22.3
Bromoxynil(AXF1240)	Post	.5	1.54	24.0
AXF1050+2,4-DB	Post	.25+.25	1.39	25.8
2,40DB	Post	.25	1.52	25.1
Fluorchloridone	PPI	.25	1.47	26.4
Fluorchloridone	PPI	.5	1.65	26.5
Fluorchloridone	PES	.25	1.41	24.0
Fluorchloridine	PES	.5	.70b	23.2
EPTC+Fluorchloridone	PPI/PPI	3.0+.25	1.54	25.6
Balan+Fluorchloridone	PPI/PPI	1.12+.25	1.84	26.0
EPTC+Fluorchloridone	PPI/PES	3.0+.25	1.34	26.3
Balan+Fluorchloridone	PPI/PES	1.12+.25	1.45	25.9
AC 263,499	Post	.025	1.60	27.4
AC 263,499	Post	.05	1.59	26.7
AC 263,499	Post	.10	1.44	28.0
AC 263,499	Post	.20	1.75	26.7
EPTC+2,4-DB	PPI/Post	4.0+1.0	1.37	28.9
Balan	PPI	1.12	1.56	27.4
PP005	Post	.063	1.47	26.3
PP005	Post	.094	1.61	28.1
PP005	Post	.125	1.59	27.4
PP005	Post	.156	1.85	26.1
PP005	Post	.188	1.41	27.8
PP005	Post	.250	1.57	25.9
PP005	Post	.50	1.41	27.8
Sethoxydim(1.5E)+o.c.	Post	.30	1.59	26.5
Fluazifop-b 4E+o.c.	Post	.25	1.53	27.0
Check	-	-	1.51	27.4
x			1.51	26.19
F 1/			3.63**	1.32
S.E.x			.122	3.36
L.S.D.(.05)			.351	NS
C.V. %			8.06	5.05

1/ F value for treatment comparison
** Indicates statistical significance at the .01 probability level
a/ Indicates values significantly greater than the check at the 05 level
b/ Indicates values significantly less than the check at the 05 level

Table 2. Agronomic data from the alfalfa herbicide study grown on the Northwestern Agricultural Center, Kalispell, MT in 1984. Field No. Y-4.

Alfalfa planted: May 16, 1984 Harvested: August 2, 1984

Treatment	Appln.	Rate	***** Weed Control 1/ July 31, 1984 ***** % FP	% SP	% LQ	0-3 Rating on Weed Presense CW	QG	GF	WO	AB	FP
Bromoxynil(AXF1050)	Post	.25	87	98	100	0	1.0	1.7	.7	1.7	1.7
Bromoxynil(AXF1050)	Post	.375	98	100	100	0	.7	1.0	.7	1.3	1.0
Bromoxynil(AXF1050)	Post	.5	100	100	100	1.3	.7	1.7	.3	1.7	1.7
Bromoxynil(AXF1240)	Post	.5	100	100	100	1.0	1.7	2.3	.7	1.0	1.7
AXF1050+2,4-DB	Post	.25+.25	97	97	100	1.7	1.0	1.0	.3	1.7	1.3
2,40DB	Post	.25	58	72	67	.7	1.0	1.3	.7	.7	.3
Fluorchloridone	PPI	.25	27	0	0	.3	.3	1.0	.3	.7	.3
Fluorchloridone	PPI	.5	25	53	33	1.0	1.0	1.3	.3	1.0	1.0
Fluorchloridone	PES	.25	100	100	92	0	.3	.7	0	0	1.0
Fluorchloridone	PES	.5	100	100	100	0	0	.3	0	0	.3
EPTC+Fluorchloridone	PPI/PPI	3.0+.25	67	67	43	.3	0	.3	0	.3	.3
Balan+Fluorchloridone	PPI/PPI	1.12+.25	100	100	100	0	0	0	0	.3	.3
EPTC+Fluorchloridone	PPI/PES	3.0+.25	100	100	100	.3	0	0	0	0	.3
Balan+Fluorchloridone	PPI/PES	1.12+.25	100	100	100	0	.3	0	0	.3	0
AC 263,499	Post	.025	73	78	50	.7	.7	0	.3	.3	0
AC 263,499	Post	.05	83	90	100	.7	0	0	.3	.7	.3
AC 263,499	Post	.10	92	92	67	.3	0	0	0	.3	0
AC 263,499	Post	.20	93	100	100	.3	0	0	0	.7	0
EPTC+2,4-DB	PPI/Post	4.0+1.0	100	62	100	1.0	.3	.3	0	.7	.3
Balan	PPI	1.12	0	0	33	1.0	0	0	0	0	0
PP005	Post	.063	0	0	33	.7	0	0	0	.3	.7
PP005	Post	.094	0	0	0	1.0	.3	.3	0	0	0
PP005	Post	.125	0	0	0	1.3	0	.3	0	.3	0
PP005	Post	.156	0	0	0	1.0	0	.3	0	.7	0
PP005	Post	.188	0	0	33	1.3	0	0	0	0	0
PP005	Post	.250	30	20	0	1.0	0	0	0	0	0
PP005	Post	.50	65	33	33	1.0	0	0	0	.7	0
Sethoxydim(1.5E)+o.c.	Post	.30	0	0	0	1.0	0	0	0	.3	0
Fluazifop-b 4E+o.c.	Post	.25	0	0	0	1.0	0	0	0	.7	0
Check	-	-	0	0	0	0	.3	0	.3	.7	0

1/ Weed Control **Note** First three weed scores are given in percent control (ie FP, SP & LQ). Remaining weeds scored on 0-3 scale: 0 = none present; 1 = light population; 2 = moderate population; 3 = heavy population. See weed codes below for common names of weeds.

Weed Code	Common Name	Latin Name	Univ. Code
FP	Field pennycress	Iblasei arveose	THLAR
SP	Shepherd's purse	Caesella bursaeastoris	CAPBP
LQ	Lambsquarter	Chenopodium album	CHEAL
CW	Chickweed	Stellaria media	STEME

- continued on next page -

QG	Quackgrass	Agropyron repens	AGRRE
GF	Green foxtail	Setaria viridis	SETVI
WO	Wild oat	Avena fatua	AVEFA
AB	Annual bluegrass	Poa annua	POAAN
FP	Fall panicum	Panicum dichotomiflorum	PANDI

APPLICATION DATA:

Applied	Date	Temp. (F) Air	Soil	Wind (mph)	Relative Humidity	Cloud Cover	Surface Soil Moisture
PPI	5/11	52	48	3-5	28%	Cloudy	moist
PES	5/17	56	54	0	23%	Clear	moist-wet
Post	6/25	77	74	3-6	20%	Clear	wet
AC263,499 (later post)	6/29	77	70	0	33%	Cloudy	wet

Soil type = Creston silt loam - O.M. = 5.7; pH = 7.7

Weed Stages at later applications (Post & later Post)

Weed	Post Application 6/25	Later Post Application 6/29
FP	5-8 " tall	8-10" tall
SP	seedling = 4" tall	3-6" tall
LQ	seedling = 6" tall	4-6" tall
CW	2-3" tall	3-5" tall
QG	3-4" tall	4-6" tall
GF	2-3" tall	3-5" tall
WO	1-2" tall	2-4" tall
AB	1" tall	1-2" tall
FP	1-2" tall	1-3" tall
Alfalfa	6th trifoliate 6-7" tall	8" tall

Evaluation dates: Heigth 7-26-84 Weed control 6-24-84

42

PROJECT TITLE: Evaluation of several herbicide combinations in a new seeding of alfalfa.

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center
Research Specialist, Todd K. Keener, NWARC
Cooperators, Chemical Company Representatives

SUMMARY:

Six grass specific herbicides were tested in combination with either bromoxynil or 2,4-DB in an evaluation for crop tolerance, weed control, and crop analysis in new seeded alfalfa. The majority of the treatments were applied post-emergence (POST) to crops or weeds and one pre-plant incorporated treatment (EPTC + 2,4-DB POST) was included as a standard for comparison. The treatments were all applied using a tractor mounted research type sprayer in 26.86 gpa to plots. Broadleaf and grass herbicides were applied as split applications.

One cutting was taken from each plot and yields were determined by harvesting a 40 sq. ft. area with a Rhem forage harvester. Percent compostion for each plant species was ascertained by hand separation, drying, and weighing of each specie.

The highest hay yield taken, and the only yield significantly differently from the check, was from a plot treated with EPTC at 4# ai/A. Further analysis revealed that the hay from that sample, as well as the sample from the check, were significantly lower in percentage of alfalfa in comparison to the other treatments. The majority of treatments yielding sinificantly higher percentages of alfalfa were those treatments which included 2,4-DB.

The percent compostion data shows that broadleaf weeds were the primary weed component and were effectively controlled when treated with bromoxynil or 2,4-DB.

The combination of fluazifop with both bromoxynil and 2,4-DB gave less control on the broadleaf weeds than other combinations of compounds or the compounds alone. This decrease in percent control of broadleaf weeds was also seen in the combination of 2,4-DB + diclfop and bromoxynil + Y6202 . At this point it has not been determined whether the reaction is one of synergism, plant growth response, or just test variation.

Grass species populations were not high and did not cause serious weed problems in this study.

Table 1. Agronomic data from the alfalfa herbicide study grown on the Northwestern Agriculutral Research Center, Kalispell, MT in 1984. Field No. X-4.

Alfalfa planted: May 16, 1984 Date harvested: August 2, 1984

Treatment	Appln.	Rate	Yield T/A	Alfalfa T/A 1/	Height In.	% Composition 2/ Alf.	Brdle	Grs
2,4-DB	Post	1.0	1.29	1.25a	24.6	96.5a	2.5b	1.0
2,4-DB+sethoxydim	Post	1.0+.375	1.36	1.32a	24.5	97.5a	2.0b	0.5
2,4-DB+fluazifop(+o.c.)	Post	1.0+.375	1.39	1.35a	26.1	97.5a	2.5b	0.0
2,4-DB+haloxyfop	Post	1.0+.25	1.21	1.19	25.6	98.7a	1.3b	0.0
2,4-DB+dpx-Y6202	Post	1.0+.5	1.23	1.19	22.8	96.2a	2.8b	1.0
2,4-DB+diclofop	Post	1.0+.75	1.21	1.16	24.8	95.7a	3.0b	1.3
2,4-DB+SC 1084	Post	1.0+.375	1.27	1.20	21.8	93.9a	1.8b	4.3
2,4-DB+SC 1084	Post	1.0+.75	1.36	1.33a	25.0	97.7a	1.8b	0.5
Bromoxynil	Post	1.0+.25	1.18	1.14	23.8	97.0a	1.0b	2.0
Bromoxynil+sethoxydim	Post	1.0+.375	1.26	1.20	22.2	95.7a	2.8b	1.5
Bromoxynil+fluazifop	Post	1.0+.375	1.37	1.27a	23.2	92.3a	7.4b	0.3
Bromoxynil+haloxyfop	Post	1.0+.25	1.18	1.18	22.7	99.7a	0.3b	0.0
Bromoxynil+dpx-Y6202	Post	1.0+.5	1.17	1.09	21.9	93.2a	5.8b	1.0
Bromoxynil+diclofop	Post	1.0+.75	1.20	1.15	21.3	95.7a	1.8b	2.5
Bromoxynil+SC 1084	Post	1.0+.375	1.22	1.16	24.0	94.2a	4.5b	1.3
Bromoxynil+SC 1084	Post	1.0+.75	1.25	1.20	24.3	96.2a	2.0b	1.8
EPTC+2,4-DB	PPI/Post	4.0+1.0	1.17	1.14	23.8	97.7a	1.0b	3.0
EPTC	PPI	4.0	1.49a	1.03	24.3	69.8	30.2	0.0
Check	-	-	1.29	0.93	26.5	71.7	38.0	0.3
	-							
	x		1.267	1.18	24.02	93.6	5.4	1.0
	F 3/		1.80	1.82*	1.08	8.53**	9.97**	.226
	S.E.x		.066	.075	3.38	2.82	2.71	.95
	C.V.%		5.17	6.38	5.54	3.02	50.3	89.3
	L.S.D.		.186	.27	NS	8.02	7.68	NS

1/ Alfalfa tons/acre = Total hay yield X percent alfalfa composition.
2/ % composition determined by hand separation of 500 gram subsample of which each plant species group is weighed independently (i.e. broadleaf, grass, or alfalfa). Different weed species are listed below.
3/ F value for treatment comparison
a/ Values significantly greater than check at .05 level
b/ Values significantly less than check at .05 level
* Indicates statistical significance at the .05 level
** Indicates statistical significance at the .01 level

Table 2. Agronomic data from the alfalfa herbicide study grown on the Northwestern Agriculutral Research Center, Kalispell, MT in 1984. Field No. X-4.

Alfalfa planted: May 16, 1984 Date harvested: August 2, 1984

Treatment	Appln	Rate	**** % Weed Control 1/ *****						
	# ai/A		FP	SP	LQ	PW	QG	GF	AR
2,4-DB	Post	1.0	75	50	75	75	.3	.8	1.3
2,4-DB+sethoxydim	Post	1.0+.375	88	55	100	100	0	0	1.3
2,4-DB+fluazifop(+o.c.)	Post	1.0+.375	92	93	25	25	0	0	.3
2,4-DB+haloxyfop	Post	1.0+.25	100	85	100	100	0	0	.3
2,4-DB+dpx-Y6202	Post	1.0+.5	100	100	100	94	0	0	1.8
2,4-DB+diclofop	Post	1.0+.75	94	68	75	75	0	0	.8
2,4-DB+SC 1084	Post	1.0+.375	81	55	94	100	0	0	1.0
2,4-DB+SC 1084	Post	1.0+.75	95	75	100	100	0	0	1.0
Bromoxynil	Post	1.0+.25	69	68	73	75	.3	.5	1.8
Bromoxynil+sethoxydim	Post	1.0+.375	100	85	94	100	0	0	1.0
Bromoxynil+fluazifop	Post	1.0+.375	50	50	50	50	0	0	.8
Bromoxynil+haloxyfop	Post	1.0+.25	100	100	100	94	0	0	.3
Bromoxynil+dpx-Y6202	Post	1.0+.5	69	50	63	50	0	0	1.3
Bromoxynil+diclofop	Post	1.0+.75	85	80	100	75	0	0	2.0
Bromoxynil+SC 1084	Post	1.0+.375	88	100	100	100	.3	.3	1.5
Bromoxynil+SC 1084	Post	1.0+.75	100	100	100	100	0	0	1.3
EPTC+2,4-DB	PPI/Post	4.0+1.0	100	94	100	100	0	0	0
EPTC	PPI	4.0	0	25	0	25	0	.5	.8
CHECK	---	----	0	0	0	0	0	0	0

1/ Weed Control: *NOTE* first four weed scores given in percent control (FP, SP, LQ & PW). Remaining weeds are scored on 0-3 scale, 0= none, 1= light population,2= moderate population, 3= heavy population (QG, GF, & AB). See below for weed codes and common weed names.

Weed Code	Common Name	Latin Name	Univ Code
FP	Field Pennycress	Iblasi arvense	THLAR
SP	Sherherd's Purse	Capsella bursa-pastoris	CAPBP
LQ	Lambsquarter	Chenopodium album	CHEAL
PW	Pigweed	Amaranthus retroflexus	AMARE
QG	Quackgrass	Agropron repens	AGRRE
GF	Green Foxtail	Setaria viridis	SETVI
AB	Annual Bluegrass	Poa annua	POAAN

APPLICATION DATA

Application	Date	Temperature Air	Temperature Soil	Wind MPH	Relative Humidity	Cloud Cover	SurfacE Soil Moisture
PPI	5/1/84	52F	48F	3-5	28	Prtly Cldy	Good
Post(brdlvs)	6/25/84	77F	74F	3-6	20	Clear	Good
Post(grass)	7/2/84	77F	72F	2-5	25	Clear	Dry

Note Grass & broadleaf post applications were split.

Weed Stages at Post Applications:

Weed	Post(brdlf)	Post(grass)
FP	5-8"	-
SP	1/2-4"	-
LQ	1/2-6"	-
PW	1-3"	-
QG	-	5-7"
GF	-	5-7"
AB	-	1 1/2-2"

Creston silt loam pH 7.7, OM % 5.7
Evaluation dates: Heisth 7-26-84 weed control 6-21-84

PROJECT TITLE: Evaluation of herbicides on lentil yields and weed control.

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT
Research Specialist, Todd K. Keener, NWARC
Cooperators: Chemical Company Representatives

SUMMARY:

Several herbicides and application methods were evaluated on lentils for crop injury, weed control, and yield analysis. The pre-plant incorporated treatment was applied in accordance to label instructions prior to seeding and the remainder of the treatments were applied after seeding either pre or post emergence to crop or weeds. All applications were made using a tractor-mounted research type sprayer with a volume of 26.86 gpa to plots 10 ft. X 20 feet in size.

RESULTS:

Fair to good yields were obtained from the lentils this year even though a hot, dry period during in the summer put some stress on the plants. Significantly higher yields were obtained from plots treated with triallate plus metribuzin or dinoseb with the high yield harvested from plots treated with oryzalin plus metribuzin. No yields were obtained from the AC 222,499 plots due to chemical injury.

Height was a good indicator of crop tolerance with the fluorchloridone applications demonstrating some significant height reductions due to chemical injury. The AC 222,499 applications were also detrimental to the crop as seen in height measurements.

Vigor and percent stand notes also reflect the phytotoxicity incured by the higher rate applications of fluorchloridone and AC 222,499.

Percent broadleaf weed control was excellant in the fluorchloridone plots and good to very good where triallate + metribuzin, oryzalin + metribuzin, triallate + dinoseb, or metribuzin were applied.

Wild oat control was best where triallate was applied alone or in combinations.

Table 1. Evaluation of herbicide combinations on Chilean lentil yields and weed control. Field R-13.

Date seeded: May 8, 1984 Harvested: August 16, 1984

Treatment	Rate Lbs/A	Appln.	Yield Lbs/A	Height Inches	Visor	% Stand Loss 1/
Fluorchloridone	.375	PES	1414.6	15.75b	9.75	7.5
Fluorchloridone	.5	PES	1159.6	14.75b	9.00	17.0a
Fluorchloridone	1.0	PES	1122.3	15.75b	8.50b	32.5a
Fluorch.+ metribuzin	.375+.125	PES	1269.2	18.50	9.50	8.8
Metribuzin	.25	PES	1624.2	19.75	9.50	5.0
Fluorch. + dinoseb	.375+1.5	PES	1459.6	18.25	10.00	5.0
Dinoseb	1.5	PES	1544.2	22.50	10.00	0.0
Triallate	1.25	PPI	1570.4	22.25	10.00	0.0
Triallate + dinoseb	1.25+2.5	PPI/PES	1669.2a	21.75	9.75	2.5
Oryzalin + metribuzin	.75+.25	PES/PES	1992.3a	20.00	10.00	1.3
AC 222,499	.25	PES	0.0b	16.75	7.00b	18.8a
AC 222,499	.5	PES	0.0b	13.25b	6.00b	23.8a
Triallate + metribuzin	1.25+.25	PPI/PES	1775.0a	22.50	9.75	1.3
Check	0	-	1057.7	19.75	10.00	0.0
x			1261.50	18.680	9.196	8.81
F 2/			7.89**	6.00**	19.81**	6.11**
S.E.X.			54.99	1.247	.278	4.15
C.V. %			16.77	6.678	3.023	47.12
L.S.D.			605.00	3.568	.795	11.87

1/ % stand loss = ocular estimate of stand loss due to chemical injury
2/ F value for treatment 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

Table 2. Evaluation of herbicide combinations on Chilean lentil yields and weed control. Field R-13.

Date seeded: May 8, 1984 Harvested: August 16, 1984

Treatment	Rate Lbs/A	Appln.	***** % Weed Control 1/ ***** NFC	FP	LQ	WO	GF
Fluorchloridone	.375	PES	100	100	100	61	24
Fluorchloridone	.5	PES	100	100	100	68	46
Fluorchloridone	1.0	PES	100	100	100	79	13
Fluorch.+ metribuzin	.375+.125	PES	100	100	100	75	66
Metribuzin	.25	PES	96	85	84	83	95
Fluorch. + dinoseb	.375+1.5	PES	100	100	100	50	44
Dinoseb	1.5	PES	13	0	0	48	0
Triallate	1.25	PPI	19	0	0	100	95
Triallate + dinoseb	1.25+2.5	PPI/PES	13	71	75	100	99
Oryzalin + metribuzin	.75+.25	PES/PES	94	56	91	61	96
AC 222,499	.25	PES	58	89	5	78	89
AC 222,499	.5	PES	48	96	5	75	89
Triallate + metribuzin	1.25+.25	PPI/PES	99	88	94	63	94
Check	0	-	0	0	0	0	0
$\bar{x}$			66.96	70.36	60.98	67.05	60.64

1/ Weed control = ocular estimate of percent weed control
NFC = night flowering catchfly (Silene noctiflora)
FP = field pennycress (Thlaspi arvense)
LQ = lambsquarter (Chenopodium album)
WO = wild oat (Avena fatua)
GF = green foxtail (Setaria viridis)

2/ F value for treatment comparison

Application data:

Appln	Date	Temp air	Temp soil	R.H. %	Wind MPH	Weather
PPI	4-27	35	46	26	6	sunny
PES	5-11	42	47	56	0-4	cloudy
POST	6-29	77	75	33	0	cloudy

Evaluation dates:
Heigth 8-1-84 % stand, vigor, weed control 8-6-84
Kalispell fine sandy loam pH 7.8 OM% 6.2

PROJECT TITLE: Spring barley variety evaluations

YEAR/PROJECT: 1984/756

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell,MT
Research Specialist, Todd K. Keener, NWARC
Cooperators, Gene Hockett USDA - ARS, Bozeman
Tom Blake, MSU, Bozeman
MSU, MAES

SUMMARY:

To determine the adaptability of new an introduced spring barley varieties to Montana various variety trials have been grown at the Northwestern Agricultural Research Center. It is this data, collected over many years, that aids in selecting the recommended varieties for N.W. Montana.

Three spring barley nurseries were grown this year at Kalispell and included the Intrastate Spring Barley, Betzes 2-6 Row Near Isogenic, and the Historic Cultivars Nurseries. The Betzes 2-6 Row Near Isogenic was a cooperative trial involving similar varietal crosses and will not be discussed further in this report as the data is pertinent to barley breeders only.

Good moisture following spring planting gave the spring barley crops a good start this season but precipitation dropped off in June. Also accumulated rainfall was one-fifth and one-third of normal for July and August respectively. This drought-like summer was not distinguishable in irrigated crops but the dryland plantings suffered in yield, test weight, and percent plump.

RESULTS: - Intrastate Spring Barley -

Yields, effected by the drought-like summer, were slightly depressed from the normal averages. In comparison to the check variety (Clark) which yielded 89.5 bu/A, there was only one variety yielding significantly higher (Lindy at 106 bu/A). No varieties were significantly less in yield than Clark.

Test weights varied from 38.4 to 52.1 lbs/bu with only five varieties showing a significantly less test weight. Those five varieties might be considered the least drought tolerant of the study.

Percent plumps were not severly effected by the season's climate yet were slightly lower than the mean of the previous year. Those thirteen varieties that registered 80% plump or less were significantly less than Clark.

Heading dates were about nine days later on the average and no doubt were prolonged due to the absense of moisture at that stage of developement. Height notes varied within each variety and can be seen in table 1.

Scald (Rynchosporium secalis) was light to moderate throughout the nursery with only two varieties having above 27% infection.

Lodging was light in the Intrastate Spring Barley nursery.

- Historic Cultivars Nursery -

This nursery was mainly grown as a point of interest to demonstrate variety and breeding modifications that have taken place over the last 50 years in spring barley. The high yielding variety was Cornel at 103 bu/A with Oderbrucker yielding a low at 23.7 bu/A. Test weights did not vary as much as yields yet showed varietal responses due to the hot, dry summer.

Table 1. Agronomic data from the Intrastate Spring Barley Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1984. Field A-3

50

Date planted: April 17, 1984 Date harvested: August 14,1984

STATE or CI #	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEADING DATE	HEIGTH INCHES	% PLUMP	BARLEY SCALD 2/ INF	%	--LODGING--3/ ANGLE	%
WA 8	LINDY	105.95a	46.05	176.25b	35.43	89.25	.00	.00b	.00	.00
MT 4126	KIMBERLY/MT547263	102.42	50.55	177.00	31.40b	86.75	6.00	21.25	.00	.00
MT 41279	KIMBERLY//HECTOR/KLA	101.30	50.98	177.00	31.40b	90.00	6.00	3.75b	.00	.00
CI 15229	STEPTOE	96.23	45.13b	176.50b	34.55	85.00	.00	.00b	.00	.00
SK 76333	HARRINGTON	95.69	49.40	178.75	32.58	90.00	2.00	1.25b	.50	2.50
CB 2	BELLONA	95.61	48.28	182.00a	28.05b	77.00b	6.00	46.25a	.00	.00
BA 296	BA296	95.06	49.28	181.00a	32.38	91.75	4.00	11.25	.00	.00
PB 1	SEVEN	95.05	50.30	180.25a	34.35	85.00	6.00	15.00	.50	2.50
FM 1	TRIUMPH	94.47	48.00	181.50a	29.23b	72.25b	4.00	8.75	.50	6.25
CI 15860	KARLA	94.44	46.28	177.75	36.12	66.00b	6.00	23.75	.00	.00
VD 23878	ANDANTE	94.08	50.63	181.00a	32.38	89.50	2.00	2.50b	.00	.00
MT 41918	FAIRFIELD//HECTOR/KL	93.92	49.90	179.00	34.35	87.25	2.00	1.25b	.00	.00
BA 7937	BA7937	93.53	47.20	182.75a	34.06	66.75b	2.00	2.50b	.00	.00
MT 755	CORNEL	93.44	50.45	182.50a	30.71b	93.75	4.00	8.75	.00	.00
MR 604	ABEE	93.09	48.93	181.00a	31.89b	77.50b	7.75	10.00	1.75	32.50a
MT 81192	HECTOR/KLAGES//KLAGE	92.66	50.30	181.25a	33.17	89.50	3.75	2.50b	.00	.00
MT 13104	GALLATIN	92.31	51.68	177.00	32.78	88.25	8.00	17.50	.50	5.00
MT312526	SUMMIT/HECTOR	91.53	51.27	177.25	34.35	86.00	8.00	47.50a	.50	2.50
MT 7312	KLAGES/SUMMIT	91.30	52.10	180.00a	30.61b	89.25	6.00	6.25	.00	.00
PB 1A	SEVEN (GERMAIN)	91.14	50.35	179.75a	34.15	86.00	4.00	7.50	.00	.00
MN 36	ROBUST	90.61	49.13	177.00	40.75a	87.25	4.00	7.50	1.75	10.00
CB 1	APEX	90.34	49.00	180.00a	28.15b	82.00	4.00	25.00	.00	.00
WA 18	PREMIER	89.97	47.48	181.50a	32.38	70.25b	2.00	2.50b	.00	.00
VD 3	MENUET	89.95	50.02	180.50a	27.17b	84.25	8.00	20.00	.00	.00
MT 81502	CLARK/WA895375	89.78	49.40	178.50	33.27	81.50	6.00	17.50	1.25	25.00a
CI 15857	CLARK 1/	89.50	49.93	178.00	34.94	87.25	4.00	25.00	.75	10.00
CI 15514	HECTOR	88.87	50.20	177.50	33.56	81.50	2.00	2.50b	.75	3.75
MT312613	SUMMIT/HECTOR	88.66	51.72	176.00b	33.17	91.25	4.00	16.25	.00	.00
MT 729	SUMMIT	88.59	50.63	179.00	33.27	76.00b	6.00	26.25	.75	7.50
MT 81619	TR440/CLARK	88.48	49.75	178.25	31.10b	78.75b	.00	.00b	1.50	15.00
MS 1	COLUMBIA	87.02	43.03b	180.00a	25.69b	77.25b	6.50	13.75	.00	.00
MT 81615	TR440/CLARK	86.52	49.68	178.50	34.55	89.50	6.00	16.25	.75	12.50
MP 601	GUSTOE	86.23	42.58b	180.25a	22.34b	60.50b	6.75	8.75	.00	.00
CI 15856	LEWIS (HECTOR/KLAGES	86.08	51.75	178.00	33.07	92.75	4.00	5.00	.00	.00
VD 22872	PISTON	85.89	49.47	181.50a	29.82b	77.75b	.00	.00b	.00	.00
CI 15773	MOREX	85.66	48.53	177.50	37.70a	84.00	3.00	6.25	2.25	31.25a
MT311885	SUMMIT/HECTOR	85.62	50.20	180.50a	31.69b	79.25	5.50	3.75b	.00	.00
VD 43278	VD432-78	85.23	47.77	182.00a	28.05b	87.75	6.00	15.00	.00	.00
MT 81143	HECTOR/KLAGES//KLAGE	84.67	52.13	177.00	32.97	92.25	4.00	2.50b	.00	.00
MT 81535	CLARK/TR443	84.30	50.35	179.25	30.81b	90.75	6.00	5.00	.00	.00
MI483238	HAZEN	82.61	47.28	177.25	37.80a	84.75	8.00	6.25	.75	3.75
VD 22476	VD224-76	82.47	45.78	183.00a	29.63b	43.00b	8.00	10.00	.00	.00
CI 9558	PIROLINE	81.92	51.25	177.25	36.32	88.00	6.00	10.00	.75	7.50
VD 31578	VD315-78	81.00	38.38b	180.00a	29.82b	86.25	3.25	7.50	.00	.00
VD 13078	CANOVA/MENUET	80.97	50.60	180.25a	30.51b	92.50	5.50	6.25	.00	.00
MI483237	BOWMAN	80.53	51.18	175.50b	33.07	92.25	6.00	16.25	1.75	11.25
MP 501	WESTBRED 501	79.25	45.02b	177.00	23.62b	73.50b	2.00	2.50b	.00	.00
CI 15478	KLAGES	75.84	48.37	182.75a	32.97	79.25	3.25	3.75b	.75	10.00

Table 1 (cont'd). Intrastate Spring Barley

STATE or CI #	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEADING DATE	HEIGTH INCHES	% PLUMP	BARLEY SCALD 2/ INF	SCALD %	--LODGING--3/ ANGLE	%
	X	89.58	48.91	179.23	32.13	82.88	4.53	10.81	.37	4.14
	F 4/	1.45*	3.01**	16.58**	13.72**	10.21**	1.75**	2.05**	1.80**	2.26**
	S.E.X.	5.06	1.56	.51	.93	3.03	1.73	7.43	.44	5.19
	C.V.%	5.64	3.20	.28	2.89	3.66	38.16	68.76	117.83	125.35
	L.S.D.	14.13	4.37	1.41	2.59	8.48	4.83	20.78	1.24	14.51

1/ Check variety
2/ Scald rating: Inf = infected area rating, 0 = base of plant, 8 = flag leaf, 9 = head
% = percent leaf area infected
3/ Lodging: angle ratings 0 = no lodging, 9 = lodged to ground
% = percent of plot lodged
4/ F value for variety comparison
a/ Indicated values significantly higher than the check at the .05 level
b/ Indicated 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 1a. Ten year summary of yields for the spring dryland intrastate barley nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT 1974-1984 (no data for 1980).

CI or State No.		Variety	1974	1975	1976	1977	1978	1979	1981	1982	1983	1984	$\bar{X}$	Sta. Yrs.	% Piroline
CI	9558	Piroline	87.1	61.2	80.8	61.9	88.1	67.5	75.4	64.8	96.8	81.9	76.6	10	100
CI	15514	Hector	80.8	52.1	78.5	57.1	91.4	64.9	90.4	88.1	109.8	88.9	80.2	10	105
CI	15229	Steptoe	83.2	69.0	105.8	68.1	96.6	74.7	131.0	94.6	124.9	96.2	94.4	10	123
MT	729	Summit	77.8	44.6	93.3	67.6	86.3	78.5	76.9	85.8	92.7	88.6	79.2	10	103
CI	15478	Klages	82.2	51.0	96.0	63.1	93.4	71.5	83.1	87.2	101.4	75.8	80.5	10	105
VD	3	Menuet				64.3	87.4	63.5	88.5	79.7	111.2	90.0	83.5	7	109
VD	22872	Piston					89.8	71.8	88.0	79.1	99.1	85.9	85.6	6	108
CI	15773	Morex					83.8	64.8	79.8	83.6	89.6	85.7	81.2	6	103
CI	15857	Clark						65.7	82.7	86.9	94.9	89.5	83.9	5	109
CI	15860	Karla (ID 4302)							78.7	84.8	111.1	94.4	92.3	4	116
FM	1	Triumph								93.1	103.8	94.5	97.1	3	120
MT	41279	Kimberly/Mt547143								89.0	102.3	101.2	97.5	3	120
VD	13078	Canova/Menuet								85.0	93.4	81.0	86.5	3	106
WP	501	WP 501								83.5	93.0	79.3	85.3	3	105
VD	23878	Adante								77.0	117.6	94.1	96.2	3	119
NA	8	Lindy									116.5	106.0	111.3	2	125
MT	41918	Fairfield/Hector/Klages									111.8	93.9	102.9	2	115
CI	15856	Lewis									109.5	86.1	97.8	2	109
MT	4126	Kimberly//Hector/Klages									109.2	102.4	105.8	2	118
MT	312526	Summit/Hector									107.0	91.5	99.3	2	111
BA	7937	BA 7937									107.0	93.5	100.3	2	112
WP	601	Gusto									105.8	86.2	96.0	2	107
MT	312613	Summit/Hector									102.1	88.7	95.4	2	107
MN	36	Robust									100.4	90.6	95.5	2	107
TR	604	Abee									98.1	93.1	95.6	2	107
SK	76333	Harrington									96.1	95.7	95.9	2	107
NA	18	NA 18									96.1	90.0	93.1	2	104
CB	2	Bellona									95.7	95.6	95.7	2	107
VD	31578	VDH 315-78									94.8	81.0	87.9	2	98
CB	1	Apex									83.9	90.3	87.1	2	97
BS	296	BA296										95.1	95.1	1	116
PB	1	Seven										95.1	95.1	1	116
MT	755	Cornel										93.4	93.4	1	114
MT	81192	Hector/Klages//Klages										92.7	92.7	1	113

Table 1a. Ten year summary of yields for the dryland intrastate spring barley nursery (cont'd)

CI or State No.	Variety	1974	1975	1976	1977	1978	1979	1981	1982	1983	1984	X	Sta. Yrs.	% Piroline
MT 13104	Gallatin										92.3	92.3	1	113
MT 7312	Klages/Summit										91.3	91.3	1	111
PB 1A	Seven (Germain)										91.1	91.1	1	111
MT 81502	Clark/WA 895375										89.8	89.8	1	110
MT 81615	TR 440/Clark										88.5	88.5	1	108
GS 1	Columbia										87.0	87.0	1	106
MT 81685	TR 440/Clark										86.5	86.5	1	106
MT 311885	Summit/Hector										85.6	85.6	1	105
VD 43278	VD 432-78										85.2	85.2	1	104
MT 81143	Hector/Klages//Klages										84.7	84.7	1	103
MT 81535	Clark/TR 443										84.3	84.3	1	103
PI 483238	Hazen										82.6	82.6	1	101
VD 22476	VD 224-76										82.5	82.5	1	101
PI 483327	Bowman										80.5	80.5	1	98

Table 2. Agronomic data from the Historic Cultivars Spring Barley Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1984. Field R-3

Date planted: April 23, 1984 Date harvested: August 14, 1984

STATE or	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEADING DATE	HEIGTH INCHES	% PLUMP	LODGING ANGLE	LODGING %
MT 755	CORNEL	103.06	47.83	179.33	34.78	92.67	.00	.00
CI 195	WHITE SMYRNA	91.58	47.83	177.33	31.76	85.33	4.67	83.00
CI 1775	HORSFORD	85.33	43.57	175.00	34.51	82.67	1.00	10.00
CI 6976	GLACIER	83.94	43.20	173.33	33.99	91.33	.00	.00
CI 15514	HECTOR	83.92	49.70	181.33	30.45	86.33	.00	.00
CI 5438	COMPANA 1/	81.56	46.90	177.00	29.92	89.33	2.33	51.67
MT 7211	VIREO	81.17	46.80	183.00	29.27	73.67	.00	.00
MT 723	GEORGIE	80.04	46.63	183.00	26.90	81.33	.00	.00
CI 3351	DEKAP	79.73	47.73	177.33	28.87	80.00	1.00	8.33
CI 278	CHEVALIER	76.75	48.23	183.33	36.48	82.00	1.33	10.00
VD 22872	PISTON	72.60	47.43	181.00	28.08	69.67	.00	.00
CI 15229	STEPTOE	72.44	44.10	177.67	28.61	83.33	.00	.00
CI 936	TREBI	71.79	41.87	178.67	32.02	66.00	1.00	25.00
MT 726	LUD	71.25	48.47	182.67	28.22	86.00	.00	.00
CI 2656	NEW ZELAND	70.75	46.93	187.00	37.01	64.33	.67	3.33
CI 10421	UNITAN	69.12	44.77	178.00	29.40	79.67	.00	.00
CI 531	HANNCHEN	68.69	47.50	181.00	33.60	63.00	.00	.00
CI 13826	ERBET	68.06	49.57	174.33	29.79	80.67	.00	.00
CI 13827	SHABET	65.83	46.83	181.00	29.00	74.00	.00	.00
CI 926	HORN	65.25	48.77	183.33	41.08	77.33	.00	.00
CI 11772	HYPANA	64.92	46.80	178.00	35.04	93.67	.00	.00
CI 10083	INGRID	64.71	47.70	186.00	26.90	75.00	.00	.00
PI 10968	DICKSON	64.38	45.70	179.00	34.12	57.67	1.00	8.33
MT 729	SUMMIT	64.04	48.50	181.00	29.27	74.00	.00	.00
CI 16181	PURCELL	63.98	46.93	181.33	28.35	84.00	.00	.00
CI 6398	BETZES	62.71	47.03	181.33	30.05	70.00	.00	.00
CI 9558	PIROLINE	62.15	48.53	178.67	27.56	80.67	.00	.00
CI 7510	STEPFORD	62.04	42.57	177.33	29.66	94.33	.00	.00
MT313104	GALLATIN	61.77	48.93	180.00	27.56	82.67	.00	.00
CI 15860	KARLA	61.58	45.07	180.33	28.08	81.67	.00	.00
CI 7130	FREJA	61.00	47.10	182.33	30.05	76.33	.00	.00
CI 15857	CLARK	60.13	47.23	182.00	29.79	81.33	.00	.00
CI 7055	TITAN	59.98	45.23	177.67	35.70	71.00	.00	.00
CI 13625	CENTENNIAL	59.83	45.40	182.67	26.51	82.67	.00	.00
CI 15722	ERSHABET	59.50	49.67	174.67	28.87	80.00	.00	.00
CI 15773	MOREX	59.13	45.87	178.33	35.96	72.00	1.33	26.67
CI 7324	VANTAGE	58.75	44.70	178.33	32.55	72.00	.00	.00
CI 15856	LEWIS	57.58	49.13	181.33	27.82	85.33	.00	.00
CI 7323	COAST	55.69	37.17	176.67	36.35	73.00	.67	30.00
NA 12	BRIDGER 82	54.85	46.80	181.33	28.87	78.33	.00	.00
CI 620	HIMALAYA	51.88	56.27	174.67	31.63	49.00	3.00	30.00
VD 3	MENUET	51.81	48.30	180.67	24.67	84.00	.00	.00
CI 15772	RIDAWN	48.96	44.70	182.67	28.74	58.33	.00	.00
CI 595	NEPAL	48.85	59.30	179.00	29.00	63.00	.67	25.00
CI 4552	VELVET	47.77	43.27	182.00	39.37	66.33	.00	.00
CI 4579	FAUST	34.19	52.20	176.67	29.00	52.00	.00	.00
CI 836	ODERBRUCKER	23.65	53.30	179.00	42.26	46.00	3.00	21.67

Table 2. (cont'd). Historic Cultivars Nursery

STATE or VARIETY	YIELD BU/A	TEST WT LBS/BU	HEADING DATE	HEIGTH INCHES	% PLUMP	LODGING ANGLE	LODGING %
-							
X	65.29	47.19	179.74	31.22	76.02	.46	7.09
F 3/	2.50**	29.37**	5.09**	3.97**	6.41**	3.33**	2.70**
S.E.X.	8.83	.65	1.23	1.99	4.48	.54	9.74
C.V.	%13.53	1.37	.69	6.37	5.90	116.49	137.35
L.S.D.	24.81	1.82	3.46	5.59	12.60	1.51	27.35

1/ Check variety
2/ Lodging: angle, 0 = no lodging, 9 = lodged to ground
% = percent plot lodged
3/ F value for variety comparison
a/ Indicates values significantly higher than the check at the .05 level
b/ Indicates values significantly less than the check at the .05 level
** Indicates value is significantly different at the .01 level

Table 3. Agronomic data from the Betzes 2-6 Row Near Isogenic Nursery, NWARC - 1984

STATE or CI #	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEADING DATE	HEIGTH INCHES	% PLUMP
CI 16652	BETZES SHORT HAIR ROCHI	93.33	48.93	178.67	36.48	64.33
CI 16643	BETZES LOW NO. SEED/HEA	81.92	49.17	174.33	30.05	77.33
MT824963	HISEBET	81.08	46.93	178.33	36.22	68.67
CI 16638	Bz*7/FAN,INTERMEDIATE,E	79.29	47.23	176.33	28.08	78.33
CI 94735	BETZES SHORT	78.96	48.07	181.00	27.30	73.00
CI 16635	BETZES CLUB HEAD	77.27	44.87	181.67	28.22	44.00
CI 16636	BETZES CLUB HEAD DERIVE	76.17	46.20	182.67	30.31	50.00
MT824981	HISEBET DERIVED	73.56	48.10	179.67	34.65	69.00
CI 16637	Bz*7/FAN,INTERMEDIATE,L	73.35	44.47	183.00	28.74	53.33
CI 9472	BETZES SHORT DERIVED	72.65	47.83	179.67	33.60	61.00
CI 16648	BETZES PLUMP NORMAL DER	72.19	47.73	179.67	32.02	69.33
CI 16651	BETZES SHORT HAIR ROCHI	71.88	48.10	178.67	30.18	44.67
CI 16649	BETZES LARGE SEED	70.92	49.33	175.00	29.92	88.67
CI 6398	BETZES	69.83	46.73	181.00	30.71	56.00
CI 16647	BETZES PLUMP NORMAL	69.81	47.87	179.33	32.02	72.67
PI467884	MOBET	67.19	47.27	181.00	30.58	65.67
CI 16639	BETZES HIGH DP	65.44	48.03	181.33	28.74	63.67
CI 16645	BETZES BEEBE PLUMP	64.56	47.50	184.00	23.75	85.67
CI 16640	BETZES HIGH DP DERIVED	62.38	46.43	182.33	28.87	58.33
CI 16646	BETZES BEEBE PLUMP DERI	62.33	46.70	180.67	29.79	52.00
CI 16650	BETZES LARGE SEED DERIV	61.77	45.63	181.33	30.18	47.33
CI 16644	BETZES LOW N. SEED/HEAD	56.73	46.07	180.33	28.22	45.00
-						
	X	71.94	47.24	180.00	30.39	63.09

SPRING BARLEY VARIETIES

SPRING BARLEY VARIETIES RECOMMENDED FOR WESTERN MONTANA

Six-row Type

1. Steptoe - dryland and irrigated
2. Horsford - dryland
3. Stepford - dryland and irrigated
4. Karla - irrigated or high moisture

Two-row Type

5. Piroline - dryland and irrigated
6. Purcell - dryland
7. Summit - dryland and irrigated
8. Georgie - irrigated and high rainfall
9. Ingrid - irrigated
10. Lud - irrigated
11. Ershabet - dryland or irrigated
12. Menuet - high rainfall or irrigated
13. Ridawn - dryland or irrigated
14. Clark - dryland feed barley with malting potential under irrigation
15. Bridger 82 - irrigated or high moisture
16. Lewis - dryland feed barley with malting potential under irrigation
17. Gallatin - dryland or irrigated
18. Piston - irrigated

CHARACTERISTICS OF RECOMMENDED VARIETIES

1. Steptoe
   a. Six-row
   b. High yielding ability
   c. Good lodging resistance
   d. Early maturity
   e. Dryland or irrigated
   f. Large kernal size
   g. Low test weight

2. Horsford
   a. Six-row
   b. Low grain yielding ability - primarily used for hay
   c. Good lodging resistance
   d. Early maturity
   e. Dryland
   f. Medium kernal size
   g. Moderate test weight

Recommended Spring Barley Varieties (cont'd)

3. Stanford
   ---
   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 abliity
   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 wieght

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

PROJECT TITLE: Montana Oat Variety Performance Trial

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT
Research Specialist, Todd K. Keener, NWARC
Cooperator, Daryl Wessenberg, USDA ARS

SUMMARY:

To determine the adaptability of new and introduced oat varieties to Montana the Northwestern Uniform Oat Nursery is grown at Kalispell. It is this data, collected over many years, that aids in selecting the recommended varieties for northwestern Montana.

Extreme climatic and environmental conditions contributed to unusual agronomic data form oat nursery locations throughout the state. The Kalispell nursery had the highest oat yields that have been recorded for many years. These yields are most likely a result of the long hot summer that was experienced in the Flathead Valley this season.

RESULTS:

Excellant yields were harvested from the Uniform Oat nursery this year and can be attributed to the favorable growing conditions this season. The harvest from plots ranged from 161.12 to 215.94 Bu/A. Thirteen varieties had yields in excess of two hundred bushels yet none were significantly higher than the check variety, Otana (203.0 Bu/A). The four varieties that yielded significantly lower than Otana were most likely not as tolerant to drought like conditions, which did exist this season also. This reaction could also be related to the light straw yield that was harvested from these four varieties.

Test weights were fair for this nursery considering the stress during the growing season. Three fours of the nursery had test weights significantly less than Otana, which might be expected for Otana continually holds a fair test weight. The one variety yeilding higher than Otana,yet not having a significantly lower test weight, was Dumont.

Heading and height varied according to variety. Table 1.

Lodging was not a problem in the oats this year. This has been the first year in five where lodging has not interferred with harvest. The light lodging that did exist in this nursery is recorded in table 1.

Table 1. Agronomic data from the Uniform Northwestern States Oat Nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT., in 1984. Field Y-6

Date seeded: April 18, 1984 Date harvested: Sept 14,1984

CI/STATE #	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEADING DATE	HEIGTH INCHES	STRAW 1/ TONS/A	LODGING 2/ SEVER.	LODGING 2/ %
ID 75861	CAYUSE/OTANA	215.94	37.57b	186.67a	43.18b	4.35	.00	.00b
ID815792	71AB2608/CAYUSE	214.69	38.03b	182.67	43.44b	4.11	.00	.00b
OT 726	CASCADE (RANDON/FORW	212.44	37.20b	185.67	51.84a	4.40	3.67	6.67
CI 9081	RANDOM	208.13	37.20b	180.67b	48.43	4.21	2.33	20.00
W 78286	DUMONT(W 78286)	207.31	38.97	186.00	50.39	4.34	1.33	1.67
ID766843	K71299/3/OTANA/2/COK	207.25	37.40b	181.67b	39.50b	4.22	1.00	1.67
ID751170	MONIDA (CAYUSE/OTANA)	206.81	35.70b	186.67a	47.24	4.02	4.67	20.00
ID783965	AURORA NYCRR COMPOSI	205.94	37.63b	186.00	45.01	4.09	.00	.00b
CI 9297	APPALOOSA (WA 6014)	205.50	33.17b	187.67a	44.88	4.13	4.67	33.67
CI 9401	OGLE	203.06	37.83b	182.00b	43.96b	4.13	.00	.00b
CI 9252	OTANA (CHECK VARIETY)	203.00	39.97	184.33	48.16	4.10	3.00	26.67
ID742300	BORDER (OTANA//COKERX8	202.69	35.63b	186.67a	45.01	4.25	1.67	3.33
PA796766	EGDOLON 26/NOBLE	200.75	39.10	185.33	38.85b	4.23	.00	.00b
CI 8263	CAYUSE	199.44	36.10b	185.33	46.33	4.00	4.67	28.33
P 70408E	PORTER (STOUT/P623)	197.31	40.23	186.00	46.06	4.07	.00	.00b
WA 6394	MINN.II-22-220/CAYUS	195.88	36.43b	190.00a	42.13b	4.28	.00	.00b
ID804725	CAYUSE/74AB1956	195.19	34.83b	186.33a	35.83b	4.32	.00	.00b
OT 308	CALIBRE (S 7886 (GEMINI	193.25	39.53	186.00	49.08	4.08	2.00	16.67
ID742608	CAYUSE/OTANA	187.94	34.53b	186.67a	44.09b	4.74	2.00	5.00
CI 6611	PARK	186.56	36.87b	188.00a	50.92	4.03	2.33	13.33
CI 9409	SEL NY COMPOSITE 1	185.44	37.07b	184.33	40.68b	3.99	.00	.00b
CI 9408	ORBIT//CI6936/CLINTL	183.50b	37.00b	185.00	46.46	4.00	.00	.00b
IL753402	COKER 227/3/CI5067/C	181.81b	39.23	180.33b	41.47b	3.88	.00	.00b
NE776131	PIERCE(ND77-61-311)	168.50b	39.47	186.33a	47.64	3.67	.00	.00b
PA796711	EGDOLON 26/OTEE	161.12b	36.43b	179.67b	33.73b	3.52	.00	.00b
	$\bar{X}$	197.18	37.33	185.04	44.57	4.13	1.33	7.08
	F 3/	4.54**	9.08**	15.53**	15.10**	1.50	1.75*	1.39
	S.E.X	3.20	.59	.65	1.16	.19	1.27	9.07
	C.V.%	3.25	1.58	.35	2.60	4.70	95.30	128.13
	L.S.D.	18.22	1.68	1.84	3.30	.55	3.61	25.79

1/ Straw yield, tons/acre
2/ Lodging notes: Sever.= angle of lodgong 0 = no lodging, 9 = lodged to ground
% = Percent of plot lodged
3/ 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
* Indicates statistical significance at the .01 level
** Indicates statistical significance at the .05 level

SPRING OAT VARIETIES

SPRING OAT VARIETIES RECOMMENDED FOR WESTERN MONTANA

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

CHARACTERISTICS OF RECOMMENDED VARIETIES

1. Cayuse
   a. Pale green plant color, yellow kernals at maturity, developed in New York
   b. High yielding ablility
   c. Low test weight
   d. Maturity - early to mid-season
   e. Very good straw strength
   f. Resistant to Victoria blight and Helminthosporium blight
   g. Tolerant to 'red leaf' disease of oats

2. Park
   a. White, plump, short kernals, developed by Idaho and Montana
   b. High yielding ability
   c. High test weight
   d. Maturity - mid-season
   e. Strong straw strength
   f. Susceptible to Victoria blight
   g. Resistant to prevalent stem rust races

3. Basin
   a. White, short, plump kernals, with occassional weak awns, developed in Montana
   b. High yielding ability
   c. High test weight
   d. Maturity - mid-season
   e. Strong straw strength
   f. Resistant to loose and covered smut
   g. Resistant to most common stem rust races (not to races 7 and 7a)
   h. Excellant oat for combining

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

PROJECT TITLE: Spring wheat variety evaluations

YEAR/PROJECT: 1984/756

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT.
Research Specialist, Todd K. Keener, NWARC
Cooperators, Larry Alexander - USDA ARS, Bozeman
Mike Wilson - USDA ARS, Bozeman
R.E. Allen - USDA ARS, Pullman
Wheat Research Marketing Committee
MAES, MSU

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 year's of accumulated testing, are the proving ground for all Montana recommended spring wheat varieties.

Three nurseries were grown this year in Kalispell, two regional nurseries (Advanced Yield and Western Regional) and a Museum spring wheat nursery.

RESULTS: - Advanced Yield Nursery -

Yields this year were similar to the 1983 season with five varieties yielding above 100 Bu/A. None of these yields were significantly higher than the check variety (Newana) which yielded 98.5 Bu/A. Six varieties did yield significantly less than the check, with five of those also having the only significantly less test weights for this nursery. These six varieties, that were lower in yields, are more than likely the least drought tolerant and were effected by the hot, dry summer this season.

Heading dates were one week later than last year which may also be a reflection on the lack of moisture during that time of development. There were no varieties that headed later than Newana (when analyzed for significance), which is understood due to the fact that Newana is a late heading variety.

Stripe rust (Puccinia striiformis) and leaf rust (Puccinia recondita) were both present in this nursery yet only leaf rust was prevalent. There were 10 entires which had moderate to severe levels of leaf rust and were significantly higher than the infection recorded in Newana. Twelve varieties were observed to be susceptible to stripe rust at the disease level that occured in this trial. Table 1.

- Western Regional Spring Wheat -

Yields were higher in the Western Regional nursery in comparison to the Advaced Yield nursery. Large differences occuring between the same varieties (such as Mckay and Owens) in different nurseries can only be attributed to field location. The mean yield for this trial was 108.1 Bu/A with Owens (the check variety) yielding 119.9 Bu/A. No varieties were significantly higher in yield than Owens yet ten entries were found to be significantly less in yield.

Test weights were lower than average, yet in the study were slightly higher than in the Advanced Yield Nursery. Nine varieties had significantly higher test weights than Owens whereas eleven showed significantly lower test weights. Five of those eleven varieties with lower test weights also were the lower yielding entries which could have been the demonstrating of low drought stress resistance.

Lodging was almost non-existant in the Regional Spring Wheat nursery this year.

Stripe rust was detected in some varieties yet was not more than a slight incidence in any of the plots observed. Leaf rust was prevalent through out the nursery and was moderate to heavy in the varieties ID 263, OR 8411, UT 1376, UT 1382, and ID 285. Five spring wheat varieties showed resistance to leaf rust. Table 4.

A spring wheat Museum nursey was grown on station this year mostly as a point of interest for field day. This nursery contained thirty entries dating from early certification days up to the present demonstrating the advances made in wheat breeding over the last fifty years. Table 5.

Table 1. Agronomic data from the Advanced Yield Spring Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1984. Field Y-6.

Date planted: April 16, 1984 Date harvested: August 28, 1984

STATE or CI #	Variety	Yield Bu/A	Test Wt Lbs/Bu	Heading Date	Height (In)	Stripe Rust 3/ In	Stripe Rust 3/ Typ	Stripe Rust 3/ Sever	Leaf Rust 4/ In	Leaf Rust 4/ Typ	Leaf Rust 4/ Sever
MT8184	AU/MAYA 74'S'	108.00	58.60	181.00b	32.15	.00		.00	1.00b		2.50
C17903	MCKAY	107.25	56.57	186.00	35.43a	.00		.00	1.00b		5.00
C17911	WAVERLY	105.00	56.50	185.67	34.91a	.00		.00	6.00		22.50
MT8017	FB434/MT7149	101.15	58.73	186.33	34.91a	.00		.00	7.00		45.00a
MT808	JARAL/NORANA	100.40	55.30	184.67b	33.20	1.50		5.00	4.50b		10.00
MT8177	KALIF/S6921	99.93	59.90	185.00	33.33	2.00		7.50	.00b		.00
WRP8-1	CHALLENGER	99.30	59.70	180.67b	32.68	.00		.00	1.00b		5.00
MT7926	ND681/MT6830	99.05	60.70	186.00	44.23a	.00		.00	3.50b		7.50
C17420	NEWANA 1/	98.50	57.87	186.00	31.36	1.50		2.50	8.50		17.50
MT8306	PM23/MT7448	97.62	58.00	184.67	38.19a	.00		.00	4.00b		10.00
C17920	MARSHALL	97.58	56.07	186.00	33.73	.00		.00	1.50b		5.00
ND582	STOA	96.82	59.67	183.33b	42.91a	.00		.00	1.50b		5.00
MT8043	PK176//SI/MT714	96.75	56.13	184.33b	37.80a	.00		.00	8.00		72.50a
C17934	GUARD	95.95	59.77	181.00b	37.14a	.00		.00	1.00b		5.00
C15930	OLAF	95.82	57.73	183.00b	36.22a	1.50		7.50	.00b		.00
C17935	CENTA	93.73	60.47	180.33b	41.60a	.00		.00	.00b		.00
C17681	BUTTE	93.67	59.47	182.00b	43.70a	1.50		7.50	.00b		.00
MT8365	MT7448/MT7031	93.63	56.80	184.33b	34.78a	.00		.00	7.50		17.50
H78113	HS 78-1139 NAPB	93.52	56.33	185.33	31.36	.00		.00	.00b		.00
MT8277	PI345931/PONDER	92.75	54.30	182.67b	34.25a	.00		.00	.00b		.00
C17438	CANDO	92.68	56.17	185.33	30.71	.00		.00	2.50b		10.00
M7819	GLENMAN AYT SOR	92.35	57.53	185.00	35.17a	.00		.00	7.50		35.00
MT8330	MEXSEL2315/MT74	91.33	57.20	183.67b	34.51a	.00		.00	8.00		60.00a
MT8316	S1103/MT747	91.08	58.37	186.00	40.29a	.00		.00	8.00		75.00a
MT8218	C15838/MARBERG	90.68	56.33	181.33b	36.09a	.00		.00	8.00		47.50a
MT8336	PM23/MT7448	90.60	57.73	185.33	34.91a	.00		.00	7.50		20.00
MT8352	PX23/MT7448	89.87	53.73	186.33	35.17a	.00		.00	6.00		25.00
MT7819	GLENMAN BREEDER	89.52	57.83	185.67	35.30a	.00		.00	7.00		52.50a
MT8328	PM23/MT7448	89.32	57.20	182.67b	36.88a	.00		.00	5.50		15.00
C17828	PONDERA	89.25	58.00	182.33b	37.27a	1.50		5.00	8.00		35.00
C17910	ALEX	88.20	59.13	184.33b	44.23a	.00		.00	1.00b		2.50
K4342	ERA/BUCK CIMARR	86.67	60.17	185.33	36.75a	3.50		7.50	.00b		.00
T8320	PM23/MT7448	86.53	54.90	185.67	35.83a	.00		.00	3.00b		10.00
18374	OSLO	86.25	55.93	180.67b	30.97	4.50a		12.50a	.00b		.00

C17904	OWENS	85.07	53.27	186.00	35.17a	.00	.00	7.50	57.50a
C17429	LEW	84.05	59.27	186.67	46.06a	.00	.00	1.00b	7.50
C17790	LEN	83.98	56.30	180.00b	35.96a	.00	.00	8.00	80.00a
NK8002	ERA//TOB/CNO/3/	83.97	57.47	183.00b	32.81	.00	.00	.00b	.00
C13596	FORTUNA	80.38	59.10	184.67	43.83a	.00	.00	3.50b	5.00
C10003	THATCHER	79.72	58.73	183.00	46.19a	1.50	5.00	8.50	67.50a
MT8313	S1103/MT747	78.07	56.00	185.33	39.89a	.00	.00	8.00	92.50a
C15892	WARD	77.82	57.07	183.00b	45.41a	3.00	10.00a	2.00b	5.00
C17789	VIC	76.47	58.30	185.00	45.67a	.00	.00	2.50b	5.00
MT8321	PM23/MT7448	72.83b	52.23b	186.00	35.43a	.00	.00	3.50b	10.00
MT8282	PI345931/MT7440	72.73b	49.90b	183.00b	31.36	.00	.00	5.50	15.00
C17282	CROSBY	70.92b	55.17	184.67	44.49a	.00	.00	.00b	.00
P47621	LLOYD	68.53b	51.60b	185.67	29.92	2.50	2.50	5.50	12.50
MT8344	JUP//MD/COLTANA	68.15b	52.37b	186.00	33.86	2.00	2.50	7.50	25.00
MT8333	S1103/MT747	65.57b	52.53b	184.67	38.32a	.00	.00	3.50b	25.00
	X	89.16	56.90	184.18	36.99	.54	1.53	3.97	20.92
	F 2/	1.52*	2.06**	15.13**	17.79**	1.46*	1.47*	5.41**	6.83**
	S.E.X.	8.35	1.73	.48	1.10	.88	2.55	1.36	9.59
	C.V.%	9.37	3.04	.26	2.96	163.4	166.9	34.39	45.87
	L.S.D.	23.45	4.85	1.34	3.08	2.51	7.26	3.88	27.28

1/ Check variety
2/ F value for variety comparison
3/ Stripe rust (Puccinia striiformis) rated 8-7-84 In Typ = infection type
0 = no chlorosis or necrosis
Sever = severity, % of leaf area infected 5 = necrotic/chlorotic stripes intermediate sporulation
9 = abundant sporulation, no necrosis
4/ Leaf rust (Puccinia recondita) In Typ = infection type
0 = no chlorosis or necrosis
Sever = severity, % of leaf area infected 5 = necrotic/chlorotic stripes intermediate sporulation
9 = abundant sporulation, no necrosis
a/ Values significantly greater than the check at the .05 level
b/ Vaules significantly less than the check at the .05 level
* Indicates statistical significance at the .05 probability level
** Indicates statistical significance at the .01 probability level

Table 2. Agronomic data from the Western Regional Spring Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1984. Field Y-6.

Date planted: April 16, 1984 Harvested: August 28, 1984

STATE or CI #	Variety	Class 2/	Yield Bu/A	Test Wt Lbs/Bu	Heading Date	Height (In)
C17903	MCKAY	H	129.83	58.50	185.67a	34.51b
ID286	ABERDEEN SELN	S	125.35	59.07	186.33a	39.11
ID232	ABERDEEN SELN	S	120.03	56.47b	185.67a	37.14
C17904	OWENS 1/	S	119.88	58.40	183.00	38.32
ID249	ABERDEEN SELN	S	116.87	57.47b	185.00a	37.53
WA7074	POTAM70/FIELDER	S	115.95	58.73	183.67	33.33b
U25129	UTW498-165/WA61	H	115.77	59.50a	185.67a	38.58
OR8414	PV18A/CIANO	H	114.23	60.57a	183.67	37.14
ID248	ABERDEEN SELN	S	114.12	56.80b	186.33a	34.12b
OR8413	HORK/YHM/KA//BB	S	113.97	58.47	183.33	31.89b
WA7073	POTAM70/FIELDER	S	113.85	58.17	183.00	32.55b
OR8412	CTK/CNO//EMU,OR	H	113.45	58.70	186.00a	37.66
ID266	ABERDEEN SELN	S	113.10	59.63a	183.67	38.19
OR8411	ST5958/ARANA,OR	H	113.07	57.47b	181.33b	36.22
C17911	WAVERLY	S	112.25	57.83	185.00a	35.96
WA6920	POTAM70/FIELDER	S	112.13	58.10	184.67a	35.56b
WA6919	POTAM70/FIELDER	S	112.00	58.83	183.67	35.56b
WA7183	K78504/K79129-3	S	111.22	58.40a	184.00	32.41b
WA7182	K74153/K74093,K	H	110.87	59.37	181.00b	38.71
ID246	BBII/4/7SF1/3/	S	110.27	56.60b	184.67a	34.51b
WA7075	K73579/BORAH	H	110.03	58.37	181.33b	33.99b
WA7181	K73772/BORAH,K7	H	109.32	60.07	184.00	38.32
U25130	UT498-165/WA615	H	109.05	59.77a	185.67a	34.25b
ID285	ABERDEEN SELN	S	107.70	60.67a	181.33b	37.66
WA6831	POTAM70/FIELDER	S	107.45	56.10b	184.67a	36.75
ID238	BOR/3/MRN//PJSI	H	107.18	58.93	181.33b	34.65b
WA6916	POTAM70/FIELDER	S	107.03	58.03	183.00	34.78b
ID269	ABERDEEN SELN	H	106.98	59.10	182.00	36.22
WA6918	POTAM70/FIELDER	S	103.17b	57.80	183.33	34.91b
OR8415	MINIVET SIB	H	103.13b	61.63a	183.33	32.55b
ID263	ABERDEEN SELN	H	101.55b	60.77a	185.00a	42.26a
ID271	ABERDEEN SELN	H	98.37b	59.20	183.67	38.45
UT209	UTW498-259/PROS	H	98.13b	56.63b	185.33a	37.80
ID227	ID67/2/BB5RESE	S	96.18b	53.30b	187.00a	35.30b
UT2746	UTW498-165/BORA	H	95.77b	59.90a	184.33	35.56b
UT1382	PWL/PDA	H	82.82b	48.17b	187.33a	35.96
UT1376	PWL/PDA	H	78.90b	50.77b	186.67a	35.04b
C4734	FEDERATION	S	75.17b	54.37b	183.33	45.41a
	X		108.06	57.81	184.16	36.29
	F 5/		3.88**	64.31**	8.22**	9.76**
	S.E.X.		5.72	.33	.59	.86
	C.V. %		5.30	.57	.32	2.37
	L.S.D.		16.13	.92	1.66	2.42

Table 2 (Cont'd) . Western Regional Spring Wheat Nursery

STATE or Cl #	Variety	Class 2/	- Lodging - Angle	%	Stripe Rust 3/ In Typ	Sever	Leaf Rust 4/ In Typ	Sever
C17903	MCKAY	H	.00	.00	.00	.00	1.50b	20.00
ID286	ABERDEEN SELN	S	.00	.00	.00	.00	7.50	15.00
ID232	ABERDEEN SELN	S	1.00	3.33	.00	.00	.00b	.00b
C17904	OWENS 1/	S	1.33	1.67	.00	.00	8.00	25.00
ID249	ABERDEEN SELN	S	.00	.00	.00	.00	8.00	35.00
WA7074	POTAM70/FIELDER	S	.00	.00	1.00	5.00	2.50b	15.00
U25129	UTW498-165/WA61	H	.00	.00	.00	.00	7.00	7.50
OR8414	PV18A/CIANO	H	.00	.00	1.00	12.50	.00b	.00b
ID248	ABERDEEN SELN	S	.00	.00	.00	.00	8.00	15.00
OR8413	HORK/YHM/KA//BB	S	.00	.00	.00	.00	1.00b	5.00
WA7073	POTAM70/FIELDER	S	.00	.00	1.00	12.50	1.00b	5.00
OR8412	CTK/CNO//EMU,OR	H	5.67a	5.00	.00	.00	9.00	37.50
ID266	ABERDEEN SELN	S	1.67	10.00	.00	.00	8.50	40.00
OR8411	ST5958/ARANA,OR	H	.00	.00	.00	.00	9.00	65.00a
C17911	WAVERLY	S	.00	.00	1.50	12.50	8.00	25.00
WA6920	POTAM70/FIELDER	S	.00	.00	6.50a	10.00	1.50b	15.00
WA6919	POTAM70/FIELDER	S	.00	.00	6.50a	10.00	.00b	.00b
WA7183	K78504/K79129-3	S	.00	.00	3.50	5.00	.00b	.00b
WA7182	K74153/K74093,K	H	1.67	1.67	3.00	2.50	1.50b	5.00
ID246	BBII/4/7SF1/3/	S	.00	.00	.00	.00	7.50	17.50
WA7075	K73579/BORAH	H	.00	.00	1.00	10.00	6.00	15.00
WA7181	K73772/BORAH,K7	H	.00	.00	.00	.00	3.00b	10.00
U25130	UT498-165/WA615	H	.00	.00	1.50	7.50	9.00	10.00
ID285	ABERDEEN SELN	S	.00	.00	.00	.00	9.00	92.50a
WA6831	POTAM70/FIELDER	S	.00	.00	.00	.00	2.50b	5.00
ID238	BOR/3/MRN//PJSI	H	.00	.00	.00	.00	3.50b	2.50
WA6916	POTAM70/FIELDER	S	.00	.00	7.00a	12.50	.00b	.00b
ID269	ABERDEEN SELN	H	.00	.00	.00	.00	8.00	17.50
WA6918	POTAM70/FIELDER	S	.00	.00	3.50	5.00	3.50b	5.00
OR8415	MINIVET SIB	H	.00	.00	.00	.00	2.50b	5.00
ID263	ABERDEEN SELN	H	.00	.00	.00	.00	9.00	50.00a
ID271	ABERDEEN SELN	H	.00	.00	.00	.00	8.00	40.00
UT209	UTW498-259/PROS	H	.00	.00	.00	.00	8.50	45.00
ID227	ID67/2/BB5RESE	S	.00	.00	.00	.00	7.50	7.50
UT2746	UTW498-165/BORA	H	.00	.00	.00	.00	4.00	7.50
UT1382	PWL/PDA	H	.00	.00	4.50a	10.00	9.00	90.00a
UT1376	PWL/PDA	H	.00	.00	.00	.00	9.00	75.00a
C4734	FEDERATION	S	1.67	3.33	.00	.00	8.00	40.00
	X		.34	.66	1.09	3.03	5.25	22.76
	F 5/		3.40**	1.18	2.46**	1.13	5.89**	8.11**
	S.E.X.		.55	1.77	1.29	4.41	1.43	8.69
	C.V. %		62.17	286.30	117.83	145.67	27.14	38.19
	L.S.D.		1.56	4.97	3.69	12.63	4.08	24.91

72

1/ Check variety
2/ Wheat class, H = hard red, S = soft white
3/ Stripe rust (Puccinia striiformis) rated 8-7-84 — In Typ = infection type
0 = no chlorosis or necrosis
Sever = severity, % of leaf area infected — 5 = necrotic/chlorotic stripes intermediate sporulation
9 = abundant sporulation, no necrosis
4/ Leaf rust (Puccinia recondita) — In Typ = infection type
0 = no chlorosis or necrosis
Sever = severity, % of leaf area infected — 5 = necrotic/chlorotic stripes intermediate sporulation
9 = abundant sporulation, no necrosis

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

Table 2a. Summary of the Western Regional 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	1984	- X	Sta. yrs.	% Owens
CI 4734	Federation	78.2	45.2	42.4	59.3	34.3	75.2	55.8	6	58
CI 17904	Owens	114.8	93.9	73.5	114.7	57.8	119.8	95.8	6	100
CI 17903	Mckay		98.1	93.9	112.0	87.6	129.8	104.3	5	113
WA 6831	Potam 70/WA 6021			95.0	109.1	65.8	107.5	94.3	4	103
WA 6919	Potam 70/WA 6021, K790				129.0	79.3	112.0	106.0	3	110
WA 6920	Potam 70/WA 6021, K790				127.6	91.9	112.1	110.5	3	113
WA 6918	Potam 70/WA 6021, K790				127.0	83.3	103.2	104.5	3	107
WA 6916	Potam 70/WA 6021, K790				126.6	76.9	107.0	103.5	3	106
UT 209	Utah WA 498-256/Prospur				116.0	61.1	98.1	91.7	3	94
ID 246	Complex Pedigree				112.9	74.0	110.3	99.1	3	102
CI 17911	Waverly				106.7	76.4	112.3	98.5	3	101
ID 227	Complex Pedigree				99.7	68.1	96.2	88.0	3	90
UT 2746	Utah W498-165/Borah				89.5	81.0	95.6	88.8	3	91
ID 238	Complex Pedigree				85.3	52.7	107.2	81.7	3	84
WA 7074	PTM70/WA 6021.BRUNS/K					90.7	116.0	103.3	2	116
WA 7075	K 73579/BORAH					78.0	110.0	94.0	2	106
WA 7073	PTM70/WA 6021.BRUNS/K					67.4	113.9	90.5	2	102
ID 263	ABERDEEN SELN.					66.7	101.6	84.1	2	95
ID 249	ABERDEEN SELN.					64.5	116.9	90.7	2	102
ID 248	ABERDEEN SELN.					64.3	114.1	89.2	2	100
ID 286	ABERDEEN SELN.						125.4	125.4	1	104
ID 232	ABERDEEN SELN.						120.0	120.0	1	100
U 25129	UTW 498-165/WA61						115.8	115.8	1	97
OR 8414	PV18A/CIANO						114.2	114.2	1	95
OR 8413	HORK/YHM/KA//BB						114.0	114.0	1	95
OR 8412	CTK/CNO//EMU,OR						113.5	113.5	1	95
ID 266	ABERDEEN SELN.						113.1	113.1	1	94
OR 8411	ST5958/ARANA,OR						113.1	113.1	1	94
WA 7183	K78501/K79129-3						111.2	111.2	1	93
WA 7182	K74153/K74093,K						110.9	110.9	1	92
WA 7181	K73772/BORAH,K7						109.3	106.3	1	91
U 25130	UT 498-165/WA615						109.1	109.1	1	91
ID 285	ABERDEEB SELN.						107.7	107.7	1	90
ID 269	ABERDEEN SELN.						107.0	107.0	1	89
OR 8415	MINIVET						103.1	103.1	1	89
ID 271	ABERDEEN SELN.						98.4	98.4	1	82
UT 1382	PWL/PDA						82.8	82.8	1	69
UT 1376	PWL/DPA						78.9	78.9	1	66

Table 3. Spring wheat Museum Nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT in 1984.

Date seeded: April 17, 1984 Date harvested: Sept. 7, 1984

CI #	VARIETY NAME	HEADING DATE	PLANT HEIGHT	YIELD BU/A	TEST WT LBS/BU	STRIPE R. I.T.	STRIPE R. %	LODGING ∠	LODGING %
CI 12244	BLUE CLUB	187	42.9	67.5	54.3	5	40	2	25
--------	BLUE CHAFF	191	37.8	64.9	55.2	5	60	3	30
CI 12053	CADET	180	42.5	69.9	55.9	3	20	0	0
CI 13345	CANTHATCH	177	42.1	63.4	55.3	2	25	0	0
CI 11637	CANUS	181	42.5	61.0	58.0	2	30	0	0
CI 12947	CENTANA	180	44.1	66.7	54.2	2	50	0	0
CI 6900	CERES	180	46.5	68.4	57.3	5	50	2	50
CI 13220	CHINOOK	177	45.3	64.9	59.0	1	20	3	40
CI 11465	COMET	180	42.1	85.2	59.6	2	20	0	0
CI 6477	DEFIANCE	181	46.1	69.3	55.4	5	30	4	50
CI 13986	ERA	181	31.5	77.3	55.0	2	15	0	0
CI 13596	FORTUNA	177	41.7	80.8	58.7	5	20	0	0
CI 5208	HOUSTON	186	48.4	62.1	57.1	5	50	3	50
CI 8004	KOMAR	178	47.2	68.2	56.8	5	40	2	40
CI 12488	LEE	175	45.3	73.5	56.7	2	30	0	0
CI 3641	MARQUIS	181	49.6	54.7	57.4	2	50	0	0
CI 12008	MIDA	177	52.8	68.2	57.4	5	50	0	0
MT 7819	----	178	38.6	69.5	53.5	1	20	0	0
CI 12318	NEWTHATCH	177	42.1	65.5	55.0	2	20	0	0
CI 15927	NORANA	180	33.5	61.8	52.0	3	20	0	0
CI 4067	PAC.BLUESTEM	185	50.4	56.2	54.5	7	60	6	20
CI 11428	PILOT	177	48.4	61.9	55.2	2	20	0	0
CI 11940	PREMIER	177	48.0	69.2	58.5	2	10	0	0
--------	PRESTON	182	50.8	62.4	57.0	2	10	8	90
CI 1915	PURPLE STRAW	184	44.1	57.4	53.0	5	30	8	80
CI 6255	RED BOBS	177	46.9	62.4	56.7	4	50	4	10
CI 4241	RED CHAFF	182	41.3	46.4	50.4	7	75	3	75
CI 12638	RED MAN	177	46.1	65.0	56.9	5	25	0	0
CI 11869	REGENT	177	44.5	66.9	57.5	5	15	0	0
--------	RELIANCE	181	44.9	65.9	57.9	2	30	6	60
CI 12435	RESCUE	178	50.4	66.3	56.4	1	60	3	75
CI 8182	REWARD	176	50.0	62.3	58.6	1	50	0	0
CI 11708	RIVAL	180	44.9	79.4	55.8	3	10	2	25
CI 12273	RUSHMORE	176	42.5	62.4	57.2	2	20	0	0
CI 12567	SAUNDERS	176	40.6	65.9	55.0	2	40	0	0
CI 13304	SAWTANA	180	45.3	63.8	58.5	1	30	2	20
CI 13100	SELKIRK	178	43.3	62.8	56.4	1	30	0	0
CI 15233	SHORTANA	180	33.5	64.5	54.1	1	10	0	0
CI 8026	SUPREME	177	50.4	61.0	55.6	1	10	3	25
CI 10003	THATCHER	177	43.7	59.9	55.8	1	40	0	0
	mean	179.5	44.3	65.6	56.1	3.0	32.1	1.6	19.1

Heading dates recorded as days from January 1
Strip R. = rating on the disease stripe rust (Puccinia striiformis)
I.T. = infection type, 0 to 9 rating (see USDA bulletin ars-410)
% = severity of disease in plot by % plot infected rating
Lodging: ∠ = angle of lodging, % = percent plot lodged

SPRING WHEAT VARIETIES

SPRING WHEAT VARIETIES RECOMMENDED FOR WESTERN MONTANA

Hard Red Varieties

1. Borah - non-irrigated and irrigated
2. Fortuna - dryland
3. Newana - dryland and irrigated
4. Pondera - dryland and irrigated
5. Marberg - dryland and irrigated

Soft White Variety

1. Owens - dryland and irrigated

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 strire 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

PROJECT TITLE: Small Grains Production

PERSONNEL: Leader - Vern R. Stewart, Technician - Todd K. Keener
Cooperators - Oscar Buller, Stillwater location
Gayle Scypheris, Lake County
Norm Neiman, Sanders County
Ross McIntrye, Ravalli County

SUMMARY: To determine the adaptability of new and introduced winter wheat varieties to Montana the Wetern Regional Winter Wheat Nurseries are grown at the Kalispell and Stillwater locations. The outstanding cultivars from these trials are then tested under the varying growing conditions of western Montana through Off-station Nursery evaluations. These data are used in making recommendations to the Montana producer.

The extreme climatic and environmental conditions that existed in western Montana this summer did not have as much effect on the winter wheat crop as was seen in the spring grain. Yields were lower in comparison to the excellant yields from the previous year. The incidence of smut was not as high as other years yet the level was enough to evaluate most of the cultivars for TCK smut resistance. Lodging was only a problem in the Hard Red Winter Wheat Nursery at Kalispell, and this was in response to an early summer rain storm.

RESULTS: Western Regional Hard Red Winter Wheat - Kalispell

Yields were equal to the previous season which may be a reflection of the open winter weather conditions. The highest yields were from five entries which resisted lodging (OI 730875, OI 602137, WA 7172, ORCR 8313, and MT 7877). These five varieties were also significantly higher in yield than the check variety, Wanser.

The average height for the nursery was greater than previous years. The heading dates were about twelve days later than last year. Both of these agronomic factors were influenced by the wet cool spring and the dry hot summer. Test weights were also affected by the climatic conditions . ORCR 8313 had the high test weight of 60.3 lbs./bu.

Stripe rust (Puccinia striiformis) was detected in the nursery and occured on all varieties except OI 730875 and WA 6815 . MT 8003, ID 0280, and Kharkof were very susceptible to stripe rust.

ORCR 8313, besides having the highest test weight also showed fair resistance to stripe rust, and had excellant straw strength. See Table 1.

- Western Regional Hard Red Winter Wheat - Stillwater

The yields from the Stillwater location were lower than those of Kalispell and also noticable lower than yields from the same location last year.

Test weights were much lower than previous seasons and varied from 47.5 to 57.2 lbs/bu.

TCK smut was not prevalent in high percentages yet was detected in all but ID 0282, ID 0283, UT 125327, Cree, ID 0281, and ID 0280. The two highest yielding varieties were also found to be smut-free. See table 2.

- Western Regional White Winter Wheat - Kalispell

Yields were slightly lower and test weight averages slightly higher than in 1983. One variety (WA 7164) had a significantly higher yield than Lewjain, was smut resistant, and showed excellant lodging resistance.

Stripe rust was prevalent throughout the nursery, although not at a high level. It was detected in all varieties except OR 7996 and OI 754989. Stripe rust was especially heavy in the varieties Elgin and Kharkof which had 85 and 45 % severity respectively.

TCK smut was light yet was detected in all but seven varieties.

Lodging was significantly less in the white wheat in comparison to the red varieties. As expected, the three low yields were recorded in those entries that were most susceptible to lodging.

WA 7164 had a significantly higher yield than the check variety (Lewjain), was smut resistant, and showed excellant lodging resistance. See table 3.

- Soft White Winter Wheat - Stillwater

Yields from the White Wheat nursery at Stillwater ranged from 40.2 to 71.8 bu/A and were much lower than last year. WA 7166 and OI 754989 had significantly higher yields than Lewjain.

There were twelve varieties that had test weights which were significantly less than Lewjain. The test weights in general were less than previous season due to the dry hot summer.

The lack of snow cover for most of the winter resulted in a low incidence of TCK smut. Although there was not a high level of the disease WA 6819, Lewjain, and WA 7168 were found to be smut free. See table 4.

- Offstation Winter Wheat Nurseries

In 1984 the offstation winter wheat nurseries were grown in Lake, Sanders, and Ravalli Counties. On a state-wide basis the top yielding varieties were OR 792, Lewjain, and Hill 81. The yields varied from 26 to 66 bu/A partly due to location with most locations showing an effect of the drought-like season experienced by most of the state this summer.

Those varieties that had the top three test weights state wide were Weston, OR 792, and Hawk. The test weights form Sanders County really reflected the dry conditions and ranged from 43 to 50 lbs/A.

Height varied according to variety. Table 5 contains a three location summary as well as the state-wide means.

Table 1 Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Northwestern Agricultural Research Center at Kalispell, MT in 1984. Random block design, four replications. Field No. E-4.

Date planted: September 19, 1983 Date Harvested August 15, 1983

State or CI #	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEIGTH INCHES	HEADING DATE	STRIPE 2/ INF TYP	STRIPE 2/ SEVER.	LODGING ANGLE	LODGING SEVER.
CI730875	7C/KARKAZ//NORD	109.65a	58.45	45.08	168.7	.00b	.00b	.00b	.00b
WA 7172	CI13438/BURT/SM7437/3/CER	107.90a	58.92	40.65b	169.7	1.00b	11.25	1.50b	27.50b
CI602137	OR-IDSEL.F60213-76	99.84a	57.08	35.73b	172.0	2.25	6.25	.00b	.00b
ORCR8313	PROBSTORFER-EXTREM/TOB66	96.91a	60.30a	41.14b	166.7	1.00b	6.25	.00b	.00b
MT 7877	NORWIN	93.28a	59.25	35.24b	169.5	2.75	30.00	.00b	.00b
WA 7171	CI13438/BURT//SM7437/3/CE	87.51	57.82	44.19	170.2	1.75	9.50	5.00	56.00b
WA 6820	GWB127/GWB236-7/STURDY	84.46	56.78	38.98b	166.7	4.75	15.00	4.25b	33.75b
ORCR8107	ALBA/GNS//FN/SONORA64	81.75	57.13	51.77b	169.2	2.00	20.00	7.75	94.75
ID 0261	BURT/CI12929//DLM/4/NBR/3	80.56	57.40	38.98b	173.5a	1.50	31.25	4.00b	35.00b
ID 0282	HGL/ID5006/3/CI14106/CLM/	79.69	56.92	43.80	170.2	4.50	50.00	8.50	96.00
WA 6816	ID5012/WA5866	77.91	54.53b	44.19	174.2a	.00b	.00b	3.00b	25.00b
ID 0281	HNL/3/CI14106/CLM//MC	74.77	56.90	47.64	170.5	3.25	18.75	7.75	98.00
ID 0259	JEFF/3/II-60155/CI14106//	73.91	58.30	48.62	169.2	2.00	7.50	7.75	99.00
UT125327	DLM/PI173438//CLM/3/DLM/4	73.18	55.88	43.01b	169.5	4.00	12.50	6.75	87.25
WA 7173	CO696317/CERCO(N8101901	68.77	58.85	50.00	170.8	3.50	49.75	7.25	84.75
UT132569	WRR/CI13837//PI173438/3/H	68.36	56.43	45.96	173.3a	2.00	3.25	6.75	93.50
ID 0283	ATL50/4/R/R//2*CNN/3/4TK/	68.19	56.60	47.54	170.0	.50b	10.00	7.75	93.25
CI 13844	WANSER 1/	66.59	57.32	47.44	169.2	4.25	29.75	7.25	94.50
MT 77063	CREE	64.53	57.48	47.54	171.0	3.00	53.75	7.75	92.25
ID 0242	SM4/TD//3*IT/178383	63.35	57.50	47.15	171.0	6.75	46.25	7.50	96.00
ID 3518	WA4765/3/BZ//BURT/178383	63.17	48.63b	36.52b	176.0a	.75b	1.25	4.00b	44.75b
MT 8003	REDWIN SEL.	60.34	55.60	48.43	169.7	7.00	94.25a	7.75	90.00
UT132534	WRR/CI13837//PI1783438/HN	54.48	55.32	47.24	173.5a	1.50	12.50	8.00	97.00
ID 0280	II-60-155/2*CI14107//RGR	48.38	55.23b	43.90	169.7	7.50a	66.25a	8.00	98.00
CI 1442	KHARKOF	45.43	55.78	52.17a	173.0	5.75	66.00a	7.50	96.75
	X	75.72	56.83	44.52	170.7	2.93	26.05	5.43	65.32
	F 3/	4.68	9.51	11.78	23.20	4.24	6.17	12.16	15.04
	S.E.X	7.82	.71	1.39	.46	1.05	10.13	.87	9.87
	C.V.%	10.33	1.25	3.12	.27	35.94	38.88	15.94	15.11
	L.S.D.	22.04	2.00	3.91	1.68	2.97	28.55	2.44	27.83

1/ Check variety

2/ Stripe = Stripe rust rating. INF TYPE, 1-9 rating where 0 = no chlorosis or sporulation
SEVER. = severity, % leaf area infected 5 = necrotic and chlorotic stripes intermediate sporulation
9 = no chlorosis or necrosis

3/ F value for variety comparison

Table 2 Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Oscar Buller farm at Kalispell, MT in 1984. Random block design, four replications.

Dated planted: Sept. 28, 1983 Harvested: August 20, 1984

State or CI #	VARIETY	YIELD BU/A	TEST WT LBS/BU	SMUT 2/ % PLOT	HEIGTH INCHES
ID 0282	HGL/ID5006/3/CI14106/CLM/	61.61	55.78	.00b	37.70b
ID 0283	ATL50/4/R/R//2*CNN/3/4TK/	60.20	54.40	.00b	44.00
ORCR8313	PROBSTORFER-EXTREM/TOB66	59.91	55.15	1.50	35.43b
OI730875	7C/KARKAZ//NORD	57.65	53.93	1.50	39.37b
UT125327	DLM/PI173438//CLM/3/DLM/4	56.86	54.22	.00b	37.89b
CI 13844	WANSER 1/	54.43	54.88	3.00	44.09
WA 6820	GWB127/GWB236-7/STURDY	54.35	51.93b	.50b	34.06b
MT 7877	NORWIN	54.25	55.07	.25b	27.56b
WA 7172	CI13438/BURT/SM7437/3/CER	53.84	52.25	1.00	36.81b
ID 0259	JEFF/3/II-60155/CI14106//	53.05	55.92	.25b	44.09
UT132534	WRR/CI13837//PI1783438/HN	52.83	50.72b	.25b	44.59
UT132569	WRR/CI13837//PI173438/3/H	52.54	51.28b	.25b	43.60
WA 7173	CO696317/CERCO(N8101901	52.37	57.15	1.25	42.91
ORCR8107	ALBA/GNS//FN/SONORA64	52.37	53.95	4.50	45.47
ID 0242	SM4/TD//3*IT/178383	51.75	56.33	.50b	44.98
WA 7171	CI13438/BURT//SM7437/3/CE	51.54	54.25	.75b	37.11b
WA 6816	ID5012/WA5866	51.50	48.65b	2.00	33.66b
OI602137	OR-IDSEL.F60213-76	50.10	53.00	1.50	30.02b
MT 8003	REDWIN SEL.	50.04	54.60	8.50a	41.93
ID 0261	BURT/CI12929//DLM/4/NBR/3	46.80	53.18	2.50	30.81b
MT 77063	CREE	46.66	53.80	.00b	43.70
ID 0281	HNL/3/CI14106/CLM//MC	43.10b	50.95b	.00b	46.56a
ID 0280	II-60-155/2*CI14107//RGR	42.20b	52.58	.00b	40.65
CI 1442	KHARKOF	41.13b	53.62	1.00	47.44a
ID 3518	WA4765/3/BZ//BURT/178383	39.11b	47.45b	.50b	31.89b
	X	51.61	53.40	1.26	39.45
	F 3/	4.41**	6.07**	6.16**	42.94**
	S.E.X.	2.78	.94	.75	.87
	C.V.	5.39	1.75	59.78	2.21
	L.S.D	7.84	2.64	2.20	2.46

1/ Check variety
2/ Smut % plot = percent plot by ocular ratins
3/ F value for variety comparison

Table 3 Agronomic data from the Western Regional Soft White Winter Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT. in 1984. Random block design, four replications, Field No. E-4.

Date seeded: September 19, 1983 Date harvested: August 15, 1984

State or CI #	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEADING DATE	HEIGTH INCHES	STRIPE 2/ IN TYPE	STRIPE 2/ SEVERTY	% SMUT 3/ TCK	LODGING ANGLE	LODGING %
WA 7164	VPM/MOS9511/YMH/HYS	113.94a	57.73	168.3b	38.68	1.50	13.75	.00	.00	.00
WA 7074	NORCO/VH72297,VH080717	111.26	56.55	172.2b	37.40	1.75	3.75	.00	.00	.00
WA 7166	VPM/MOS421//2*TYEE	110.95	56.88	169.2b	41.34a	2.00	2.75	.00	.75	15.00
CI754989	MNIM/KAL/BB	110.55	60.03a	166.7b	40.75	.00	.00	1.50a	.00	.00
ORCW8314	7C/CNO//CAL/3/YMH	106.78	56.15	169.0b	36.81	.25	2.50	.50	.00	.00
WA 6912	BVR/CI 15923/NGS,VH07457	105.71	58.65a	173.3b	37.89	1.00	5.00	.37	.00	.00
WA 7167	VB 72277,WA4996/VH66457/	105.52	58.28a	170.0b	39.47	3.25a	5.00	.00	.00	.00
WA 6910	MARIS HUNTSMAN/VH74521,V	103.15	57.38	172.7b	40.45a	2.00	3.75	.25	.00	.00
CI754022	RDL/SU92/KALIAN/BB	102.21	57.52	165.7b	36.91	1.50	5.00	.75	.00	.00
CI 17419	DAWS	102.18	58.55a	170.8b	37.60	.75	1.25	.50	.00	.00
CI 17773	TYEE	100.73	56.27	170.0b	42.52a	5.00a	4.75	.25	3.00	16.25
WA 7050	PI17346/GNS,SEL292-1//MO	100.35	54.62b	170.8b	37.89	5.50a	31.25a	.00	3.75	46.25a
OR 8188	HYS/NORCO//CAMA//SM4,A13	99.64	57.95a	169.5b	36.02	1.25	6.25	.37	.00	.00
WA 7169	VH 74340,CI14484/66344//	97.68	57.55	169.5b	38.58	2.75a	5.00	2.37a	1.00	3.75
WA 7163	VPM/MOS951112*OR68007	97.60	58.43a	170.8b	38.48	2.25	6.25	.50	.00	.00
ORCW8113	SPN//63189-66-71/BEZ	97.21	56.85	168.5b	36.12	.75	1.25	.37	.00	.00
CI 17926	PHOENIX,WW33	96.89	59.85a	163.0b	36.32	4.25a	17.50a	1.25a	.00	.00
CI 17596	STEPHENS	96.34	57.57	168.5b	39.37	.50	1.25	.37	.00	.00
WA 6819	CJP CLUB/SPRAGUE	96.26	58.08a	171.0b	36.81	2.50	5.75	.25	3.75	36.25a
WA 7165	VPM/MOS421//2*RAEDER	95.56	56.85	170.8b	35.14	1.50	3.75	.25	.00	.00
WA 6698	SW92/6 0/3/T.SP/CTL//3 0	94.99	58.95a	170.0b	42.62a	4.50a	8.50	.12	1.50	5.00
ORCW8318	1523/DC DWF//RBS,F1/3/WA	94.89	58.38a	170.5b	39.86a	.25	5.00	.12	.00	.00
CI 17909	LEWJAIN 1/	94.85	56.35	176.9	36.42	.25	.25	.12	1.75	5.00
OR 835	1523 DRC/RBS	93.50	55.97	174.2b	38.09	.50	5.00	.63	.00	.00
CI765784	ROMANIA FONDEA 12-71/JUP	93.22	58.08a	166.7b	34.94	2.25	4.50	.50	.75	18.75
WA 7168	VB 72277,WA1996/VH6647/	91.36	56.92	173.0b	36.02	.75	8.75	.00	.00	.00
CI 13968	NUGAINES	86.25	58.15a	170.5b	37.89	3.75a	20.00a	.12	2.00	15.00
OR 7996	HYS/YAYLA//WA4995/3/CERC	85.96	54.40b	174.7b	40.26a	.00	.00	.12	2.50	35.00a
WA 7170	55-1744/7C//SU/RDL	84.59	55.80	170.5b	38.88	.25	1.25	1.50a	.00	.00
CI 13740	MORO	65.82b	55.85	169.0b	43.90a	3.75a	14.50	.00	7.50a	87.50a
CI 11755	ELGIN	62.79b	56.33	170.5b	44.98a	8.00a	84.75a	.37	7.25a	87.00a
CI 1442	KHARKOF	56.39b	56.78	171.5b	52.17a	3.75a	45.00a	1.25a	6.50a	74.75a
	X	95.47	57.30	170.2	39.08	2.13	10.10	.46	1.31	13.92
	F 4/	3.90**	6.29**	21.48**	8.96**	5.04**	10.40**	3.39**	9.31**	10.21**
	S.E.X.	6.69	.52	.56	1.15	.85	5.15	.30	.72	8.03
	C.V. %	7.00	.92	.33	2.94	39.63	50.95	65.08	55.07	57.71
	L.S.D.	18.78	1.47	2.06	3.22	2.37	14.45	.84	2.03	22.58

1/ Check variety

2/ Stripe = Stripe rust (Puccinia striiformis) ratings. IN TYPE = infection type: 0 = no chlorosis, 5 = necrotic and chlorotic stripes, light to intermediate sporulation, 9 = no chlorosis or necrosis, abundant sporulation
SEVERTY = Severity of disease in plot, % leaf area infected.

3/ % Smut, TCK (dwarf smut Tilletia controversa kuhn) Ocular observation.

4/ F value for variety comparison.

Table 3a. Ten year summary of yields for the Western Regional White Winter Wheat Nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT 1975-1984.

CI or State No.	Variety	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	$\bar{X}$	Sta. Yrs.	% Nusaines
CI 1442	Kharkof	37.4	61.1	50.7	16.9	78.1	55.5	40.7	59.7	86.2	56.4	54.3	10	69
CI 11755	Elgin	42.3	67.6	57.8	21.3	94.1	68.5	42.5	63.2	84.4	62.8	60.5	10	77
CI 13740	Moro	44.0	69.8	57.0	27.8	96.3	67.4	62.5	84.8	81.1	65.8	65.6	10	83
CI 13968	Nusaines	51.8	80.2	66.0	18.9	93.7	75.3	79.1	130.9	106.0	86.3	78.8	10	100
CI 17596	Stephens	52.3	82.1	60.6	23.4	100.2	99.3	79.8	119.0	109.2	96.3	82.2	10	104
CI 17419	Daws	56.3	92.8	68.7	22.9	--	--	90.9	130.8	114.3	102.3	85.3	9	110
CI 17909	LewJain			70.2	34.2	104.8	109.7	85.3	130.5	106.0	94.9	92.0	8	112
CI 17773	Tyee					114.6	82.2	91.1	124.1	98.8	100.7	101.9	6	107
WA 6698	Allan Sel. A7815						107.7	54.0	122.3	124.2	95.0	100.6	5	105
OR CW8113	SPN//63189-66-71/BEZ								138.5	128.9	97.2	121.5	3	112
WA 6912	BUR/CI15923/NGS,VH074								137.4	118.3	105.2	120.5	3	112
OR 7996	HYS/YAYLA/WA4995/3/								131.7	109.5	86.0	109.1	3	101
OR 835	1523 DRC/RBS								119.5	105.1	93.5	106.0	3	98
WA 6910	Maris Huntman/VH74521								118.9	109.1	108.2	110.4	3	102
WA 6819	CJ Club/Sprague								93.8	83.3	96.3	91.1	3	85
OR 8188	HYS/NORCO//CAMA///SM									123.2	99.6	111.4	2	116
WA 7047	NORCO/VH72297,VH0807									115.8	111.3	113.6	2	118
CI 17926	Phoenix, WW33									94.5	96.9	95.7	2	99
WA 7050	PI 173467/GNS, Sel 292									87.2	100.4	93.8	2	98
WA 7164	VPM/MOS9511/YMH/HYS										113.9	113.9	1	145
WA 7166	VPM/MOS4521//2*TYEE										110.0	110.0	1	140
OI 754989	MNIM/KAL/BB										110.6	110.6	1	140
ORCW 8314	7C/CNO//CAL/3/YMH										107.8	107.8	1	137
WA 7167	VB72277,WA 4996/VH 664571										105.6	105.6	1	134
OI 754022	RDL/SU92/KALIAN/BB										102.2	102.2	1	130
WA 7169	VH 74340, CI 14484/66344//										97.7	97.7	1	124
WA 7163	VPM/MOS951112 * OR 68007										97.6	97.6	1	124
WA 7165	VPM/MOS 421//2 * RAEDER										95.6	95.6	1	121
ORCW 8318	1523/DC DWF//RBS,F1/3/WA										94.9	94.9	1	120
OI 765784	ROMANIA FONDEA 12-71/JUF										93.2	93.2	1	118
WA 7168	VB 72277,WA 1996/VH 6647										91.4	91.4	1	116
WA 7170	WA 7170 55-1744/7C//SO/RDL										84.6	84.6	1	107

Table 4 Agronomic data from the Western Regional White Winter Wheat nursery grown on the Oscar Buller farm, Kalispell, MT in 1984. Random block design, four replications.

Date planted: September 28, 1983 Date harvested August 20,1984

State or CI #	VARIETY	YIELD BU/A	TEST WT LBS/BU	HEIGTH INCHES	% SMUT TCK
WA 7166	VPM/MOS421//2*TYEE	71.83a	53.03	33.17	.25
CI754989	MNIM/KAL/BB	71.48a	57.35	33.07	4.25a
ORCW8314	7C/CND//CAL/3/YMH	68.89	53.73	33.37	.25
WA 7050	PI17346/GNS,SEL292-1//MO	67.29	50.70b	30.41	.50
CI 17419	DAWS	66.01	55.70	30.61	2.00
WA 6698	SW92/6 0/3/T.SP/CTL//3 0	64.33	54.70	34.45a	.25
WA 7164	VPM/MOS9511/YMH/HYS	64.24	54.47	31.89	.50
WA 6912	BVR/CI 15923/NGS,VH07457	63.04	53.35	30.61	.50
ORCW8318	1523/DC DWF//RBS,F1/3/WA	62.91	55.72	34.45a	.50
WA 7167	VB 72277,WA4996/VH66457/	62.65	54.62	32.58	1.00
WA 6910	MARIS HUNTSMAN/VH74521,V	60.70	51.88b	33.86a	.50
WA 6819	CJF CLUB/SPRAGUE	59.79	54.07	31.00	.00
OR 7996	HYS/YAYLA//WA4995/3/CERC	59.79	52.60	33.46	.50
CI754022	RDL/SU92/KALIAN/BB	59.73	51.85b	29.04	.50
OR 8188	HYS/NORCO//CAMA//SM4,A13	58.38	51.57b	31.59	.50
CI 17909	LEWJAIN	58.26	54.93	30.51	.00
WA 7163	VPM/MOS951112*OR68007	57.68	52.83	32.28	.50
CI 13740	MORO	57.01	52.58	38.48a	.25
ORCW8113	SPN//63189-66-71/BEZ	55.50	52.85	32.09	1.25
WA 7074	NORCO/VH72297,VH080717	54.99	52.28b	33.37	.50
CI765784	ROMANIA FONDEA 12-71/JUP	53.93	55.88	29.23	1.00
WA 7168	VB 72277,WA1996/VH6647/	52.65	51.32b	30.71	.00
CI 13968	NUGAINES	52.30	55.32	29.82	.25
WA 7165	VPM/MOS421//2*RAEDER	51.78	53.18	29.63	.25
OR 835	1523 DRC/RBS	51.35	49.57b	29.82	2.25
CI 17596	STEPHENS	50.96	51.25b	32.18	.75
CI 17926	PHOENIX,WW33	48.99	57.60a	29.92	.25
WA 7169	VH 74340,CI14484/66344//	47.94	51.07b	31.20	2.50
CI 11755	ELGIN	47.55	52.30b	38.78a	1.50
CI 17773	TYEE	47.31	50.10b	31.99	.50
CI 1442	KHARKOF	41.90b	54.02	43.41a	2.00
WA 7170	55-1744/7C//SU/RDL	40.24b	51.18b	34.06a	22.50a
	X	57.23	53.24	32.53	1.51
	F 3/	4.87**	25.99	.41	.24
	S.E.X.	4.34	.87	1.09	1.00
	C.V. %	7.58	1.63	3.34	66.27
	L.S.D.	12.18	2.43	3.05	2.88

1/ Check variety
2/ % TCK smut (Tilletia controversa kuhn) Ocular observation
3/ F value for variety comparison

Table 5 Offstation winter wheat yields from three locations in western Montana in 1984

STATE or CI #	VARIETY	1/ CLASS	LAKE COUNTY YIELD BU/A	LAKE COUNTY TEST WT LBS/BU	LAKE COUNTY HEIGHT INCHES	SANDERS COUNTY YIELD BU/A	SANDERS COUNTY TEST WT LBS/BU	SANDERS COUNTY HEIGHT INCHES
OR 792	TRIUMPH/LANCER	R	66.66	58.10	36.75	35.54	50.12	30.41
CI 17909	LEWJAIN	W	66.63	57.40	34.25	32.44	48.22	24.31
CI 17773	TYEE	W	66.05	55.15	36.00	28.10	43.83	24.11
WA 7049	LIND SEL B	R	64.44	55.75	36.00	33.80	50.23	27.56
OR 68007	HILL 81	W	63.34	55.82	37.13	32.98	46.05	28.74
MT 77077	WINRIDGE	R	60.33	57.07	37.00	35.41	50.30	24.31
CI 14586	LUKE	W	59.51	57.20	31.50	27.81	48.90	22.64
CI 11727	WESTON	R	59.07	59.63	37.50	28.10	48.85	31.00
ID 3518	WA4765/3/BEZ//BURT	R	58.13	56.02	33.25	26.48	49.28	22.74
CI 17596	STEPHENS	W	56.75	56.68	34.00	34.24	48.60	23.62
WA 6820	GWB;127;GWB236;//G	R	55.41	57.08	32.00	34.48	44.75	28.15
ORC 8113	SPN//63189-66-71-7	W	54.93	55.98	33.75	27.91	45.18	25.00
CI 17590	FARO	W	53.88	54.97	32.75	28.79	43.95	25.10
CI 17149	DAWS	W	52.56	57.80	35.00	30.24	46.15	25.00
WA 6696	DAWS/WA5829 VH 079	W	47.06	58.43	35.50	32.82	47.95	26.67
NA 234	HAWK	R	45.13	58.25	35.50	33.86	47.93	25.69
		X	58.12	56.96	34.87	31.44	47.52	25.94
		F 2/	1.87	7.19	1.23	1.51	12.89**	3.84**
		S.E.X.	4.79	.48	1.69	2.55	.62	1.31
		C.V. %	8.24	.85	4.84	8.12	1.30	5.06
		L.S.D.	13.64	1.37	4.80	7.27	1.76	3.74

STATE or CI #	VARIETY	1/ CLASS	RIVALLI COUNTY YIELD BU/A	RIVALLI COUNTY TEST WT LBS/BU	RIVALLI COUNTY HEIGHT INCHES	3 LOCATION MEAN YIELD BU/A	3 LOCATION MEAN TEST WT LBS/BU	3 LOCATION MEAN HEIGHT INCHES
OR 792	TRIUMPH/LANCER	R	49.01	58.55	32.28	50.34	55.59	33.15
CI 17909	LEWJAIN	W	44.58	57.73	27.36	47.88	54.45	28.64
CI 17773	TYEE	W	32.15	53.05	24.11	42.10	50.68	28.07
WA 7049	LIND SEL B	R	40.06	56.85	26.87	46.10	54.28	30.14
OR 68007	HILL 81	W	42.85	55.27	31.79	46.39	52.38	32.55
MT 77077	WINRIDGE	R	42.68	58.18	29.92	46.14	55.18	30.41
CI 14586	LUKE	W	41.66	57.40	26.28	42.99	54.40	26.81
CI 11727	WESTON	R	38.65	60.72	37.01	41.94	56.40	35.17
ID 3518	WA4765/3/BEZ//BURT	R	33.86	54.35	26.28	39.49	53.22	27.42
CI 17596	STEPHENS	W	31.73	55.32	26.18	40.91	53.53	27.93
WA 6820	GWB;127;GWB236;//G	R	44.58	57.73	27.36	44.82	53.19	29.17
ORC 8113	SPN//63189-66-71-7	W	32.59	56.37	27.26	38.48	52.51	28.67
CI 17590	FARO	W	41.43	53.18	28.64	41.37	50.70	28.83
CI 17149	DAWS	W	39.45	56.68	26.18	40.75	53.54	28.73
WA 6696	DAWS/WA5829 VH 079	W	46.33	58.57	30.22	42.07	55.00	30.80
NA 234	HAWK	R	47.00	60.13	34.74	42.00	55.44	31.98
		X	40.53	56.86	29.16			
		F 2/	1.65	24.98**	15.43**			
		S.E.X.	4.27	.44	.90			
		C.V. %	10.54	.78	3.10			
		L.S.D.	12.16	1.27	2.57			

1/ Class = type of winter wheat, R = red, W = white

2/ F value for variety comparison

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, develored 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

PROJECT TITLE: Dwarf Bunt Tillage Study

PROJECT LEADER: Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT

PROJECT PERSONNEL: James Hoffman (USDA-ARS), Todd K. Keener - Research Specialist

SUMMARY:

The primary objectives of this research is to determine the effect of tillage management practices on the incidence and perpetuation of dwarf smut and the effect smut has on yields. High tillage treatments are being evaluated over a period of five to ten years. These techniques and descriptions are found in table 1.

RESULTS:

1984 was the first harvest year of this tillage study. It should be noted that the dwarf smut levels were not extremely high in 1984, but we were able to make some determinations as to some level of smut. Smut levels were the highest in the Claridge technique of tillage at 19.6% . The lowest smut level was obtained in the Convention 1 technique which consists of fall plowing. This may indicate that deep mold board plowing may reduce the spore load at the soil surface. All the tillage methods exceeded the No-till as far as yield is concerned. We did have somewhat higher test weights with the Conventional 1 technique which also had the highest yield. This is reflected in the number of heads per linear feet of row.

FUTURE PLANS:

The second year of tillage practices was completed this fall and winter wheat was seeded into the various tillage plots. A continuation of tillage practices is planned to observe the long range effects on dwarf bunt frequency in relation to cultural techniques.

Table 1. Description of tillage techniques

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1. Conventional Tillage I

   Fall plow (after harvest)
   Disc, rod weed, and harrow during the fallow season
   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 Tillage

Disc in fall, use herbicides to control weeds during season
Disc, harrow, and seed in fall (two discings total)

4. Claridge Technique

Use one-way (shallow discing apparatus)
Disc 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 Melrow drill (minimum tillage drill)

Table 2. Agronomic data from the TCK Tillage study grown on the Oscar Buller farm in 1984, Kalispell, MT.

Tillage tech.	Yield Bu/ A	Test Wt. lbs./ Bu	# Heads per 3 ft	# Smut per 3 ft	% Smut 1/
Conventional I	40.0a	58.3	49.5a	2.3	4.6
Conventional II	29.7a	56.8	42.8ab	3.2	7.5
Minimum Tillage	26.9a	56.7	26.8c	1.6	6.0
Claridge Tech.	29.8a	55.6	34.2bc	6.7	19.6
No - Till	11.1b	54.3	19.6c	1.4	7.1
X	27.5	56.3	34.57	3.03	8.96
F 2/	4.33*	1.32	6.89*	2.40	2.46
S.E.X.	5.03	1.31	4.57	1.39	4.34
C.V.	18.28	2.33	13.23	46.09	48.5
L.S.D.	18.07	NS	18.94	NS	NS

1/ % smut determined by dividing number of smut heads/ 3 ft by the number of heads per 3 ft of row.
2/ F value for technique comparison

Means within a column followed by a common letter are not significantly different at the 5% probability level according to the Multiple Range Test.

Plots were seeded October 13, 1983 with Wanser at 70 # seed per acre

PROJECT TITLE: Small Grain Production (Growth Regulator)

PROJECT LEADER: Vern R. Stewart, N. W. Agric. Res. Center

Cooperators: Todd K. Keener, N. W. Agric. Res. Center
Al Luke, Union Carbide, Idaho Falls, ID

SUMMARY:

The primary objective of the project is to find a product that will effectively and economically reduce lodging of small grains under high yielding conditions.

RESULTS:

There were no statistically significant differences in yields of Ingrid, Menuet and Clark barley. Yield differences because of treatment were non-significant. The check was the highest yielding treatment and ethephon (Cerone) .125 lb ai/a plus surfactant was the lowest.

A significant difference in test weights because of varieties was noted with Menuet being the highest. The rates of ethephon did not affect the test weight in this experiment.

The differences in height of barley varieties varied and were statistically significant. All the ethephon treatments were significantly shorter than the check. The differences in height can be part of the function of peduncle length. It is noted that there is little or no effect on the variety Ingrid, considerable reduction in peduncle length on Menuet and to a lesser degree on Clark. The addition of the surfactant to ethephon tends to cause greater reduction in peduncle length than when ethephon was used alone.

Yield components measured were number of seeds/head, heads/foot of row and percent plump. Menuet was significantly higher in percent plump than Ingrid and Clark. There was not any statistical significant difference for plumpness across ethephon treatments. Ethephon at .25 lb ai/a plus a surfactant caused a significant reduction in the number of seeds/head and was the lowest in the test. With the lowest rate of ethephon plus a surfactant we did have a significant reduction in the number of seeds/head. Clark had less seeds/head than the other two varieties. There were no significant differences in heads/foot between varieties. Across ethephon treatments we did not find any significant differences in heads/foot, however we did note more heads/foot in the ethephon treatments when compared to the check.

Table 1. Agronomic data from the Ethephon (Cerone) Growth Regulator Study, NWARC - 1984

Treatment	Rate lb ai	Yield Ingrid	Yield Menuet	Yield Clark	Yield X	Test Wt. Ingrd	Test Wt. Menuet	Test Wt. Clark	Test Wt. X	% Plump Ingrd	% Plump Menut	% Plump Clrk	% Plump X
Ethephon	.38	106.4	103.3	99.3	103.0	51.7	52.8	50.9	51.8	89.5	95.5	88.8	91.3
Ethephon	.50	103.0	110.9	97.7	103.9	51.8	53.0	50.9	51.9	90.5	96.3	89.0	91.9
Ethephon + surfact.	.25	109.8	106.9	97.9	104.9	52.1	52.9	50.7	51.9	91.8	96.0	90.3	92.7
Ethephon + surfact.	.125	99.6	105.5	94.7	99.9	51.3	52.6	50.8	51.6	90.0	95.5	92.0	92.5
Check	---	100.1	107.5	105.3	104.3	51.2	52.9	51.1	51.7	88.3	95.8	89.8	91.3
	mean	103.8	106.6	99.1		51.6b	52.9a	50.9c		90.0b	95.8a	90.0b	

Table 2. Agronomic data from the Ethephon (Cerone) Growth Regulator Study, NWARC - 1984

Treatment	Rate lb ai	Height Ingrid	Height Menuet	Height Clark	Height X	Seed/Heads Ingrd	Seed/Heads Menuet	Seed/Heads Clark	Seed/Heads X 1/	Heads/Foot Ingrd	Heads/Foot Menut	Heads/Foot Clrk	Heads/Foot X 2/
Ethephon	.38	31.6	28.0	30.6	30.1c	22.8	23.5	20.2	22.1c	34.9	29.3	38.0	34.1
Ethephon	.50	31.8	27.3	30.0	29.7c	21.8	23.7	21.1	22.2c	28.4	30.9	36.6	32.0
Ethephon + surfact.	.25	34.2	27.1	28.9	30.1c	21.4	23.4	20.7	21.9c	39.3	28.4	36.8	34.8
Ethephon + surfact.	.125	34.2	29.5	31.4	31.7b	23.7	23.8	21.1	22.9ab	32.0	30.0	36.1	32.7
Check	---	36.5	31.0	33.2	33.6a	24.0	24.4	22.7	23.7a	32.8	28.8	32.5	31.4
	mean	33.6a	28.6c	30.8b		22.7a	23.7a	21.2b		33.5	29.5	36.0	

Table 3. Agronomic data from the Ethephon (Cerone) Growth Regulator Study, NWARC - 1984

Treatment	Rate lb ai	*** Peduncle Lngth ** 3/ Ingrid	Menuet	Clark	X	*** Lodging Angle ** 4/ Ingrd	Menuet	Clark	X	***** Lodging % **** 5/ Ingrd	Menuet	Clark	X
Ethephon	.38	2.3	1.4	2.2	2.0	.75	0.0	.25	.33	62	0	25	29
Ethephon	.50	2.7	1.6	2.6	2.2	.5	0.0	.5	.33	50	0	50	33
Ethephon + surfact.	.25	2.7	1.3	1.7	1.9	.75	0.0	0.0	.25	62	0	0	21
Ethephon + surfact.	.125	2.4	1.9	1.8	2.0	1.75	0.0	.25	.66	72	0	25	32
Check	---	2.5	3.5	3.5	3.2	3.3	0.0	1.8	1.7	94	0	61	52
	mean	2.5	1.9	2.4		1.41	0.0	.56		68	0	32	

1/ Seed per heads = average number of seeds from 10 head counts per replication
2/ Heads per foot = number of heads per foot of row from three counts per replication
3/ Peduncle length = average length from flag leaf to base of emersed head from three counts per replication
4/ Lodging angle = a 1-9 ocular rating on degree of lodging where 0 = straight up and 9 = lodged to ground
5/ Lodging percent = percent of plot lodged.
Means in the same column followed by a common letter are not significantly different at the 5% probability level according to the Multiple Range Test.

Application data: Date 6-26-84, Air temp 78 F, Soil temp 69 F, Wind 2-4 mph, Relative humidity 20%, Cloud cover clear and hot, Last rain 6-21-84 (1.09 "), GPA 26.86, PSI 32, Plots were 10' x 14', Planted by new research seeder on 4-47-84, Barley stage at application was 17 " tall (between stage #8 & #9), Surfactant (R-11) added to spray solution at .5% V/V.

PROJECT TITLE: Dupont growth regulator study

YEAR/PROJECT: 1984/754

PROJECT PERSONNEL: Leader, Vern R. Stewart, Northwestern Agricultural Research Center - Kalispell, MT

Research Specialist, Todd K. Keener, NWARC
Cooperators: Chemical Company Representatives

SUMMARY:

Several rates and three application types were tested to evaluate the efficacy of the compound DPX-Y6185 as a growth regulator that would increase tillering in irrigated spring barley. The aplication types investigated were a seed treatment, a pre-emergence surface, and a post emergence application. The rates ranged from .25 to 1.0 lb ai/A which were applied using a research type tractor mounted sprayer

RESULTS:

In light of the fact that the check plot yielded the highest and that there were no significant differences between treatments in respect to yield, test weight, % plump, height, head or tiller counts, and peduncle length it has been determined that DPX-Y6185 had no sisnificant growth regulator effect on Clark spring barley (Table 1).

Table 1. Agronomic data from the Dupont growth regulator study on irrigated spring barley grown on the Northwestern Agricultural Research Center in 1984. Field P-2

Date planted April 27, 1984 Date harvested: August 27, 1984

Treatment	Rate # ai/A	Appln Type	Yield Bu/A	Test Wt. lbs/Bu	% Plump	Height inches	Heads/ 3 ft. 1/	Till/ plant 2/	Peduncle length 3/
DPX-Y6185	seed trtmt		52.8	49.7	85.3	26.4	55	3.0	.83
DPX-Y6185	.25	Pre	53.8	48.8	83.5	28.7	61	3.7	.75
DPX-Y6185	.50	Pre	57.2	49.0	83.5	29.5	65	2.7	.63
DPX-Y6185	1.0	Pre	56.6	49.5	82.8	28.7	57	3.7	.63
DPX-Y6185	.25	Post	54.9	49.4	85.5	28.0	71	4.5	.79
DPX-Y6185	.50	Post	57.0	49.4	85.8	28.3	59	3.3	.98
DPX-Y6185	1.0	Post	52.2	50.0	86.5	28.7	51	3.9	.59
ETHEPHON+S	1.0	Post	51.3	48.6	81.3	28.7	56	3.5	1.18
CHECK	---	---	59.3	49.5	84.5	28.7	57	4.4	1.06

	Yield Bu/A	Test Wt. lbs/Bu	% Plump	Height inches	Heads/ 3 ft. 1/	Till/ plant 2/	Peduncle length 3/
X	54.73	49.3	84.3	28.4	58.8	3.46	.81
F 4/	.53	1.46	.794	.50	1.68	1.69	1.73
S.E.X.	100.3	.381	1.87	3.04	4.69	.42	.70
C.V.	6.55	.77	2.22	4.21	7.98	20.18	20.2
L.S.D.	NS	NS	NS	NS	NS	NS	NS

1/ Heads/3ft = heads per 3 feet linear row
2/ Till/plant = tillers per plant
3/ Peduncle length = the distance from the flag leaf to the bottom of the head
4/ F value for treatment comparison

APPLICATION DATES:	Appln	Date	Temps Air	Temps Soil	Wind MPH	R.H. %	Weather	Stage
	PES	5-1	60	63	3-5	14	Sunny	Pre-em
	POST	5-29	73	79	2-3	13	Sunny	3 1/2- 4 leaf
	Ethephon	6-4	63	58	3	23	Prt cld	Pre-till

EVALUATION DATES: Head count 7-26-84
Heisth 7-30-84
Peduncle 8-7-84
Tillers 8-9-84

Planted 4-27-84
Harvested 8-27-84
Bronate applied 5-29-84
Creston silt loam;pH 7.8;om 6.4%

TITLE: Pulse and Oil Seed Variety Trials

PERSONNEL: Leon E. Welty and Louise Prestbye

YEARS: 1979-1984

PROCEDURES:

Various annual legume varieties were evaluated over the past five years at the Northwestern Agricultural Research Center, Kalispell, MT under dryland and irrigated conditions. Performance of these varieties were very dependent upon the growing season. Following is weather information for 1978-1984.

Frost Free Period		Precipitation	
		Sept. - Aug.	
Year	Days	Year	Inches
1979	123	1978-79	16.31
1980	111	1979-80	23.62
1981	142	1980-81	23.66
1982	108	1981-82	18.26
1983	114	1982-83	20.99
1984	103	1983-84	19.93

RESULTS AND DISCUSSION:

Lentil

Lentil yields varied from 1500-3200 lbs/a depending upon year. Low yields were usually encountered with very low or very high precipitation levels. Lack of precipitation obviously limited plant growth whereas excess precipitation produced excess foilage and more disease problems.

Pea

Pea yields were also variable from year to year. Peas need more precipitation than lentils, but too much can also stimulate vegetative growth and reduce yield.

Fababean

Fababeans are very sensitive to moisture stress. A stress early in the growing season usually results in reduced plant growth throughout the entire growing season. In 1984, fababeans did not respond to irrigation. The irrigated nursery was located on a very sandy soil and the 5.4 inches of irrigation was not adequate.

Lupine

Lupines were grown at the center in 1983 on a heavy soil. All varieties died due to disease. In 1984, on a coarser textured soil under irrigation (and with more sunny days) lupines matured and produced good yields. In a normal growing season, we question if this crop would mature in the Flathead.

Garbanzo Bean - Chickpea

Chickpeas have produced high quality and high yields in two out of four years. This crop requires more heat and a longer growing season than we usually have in the Flathead.

Rape and Mustard

These crops require a relatively short growing season and appear to be well adapted to the Flathead. The marketing of this crop needs to be developed.

DRYLAND LENTIL TRIAL - 1984

VARIETY	HEIGHT inches	1ST FLOWER days	MATURITY days	SEED SIZE no./lb	YIELD lbs/a
Chilean 78	19	70	114	8563	3220
Red Chief	18	67	116	8148	3145
Eston-Canadian	18	73	115	13,555	3753
Brewer	18	68	113	7901	3474
Laird-Canadian	20	76	119	6050	2831
Emerald	21	74	116	8213	3306
LSD(0.05)	1	1	1	399	305

Planting Date: 4/13/84 No fertilizer
Herbicides: Poast - .75 lb AI/a Farso - 1.25 lb AI/a

LENTIL VARIETY TRIALS 1979-1984

YIELD - lbs/a

VARIETY	1979	1982	1983 *	1984
Brewer		1707	2143	3474
Chilean	1493	1704	1573	3220
Laird	1466	1825	1983	2831
Red Chief		1438	1965	3145
Eston			1915	3753

* irrigated

DRYLAND PEA TRIAL - 1984

VARIETY	HEIGHT inches	1ST FLOWER days	MATURITY days	SEED SIZE no./lb	YIELD lbs/a
Alaska (green)	53	65	112	2426	3170
Latah (yellow)	60	68	112	2592	2886
Maro (green)	31	74	113	1533	4172
Trapper (yellow)	51	76	113	3723	3189
Garfield (green)	58	73	113	2422	3288
Melrose (black)	56	78	116	4108	2996
Glacier (black)	29	80	116	3915	3233
LSD(0.05)	8	1	2	169	655

Planting Date: 4/13/84 No fertilizer
Herbicides: Poast .75 lb AI/a Farso 1.25 lb AI/a

PEA VARIETY TRIALS 1981-1984

VARIETY	YIELD - lbs/a 1981	1982	1983 *	1984
Alaska	4550	2399	2651	3170
Garfield	5069	2122	2192	3288
Latah	5026	3088	2655	2886
Maro		2052	2914	4172
Tracer	4590	2892	2538	

* irrigated

IRRIGATED FABABEAN TRIAL - 1984

VARIETY	HEIGHT inches	1ST FLOWER days	MATURITY days	SEED SIZE no./lb	YIELD lbs/a
Diana	31	68	115	1455	2514
Herz-Freya	37	69	117	1255	2773
Alladin	36	69	115	1377	2791
Ackerperle	32	68	116	1437	2358
Petite	21	72	112	2128	1567
Chinese	30	62	111	749	2352
LSD(0.05)	4	1	2	91	599

Planting Date: 4/16/84 No fertilizer
Herbicides: Poast - .75 lb AI/a
Irrigation: 5.4 inches

DRYLAND FABABEAN TRIAL - 1984

VARIETY	HEIGHT inches	1ST FLOWER days	MATURITY days	SEED SIZE no./lb	YIELD lbs/a
Diana	36	71	115	1528	2221
Herz-Freya	40	73	117	1302	2346
Alladin	40	71	116	1448	2464
Ackerperle	37	72	117	1526	2112
Petite	27	74	112	2352	1712
Chinese	33	67	113	778	2432
LSD(0.05)	3	1	3	89	383

Planting Date: 4/16/84 No fertilizer
Herbicides: Poast - .75 lb AI/a Farso - 1.25 lb AI/a

FABABEAN - 1984 - IRRIGATED VS DRYLAND

VARIETY	HEIGHT (inches) Irrigated	Dryland	YIELD (lbs/a) Irrigated	Dryland
Diana	31	36	2514	2221
Herz-Freya	37	40	2773	2346
Alladin	36	40	2791	2464
Ackerperle	32	37	2358	2112
Petite	21	27	1567	1712
Chinese	30	33	2352	2432

FABABEAN TRIALS 1979, 1983, 1984

YIELD - lbs/a

	1979	1983	1984
Irrigated	4290	5363	2393
Dryland	998	6035	2215

IRRIGATED LUPINE TRIAL - 1984

VARIETY	HEIGHT inches	MATURITY days	SEED SIZE no./lb	YIELD lbs/a
Astra non-inoc.	26	122	1211	2492
Astra inoc.	26	122	1217	2923
Nyirsegi	31	127	1307	3673
Ultra	29	122	1295	3083
LSD(0.05)	1	0	60	375

Planting Date: 4/30/84 Herbicide: Poast - .75 lb AI/a
Irrigation: 3.6 inches
No fertilizer

RAPE & MUSTARD TRIAL - 1984

VARIETY	HEIGHT inches	MATURITY days	SEED SIZE no./lb	YIELD lbs/a
Domo Oriental Mustard	45	109	210,000	2008
Tobin Turnip Rape	38	93	340,000	1947
Westar Argentine Rape	40	105	150,000	2398
LSD(0.05)	3	0	121,500	392

Planting Date: 4/30/84 Herbicide: Poast - .75 lb AI/a
Seeding Rate: 11 lbs/a Irrigation: 3.6 inches
No fertilizer

CHICKPEA VARIETY TRIALS 1982-1984

YIELD - lbs/a

	1982		1983		1984	
	Irrig	Dry	Irrig	Dry	Irrig	Dry
UC-5	342	1000	139	1468	2625	3414
Turkey	551	1880	275	2267	2908	3577
Surutato 77	577	577	79	744	1865	3149

TITLE: Nitrogen Economy Studies

PERSONNEL: Leon E. Welty and Louise Prestbye

YEARS: 1982-1984

PROCEDURES:

Two separate experiments (cycles) evaluating nitrogen (N) contribution of annual legumes to subsequent small grain crops were conducted at Creston, Montana. Cycle 1 was conducted one mile north and one mile west of the Northwestern Agricultural Research Center (NWARC) during the period of 1982-83 on land leased by Dale Sonstelie. Cycle 2 was conducted just east of the NWARC during the period of 1983-84 on land owned by Arne Grob and leased by Ed Sanders.

Year 1 of each cycle involved growing various annual legumes for grain and hay. Year 2 of each cycle involved recropping the entire plot area to a small grain to measure N contribution through crop response. In year 2, N rates (0, 25, 50, 75, 100 lbs/a) were randomly stripped across annual legume plots to quantify N contribution.

RESULTS AND DISCUSSION

Results of Cycle 1 (Sonstelie) are presented in Table 1 and Figure 1 while results of Cycle 2 (Grob) are presented in Table 2 and Figures 2 and 3.

Cycle 1

N contribution of annual legumes (1982) to small grain yields (1983) was evident (Fig. 1). Austrian pea-green manure produced more barley at the 0 inorganic N rate than any annual legume harvested for grain or hay. Austrian pea-hay, grain pea and lentil provided more N than fababean or garbanzo bean. Garbanzo beans were not well nodulated in 1982 due to harmful effects of Captan on garbanzo Rhizobia. Fababean growth and nodulation was reduced in 1982 because of moisture stress during early growth stages even though total crop year precipitation was normal. Barley yields on fallow were high due to high soil organic matter (OM) resulting in high amounts of N mineralization throughout the crop year.

Cycle 2

N response in 1984 was not as great as 1983 because of drought (Fig. 2 and 3). Yields were maximized at about 50 lbs N/a. Grain yields on fallow were much lower than in Cycle 1 due to the lower soil organic matter. Because of the drought in 1984 this area will again be recropped (barley and wheat) in 1985 to determine if any residual N exists from 1984.

Table 1.

NITROGEN ECONOMY STUDY - DALE SONSTELIE FARM - 1982

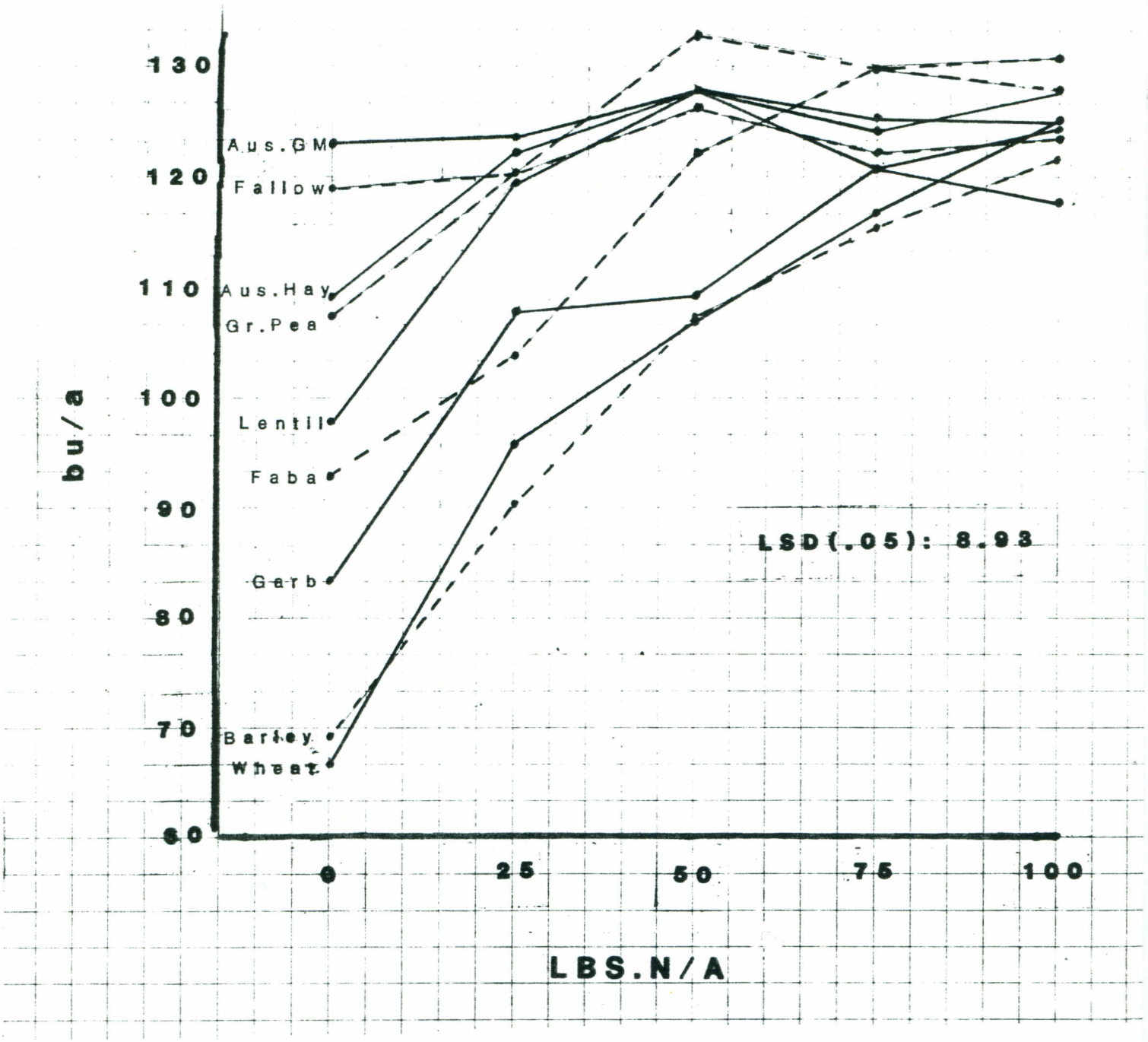
CROP	EMERGENCE DATE	HARVEST DATE	STRAW YIELD	GRAIN YIELD	GRAIN CRUDE PROTEIN
			-lbs/a-	-lbs/a-	-%-
'UC-5' Garbanzo Bean	5/9	9/8	1021	912	----
'Chilean-78' Lentil	5/2	8/23	2375	1908	26.5
'Garfield' Grain Pea	5/3	8/16	2084	2814	26.4
'Ackerperle' Fababean	5/7	9/3	698	1116	26.3
'Melrose' Austrian Winter Pea (Hay)*	5/4	7/21	4400		
'Melrose' Austrian Winter Pea (Gr.Manure)	5/4	7/20 !			
'Clark' Barley	4/29	8/25	1277	3283	10.8
'Newana' Wheat	4/30	8/25	1910	2562	14.7

* Hay harvest taken when majority of plants had 6 to 8 flowering nodes.
! Date of plow down

AGRONOMIC NOTES

Planting date: April 21 on barley recrop
Fertilization in 1982: Annual legumes - 0 lbs/a N; 50 lbs/a P205; 50 lbs/a K20; 30 lbs/a S02
Cereal grains - 75 lbs/a N; 50 lbs/a P205; 50 lbs/a K20; 30 lbs/a S02
Crop year precipitation (Sept.1981-Aug.1982): 18.3 inches
Frost free period: May 30 - Sept.15 (108 days)
Annual legume nodulation: Lentils, grain peas and Austrian peas - good; fababeans and garbanzos - poor
Indigenous NO3-N: 45.8 lbs/a -available N to 4' in spring 1982
Organic matter: 4.7%
Herbicides: Hand-weeded
Soil type: Creston silt loam
Fungicide seed treatment: Annual legumes - Captan + Lindane + inoculum

Figure 1. YIELD OF CLARK BARLEY 1983



AGRONOMIC NOTES

Plantins and fertilization date: 4/12/83
Seedins rate of 'Clark' barley: 50 lbs PLS/a
Fertilizer: 32 lbs/a P205
0,25,50,75,& 100 lbs/a N
Soil temperature at plantins: 46 deg.F at 2"
Frost free period: May 15 - Sept.6 (114 days)
Crop year precipitation (Sept.1982-Aus.1983): 20.99 inches
Herbicides: Buctril (.375 lbs.AI/a)

Table 2.

NITROGEN ECONOMY STUDY - ARNE GROB FARM - 1983

CROP	EMERGENCE DATE	HARVEST DATE	GRAIN YIELD	STRAW YIELD
			-lbs/a-	-lbs/a-
'UC-5' Garbanzo Bean	5/17	8/29	1536	3091
'Chilean-78' Lentil	5/9	8/29	1626	3470
'Garfield' Grain Pea	5/10	8/22	1392	3788
'Ackerperle' Fababean	5/14	8/29	2115	3700
'Melrose' Austrian Winter Pea (Hay)	5/11	8/4	4440	
'Melrose' Austrian Winter Pea (Green Manure)	5/11	8/1 *		
'Clark' Barley	5/6	8/25	3657	1841
'Newana' Wheat	5/7	8/25	3358	1838

* Date of plow down. Majority of plants had 9 flowering nodes.

AGRONOMIC NOTES

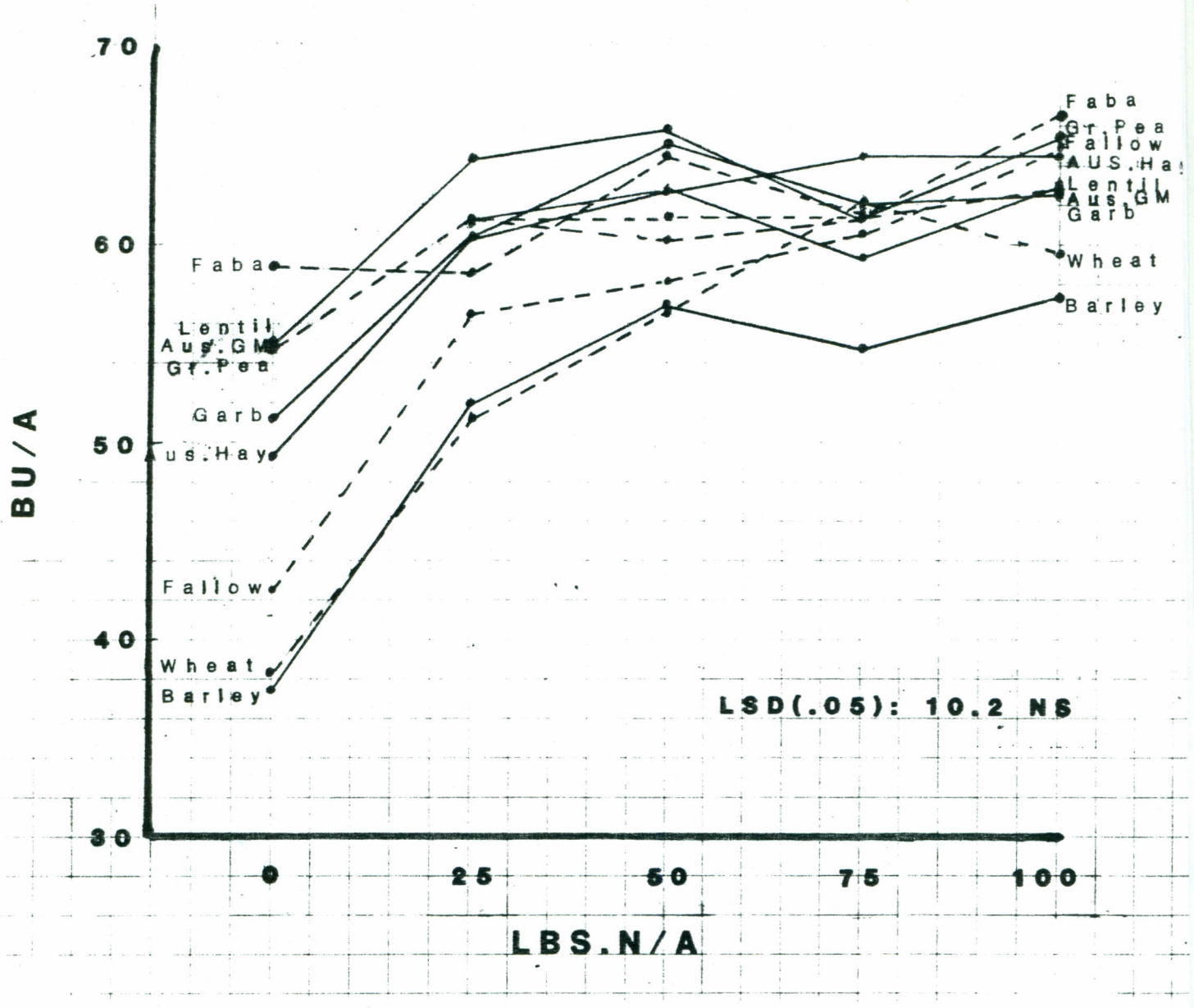
Planting date: April 29 on barley recrop.
Soil temperature at 2.5 inches = 58 deg.F.
Soil type: Flathead very fine sandy loam.
Indigenous NO3-N: 58 lbs/a - available N to 4' in spring 1983
Organic matter: 3.14%
Crop year precipitation (Sept.1982-Aug.1983): 20.99 inches
Frost free period: May 15 - Sept.6 (114 days)
Annual legume nodulation: Garbanzo bean - very good
Austrian peas - good
Fababean, lentils and grain peas - fair
Fertilization in 1983: Annual legumes - 0 lbs N/a; 40 lbs P2O5/a; 40 lbs K2O/a; 20 lbs SO2/a
Cereal grains - 70 lbs N/a; 40 lbs P2O5/a; 40 lbs K2O/a; 20 lbs SO2/a
Fungicide seed treatments: Lentils - Captan and Lindane + inoculum
Garbanzo - Ridomil
Insecticide: Dimethoate 0.5 lb AI/a on grain pea & lentil - 7/18/83
No herbicides - hand-weeded

NITROGEN ECONOMY STUDY - ARNE GROB FARM

Figure 2.

1984

EFFECT OF 1983 CROP ON YIELD OF CLARK BARLEY



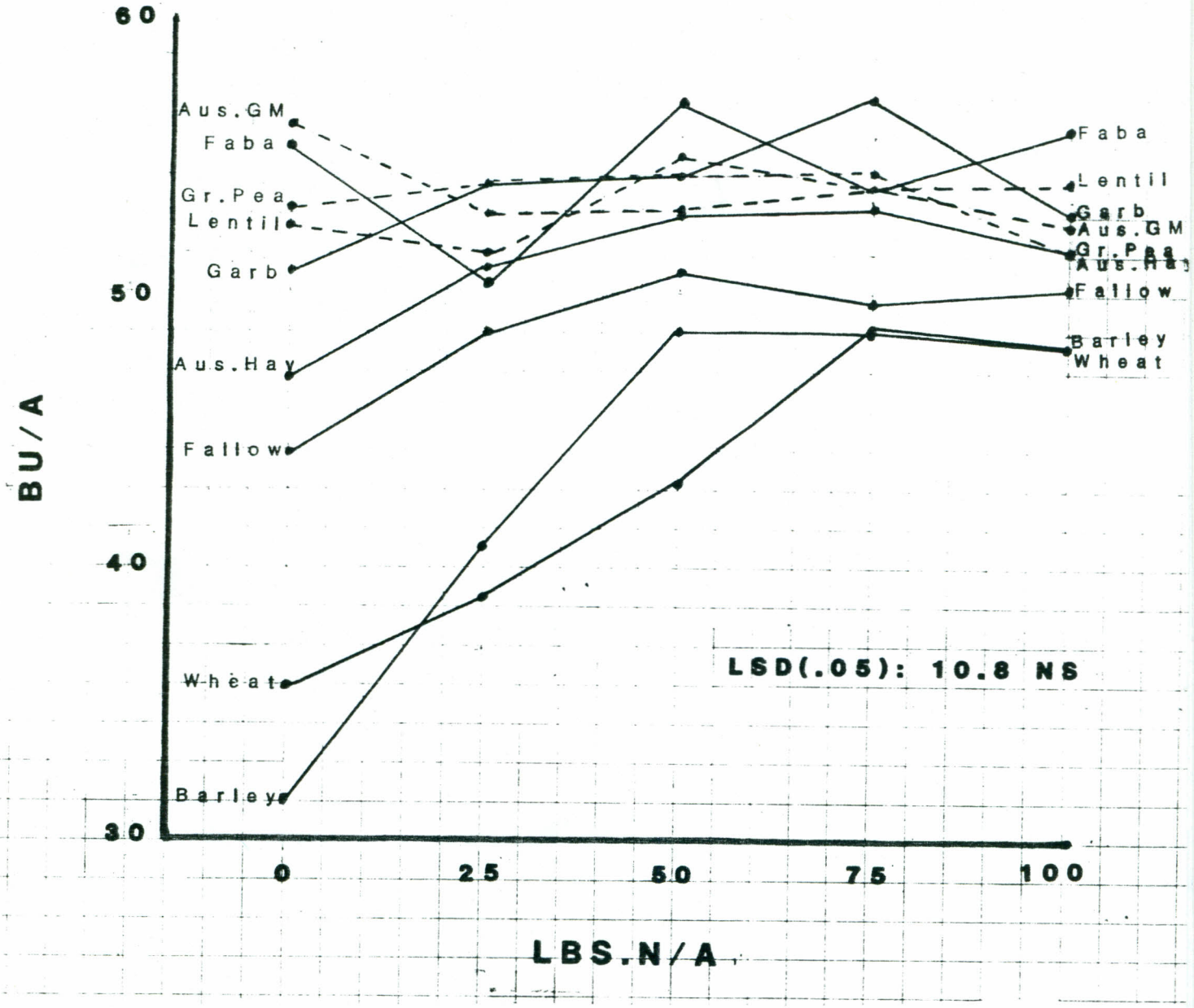
AGRONOMIC NOTES

Planting and fertilization date: 4/23/84
Seeding rate: 60 lbs PLS/a
Fertilizer: 33 lbs P205/a with seed
0,25,50,75, & 100 lbs/a N
Soil temperature at 2.5 inches: 52 deg.F
Frost free period: June 2 - Sept.13 (103 days)
Crop year precipitation (Sept.1983-Aug.1984): 19.93 inches
Herbicides: Hoelon (0.75 lb.AI/a); Buctril (0.375 lb.AI/a)
Harvest date: 8/13/84

NITROGEN ECONOMY STUDY - ARNE GROB FARM
1984

Figure 3.

EFFECT OF 1983 CROP ON YIELD OF NEWANA WHEAT



AGRONOMIC NOTES

Planting and fertilization date: 4/23/84
Seeding rate: 60 lbs PLS/a
Fertilizer: 33 lbs P205/a with seed
0,25,50,75, & 100 lbs/a N
Soil temperature at 2.5 inches: 52 deg.F
Frost free period: June 2 - Sept.13 (103 days)
Crop year precipitation (Sept.1983-Aug.1984): 19.93 inches
Herbicides: Hoelon (0.75 lb.AI/a); Buctril (0.375 lb.AI/a)
Harvest date: 8/24/83

1984 Northwestern Agricultural Research Center
Annual Report Addendum

PROJECT TITLE: Tansey Weed Control

YEAR/ PROJECT: 1984/ 764

PERSONNEL: Leader, Vern R. Stewart
Todd K. Keener, Research Specialist
Cooperator - Rob Johnson, Ravalli County Agent

SUMMARY:

Several herbicides tested in a canal-bank vegetation study were found effective in controlling tansey (Tanacetum vulgaris). In spray applications 2,4-D, dicamba, glyphosate, and SC 0224 provided excellant control of tansey. In rope wick applications dicamba, 2,4-D + dicamba, glyphosate and SC 0224 also proved to be effective in controlling tansey. Significant reduction in tansey regrowth was observed in the rope wick treatments of dicamba and SC 0224 that had been applied two years before.

MATERIALS AND METHODS:

Two studies for tansey weed control were initiated on the Bob Severs farm, Ravalli County, Corvallis, Montana. Each study was established on the far side of a irrigation canal bank where tansey growth, in most cases, was the only plant species. One study was applied in 1982 and the other in 1983 using a 2 gallon sprayer for spray applications and a Micromax " Walk-a-wick " for the rope wick applications. The spray volume was approximately 100 gals/A (8001 nozzle at 40 psi) and the rope wick dilution was 1:3, except where glyphosate was applied with surfactant (1:6 dilution).

The plots that were established on actively growing tansey measured 10 feet by 3 feet. Spray applications were applied to tansey plants until runoff was detected. Walk-a-wick applications were applied by walking across the plot twice making each pass perpendicular to the other, therefore giving thorough coverage. Observations for weed control began the following season and were repeated the second season after application.

RESULTS:

One year after application of the 1982 study 100% tansey control was noted in the plots that had been sprayed with glyphosate and SC 0224. 95 to 100% control was observed in rope wick plots that had been treated with dicamba, 2,4-D + dicamba, glyphosate, and SC 0224. Second year evaluations from the 1982 study show rope wick applications of dicamba and SC 0224 giving 90 and 100% tansey control (respectively) with marked reductions in tansey regrowth. Other treatments provided good control but not as effective as those mentioned above (see table 1). Spray applications were not as effective in controlling tansey two years after application although slight stunting of regrowth was apparent in the glyphosate plots.

An alternate objective in this study was to control tansey yet allow grass regrowth . As tansey was the predominant species and grass was shaded out, it was the controlling of tansey that allowed grass to become established at the end of the first season and into the next. An application of some of these non-selective systemics treatments to a stand mixed with grass would greatly reduce the chances of grass regrowth.

Grass regrowth in the 1982 study was best seen in the plots that recieved rope-wick applications of glyphosate + surfactant and probably was due to the lower dilution rate of the chemical.

Other broadleaf weeds (Canada thistle mainly) in this study were controlled well by a number of treatments yet resumed normal regrowth the first season after application.

The 1983 study revealed similar results in tansey control when observed one year after application. In spray applications 2,4-D + dicamba and glyphosate gave 100% control (see table 2). Rope wick applications of dicamba, glyphosate, and SC 0224 had 95 - 100% control of tansey. Grass regrowth was good in the plots where 2,4-D had been applied both by spray and rope wick application. Dicamba applied to plots by rope wick also allowed excellant grass regrowth the following season.

Comparing the two application dates of the two studies it was apparent that the earlier the herbicides were applied, the better the tansey control. In fact such good control of tansey was not expected in the later application date because the plants had begun to flower, were much bigger (36 versus 22 inches), and had a dense foliage canopy. Rope wick applications were more effective at the earlier stage due to the fact that chemical concentration was higher in relation to amount of plant material. Second year control of tansey was better in rope wick plots probably because of greater amounts of chemical being translocated.

Good grass regrowth was seen in the 1983 study in plots treated with 2,4-D and dicamba because of their nature being that of a broadleaf herbicide. Grass regrowth was good in the 1982 study concerning the glyphosate plot due to the reduced rate (1:6) used in the wick application and application time.

Effective tansey weed control will be a result of combining weed management practices. No one herbicide treatment will totally eliminate this troublesome weed species yet the use of these chemicals combined with cultural techniques (mowing, clipping, burning, etc)should bring tansey situations under control.

Table 1. 1982 TANSEY HERBICIDE STUDY - SEVERS FARM. CORVALLIS, MT

Plot #	Treatment	Rate or dilution	Appln.	Grass Regrowth 1/	Weed Control-1983 Tansey	Other
1	2,4-D	1:3	Rope wick	5.0 Fair	30% Poor	100% Excel
2	Dicamba	1:3	" "	1.5 Poor	100% Excel	100% Excel
3	2,4-D + dicamba	1:3	" "	1.0 Poor	100% Excel	100% Excel
4	Glyphosate	1:3	" "	5.5 Fair	95% VGood	60% Fair
5	Glyphosate + surfactant	1:6	" "	8.0 Good	100 Excel	60% Fair
6	SC 0224	1:3	" "	3.0 Poor	100 Excel	20% Poor
7	CHECK	---	-- --	10.0 Excel	0% VPoor	100% Check
8	2,4-D	2.0#	Spray	1.0 VPoor	5% VPoor	100% Excel
9	Dicamba	2.0#	"	5.0 Fair	25% Poor	100% Excel
10	2,4-D +Dicamba	2 + 1 #	"	Plot destroyed no data		
11	Glyphosate	3# ae	"	0.0 None	100% Excel	60% Fair
12	Glyphosate +	1.5#ae	"	3.0 Poor	100% Excel	0% None
13	SC 0224	3.0#	"	0.0 None	100% Excel	0% None
14	CHECK	----	-	10.0 Check	0% None	100% Check

1/ Grass regrowth 1 year after chemical applications. Good grass regrowth was seen in plots #5, #7, and #14.

Weed Control figures are given in % control with an accompanying word interpretation. The column refered to as "other" refers to Canada thistle and dandelion. Notice that there were no other weeds in the two checks besides the tansey due to competion of the tansey.

Plot #10 was destroyed when the Power Company put in a new utility pole.

Ratings taken 7-8-83

Table 1 (cont'd). 1982 TANSEY HERBICIDE STUDY - SEVERS FARM. CORVALLIS, MT

**** 1984 RATINGS ****

Plot #	Treatment	Rate or dilution	Appln.	Regrowth Grass	Regrowth Other	Tansey Control
1	2,4-D	1:3	Rope wick	Normal	Regrowth	33%
2	Dicamba	1:3	" "	"	"	90% sl red.
3	2,4-D + dicamba	1:3	" "	"	"	85% " "
4	Glyphosate	1:3	" "	"	"	75% " "
5	Glyphosate + surfactant	1:6	" "	"	"	50% " "
6	SC 0224	1:3	" "	"	"	100% excel
7	CHECK	---	-- --	"	"	Normal regr.
8	2,4-D	2.0#	Spray	"	"	" "
9	Dicamba	2.0#	"	"	"	" "
10	2,4-D +Dicamba	2 + 1 #	"	"	"	" "
11	Glyphosate	3# ae	"	"	"	Slight retd
12	Glyphosate + surfactant	1.5#ae	"	"	"	Slight retd
13	SC 0224	3.0#	"	"	"	Normal regr
14	CHECK	----	-	"	"	" "

Rated June 21, 1984

sl red = slight reduction in regrowth
normal regr = normal regrowth equal to check
Slight retd = slight retardation of tansey regrowth
Rating made 6-21-84

Table 2. 1983 TANSEY HERBICIDE STUDY - SEVERS FARM, CORVALLIS, MT

Plot #	Treatment	Rate or dilution	Appln.	Grass Regrowth 1/	Weed Control-1984 Tansey	Other
1	2,4-D	1:3	Rope wick	10.0 VGood	80% Good	0% None
2	Dicamba	1:3	" "	0.0 None	100% Excel	100% Excel
3	2,4-D + dicamba	1:3	" "	0.0 None	75% Good	0% None
4	Glyphosate	1:3	" "	0.0 None	100% Excel	100% Excel
5	Glyphosate + 2,4-D	1:3	" "	2.0 Poor	80% Good	60% Fair
6	Glyphosate + surfactant	1:6	" "	4.0 Fair	100% Excel	80% VGood
7	SC 0224	1:3	" "	2.0 Poor	95% VGood	100% Excel
8	CHECK	---	-- --	10.0 VGood	0% None	0% None
9	2,4-D	2.0#	Spray	10.0 VGood	20% Poor	70% Good
10	Dicamba	2.0#	"	10.0 VGood	0% None	30% Poor
11	2,4-D +Dicamba	2# + 1#	"	0.0 None	100% Excel	95% VGood
12	Glyphosate	3# ae	"	1.5 VPoor	100% Excel	80% VGood
13	Glyphosate + 2,4-D	3#+1#	"	1.0 VPoor	70% Good	70% Good
14	Glyphosate + surfactant	1.5#ae	"	0.0 None	55% Fair	25% Poor
15	SC 0224	3.0#	"	0.5 VPoor	90% VGood	100% Excel
16	CHECK	----	-	10.0 Check	0% None	0% None

1/ Grass regrowth 1 year after chemical application. Good grass regrowth was seen in treatments # 1, 8, 9, 10, and 16.

Rated June 21, 1984

1:3 rope wick dilutions = 1 part chemical, 3 parts water
2,4-D + dicamba formulation was Weedmaster (2# 2,4-D + 1# dicamba)
Glyphosate + 2,4-D rope wick dilution (3 parts gly. + 1 part 2,4-D)
Surfactant used in rope wick: 1/2 gallon per 100 gallons water, in spray solutions .5% V/V.