THIRTY-EIGHTH ANNUAL REPORT

1986

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

Todd K. Keener
Ag. Research Specialist I

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DISTRIBUTION OF THE

1986 NORTHWESTERN AGRICULTURAL RESEARCH CENTER REPORT

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Co-op Supply Inc. - Ronan
Equity Supply Company - Kalispell
Farmers Union Exchange - Kalispell
Westland Seeds Inc. - Ronan

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.

Full-time Staff Members

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

Sudent Employees

Ramona Benz (June 16 thru September 19)
Wanda Iverson (July 21 thru September 9)
Randy Turnacliff (May 28 thru August 22)

Part-time Hourly Employees

Kristi Carda
Craig Fischer
Amy Wilcox

Office Equipment Purchased

Star NX10 Printer	Cost - $253	(161)

GENERAL FARM 751

The General Farm Project (751) supports all research projects. This includes items purchased and used in the total research program. The following were purchased in 1986.

1986 4-Door Chevrolet Sedan (Celebrity)	$ 9299.00	(715)
1986 One-half Ton Chevrolet Pickup	7822.00	(755)
Sears Tool Chest	271.75	(751)
Total	$17392.75	

PHYSICAL PLANT 752

The Physical Plant Project (752) pertains to the maintenance of buildings and grounds at the Northwestern Agricultural Research Center.

The Forage & Livestock Building was remodeled into a shop. The shop was moved out of the Crops Research Building when the remodeling was completed.

Cost of this project was: $12,728.00 (Plant Funds)

The upstairs bathroom in Residence II was remodeled.

A new septic system was installed in Residence I.

Cost of this project was:	1,156.00	(752)
	$13,884.00	

VISITORS 1986

DATE		REPRESENTING	ADDRESS
1/8	Andy VanTeylingen	University Services, MSU	Bozeman
1/10	Mark Passmore	Farmer	Kalispell
	Dan Basketfield	Conf. Salish/Kootenai Tribe	Pablo
2/11	Gene Mockabee	Pastor	Kalispell
2/27	Bob Bishop	SCS	Kalispell
	Durvin Wick	SCS	Kalispell
3/4	Eugene Thomas	Thomas Electric	Kalispell
	M. O. Lockrem	MOE Electric	Marion
3/5	Andy VanTeylingen	University Services, MSU	Bozeman
3/28	Todd Cramer	Student	Kalispell
	Randy Turnacliff	Student	Bigfork
4/21	Ole Olson	U.S. Weather Service	Idaho
4/28	Malvern Westcott	Supt. W. Agric. Res. Center	Corvallis
	Eugene Thomas	Thomas Electric	Kalispell
5/1	Gary Mayland	Farmer	Havre
	Glen Gray	Farmer	Kalispell
5/5	Farnk Michaud	Farmer	Kalispell
	Ken Pederson	Pederson Excavating	Kalispell
5/6	Pernal Whitehead	Pack & Co.	Kalispell
	Ray Galloway	Galloway's BAckhoe/Septic	Kalispell
5/21	Arthur David	Farmer	Bigfork
	Marvin Wang	Businessman	Kalispell
5/23	Andy VanTeylingen	University Services, MSU	Bozeman
5/24	Carol Brashears		Albuquerque, NM
	Gary & Elaine Fellows	Graduate Student	Bozeman
5/28	Dan Burkhart	DuPont	Bozeman
	Jim Buechle	Farmer	Kalispell
	Dale Sonstelie	Farmer	Kalispell
6/3	Eugene Lee	Wilderness Ranch - Farmer	Spotted Bear
6/10	Heidi Carter	APHIDS	Billings
	Todd Borchers	APHIDS	Billings
6/12	Monty Hall	Hoecht	
6/16	Ray Livingston	Farmer	Polson
	Ron deYong	Farmer	Kalispell
6/26	Jeff Key	UWI - Extension	Oshkosh, WI
7/2	Lloyd Hall	Farmer	Kalispell
7/3	Bruce Johnson	Flathead Co. Weed Dept.	Kalispell
7/14	Steve	Kalispell Weekly News	Kalispell
	Carl Rickman	The Daily InterLake	Kalispell
7/30	Clyde/Jeanine Pederson	Farmers	Kalispell
	Dan Burkhart	DuPont	Bozeman

DATE		REPRESENTING	ADDRESS
8/12	Gary Fellows	Graduate Student	Bozeman
9/4	Bob Evans	Farmer	California
9/8	Doug McLean	Farmer	Columbia Falls
9/9	Dan Smith	Student Teacher	Bigfork
9/10	Harold Small	Farmer	Kalispell
	Ray Ditterline	Plant & Soil Science, MSU	Bozeman
	Rodolfo Augustinho	Grad Student	Bozeman
	Jim Brice	APHIDS	Billings
	Carter Fritz	Farmer	Kalispell
	Al Zimmerman	Farmer	Kalispell
	Dan Smith	Student Teacher	Bigfork
9/11	Tom Jacobson	Farmer	Whitefish
9/15	Floyd LaBrant	Farmer	Kalispell
9/18	Floyd LaBrant	Farmer	Kalispell
10/8	Jim Buechle	Farmer	Kalispell
	Scott Johnson		Kalispell
10/23	Harold Small	Farmer	Kalispell
	Myron Mast	Farmer	Kalispell
10/28	Marie Keller		Kalispell
11/3	Alvin Gordon	Farmer	Bigfork
11/8-9	Dwane Miller & Students	Plant & Soil Science, MSU	Bozeman
11/11	David Landsberger	Logger-Farmer	Kalispell
11/17	Mr. Fopp	Lillienthal Insulation	Kalispell
12/17	Carter Fritz	Farmer	Kalispell

ACTIVITIES 1986

DATE	ACTIVITY		PLACE
1/16	Advisory Committee Planning Meeting	Stewart	Missoula
1/10	Farm Show Committee Meeting	Stewart	Kalispell
1/16	N.W. & W. Advisory Committee Meeting	Stewart	Allentown
		Welty	Allentown
1/18	Farmers Union Annual Meeting	Stewart	Kalispell
1/27-31	Planning Conference	Stewart	Bozeman
		Welty	Bozeman
2/4	Polson Conservation Dist./Talk	Welty	Polson
2/5	TCK Meeting	Stewart	Spokane, WA
2/7	Farm Show Committee Meeting	Stewart	Kalispell
2/13	Annual Review	Stewart	Bozeman
2/14	Fertilizer Advisory Committee	Stewart	Bozeman
		Welty	Bozeman
2/21	Chamber of Commerce Meeting	Stewart	Kalispell
2/22	Equity Annual Meeting	Stewart	Kalispell
2/24-26	PN Rape Conference Synposium	Welty	Moscow, ID
2/25	Farm Show Committee Meeting	Stewart	Kalispell
2/26	Bitterroot Farm Days	Stewart	Bitterroot Valley
2/27	Equity Supply Educational Meeting	Stewart	Kalispell
		Welty	Kalispell
3/4	Annual Mint Growers Meeting	Stewart	Kalispell
3/5	Farm Show Banquet	Stewart	Kalispell
3/6	Farm Show	Stewart	Kalispell
		Welty	Kalispell
3/14	Eastside Grange/Talk	Welty	Creston
3/16-20	Western Society of Weed Science	Stewart	San Diego, CA
3/27	Equity Meeting	Welty	Kalispell
4/3	Budget Meeting	Stewart	Bozeman
4/8	County Agents Up-Dating Meeting	Stewart	Allentown
		Welty	Allentown
4/11	Eastside Grange/Talk	Stewart	Creston
4/16-17	Interview of Charles Hagedorn	Stewart	Bozeman
4/18	Chamber of Commerce Meeting	Stewart	Kalispell
4/29-5/1	Priorities Planning Committee	Stewart	Bozeman
5/1	SCS Tour	Welty	Missoula County
5/6	Extension Type Program	Stewart	Eureka
		Welty	Eureka
5/7	Extension type Program	Stewart	Plains
		Welty	Plains
5/16	Chamber of Commerce Meeting	Stewart	Kalispell
6/5	Northrup King Tour	Welty	Station
6/6	Pioneer Tour	Welty	Station
6/9	DAR Tour	Stewart	Station
6/20	Arne Hoven's Retirement Party	Stewart	Bozeman
		Welty	Bozeman
6/30-7/1	Field Day & Res. Cen. Faculty Mtg.	Stewart	Bozeman
		Welty	Bozeman

DATE	ACTIVITY		PLACE
7/7	Food legume Meeting	Welty	Spokane, WA
7/10	Made Tape @ KERR Radio	Stewart	Polson
7/10	Made Tape @ KGVO & KUFM Radio	Stewart	Missoula
7/10-11	Planning & Priorities Meeting	Stewart	Bozeman
7/15	Made Tape @ KGEZ Radio	Stewart	Kalispell
7/16	Northern Ag. Res. Center Field Day	Stewart	Havre
7/17	Central Ag. Res. Center Field Day	Stewart	Moccasin
		Welty	Moccasin
7/18	Chamber of Commerce Meeting	Stewart	Kalispell
	Made Tape @ KOFI Radio	Stewart	Kalispell
	Alive at Five, KCFW-TV	Stewart	Kalispell
7/21	Extension Field Day	Stewart	Moise
	Made TV Tape KAPX	Stewart	Missoula
7/24	Northwestern Ag. Res. Center Field Day	Stewart	Station
		Welty	Station
8/12	County Agent Tour	Stewart	Station
		Welty	Station
8/14	Fair Judging	Welty	Kalispell
8/15	GRA Meeting	Welty	Bozeman
8/22	Chamber of Commerce Meeting	Stewart	Kalispell
9/3	Foundation Seed Meeting	Stewart	Lewistown
9/4	Superintendent's Retreat	Stewart	Lewistown
9/10	County Extension Advisory Committee	Stewart	Kalispell
9/19	Chamber of Commerce Meeting	Stewart	Kalispell
10/8	Research Meeting	Welty	Corvallis
10/15	Toured Off Station Plots	Stewart	
		Welty	
10/17	Western Area Weed Control Conf.	Stewart	Ronan
10/28	Bigfork Hi School Biology Class/Talk	Stewart	Bigfork
11/9	Plant & Soil Sci. Students, MSU/Talk	Stewart	Station
		Welty	Station
11/13	Meeting with Forest Service	Stewart	Kalispell
11/17	Extension/Research Consolidation Mtg.	Stewart	Kalispell
		Welty	Kalispell
11/18	Extension/Research Consolidation Mtg.	Stewart	Missoula
11/19	Chamber Commerce Banquet	Stewart	Kalispell
11/21	Farm Show Committee Meeting	Stewart	Kalispell
11/29-12/4	ASA Convention	Stewart	New Orleans,La
		Welty	New Orleans,La
12/9-11	Res. Faculty & Variety Recommendation	Stewart	Bozeman
	Meetings	Welty	Bozeman
12/17	Deer Park School/Talk	Stewart	Flathead Valley
12/19	Chamber of Commerce Meeting	Stewart	Kalispell

CLIMATOLOGICAL DATA
NORTHWESTERN AGRICULTURAL RESEARCH CENTER
Kalispell, MT

In 1949 the personnel at the Northwestern Agricultural Research Center began gathering and tabulating the weather data for the National Climatic Center, Ashville, NC. This data is published monthly in Climatological Data, the official publication of the National Oceanic and Atmospheric Administration. Maximum and minimum air temperatures, soil temperatures (4" and 8") and precipitation are the data collected daily and made a part of this report.

The precipitation for the growing season (September 1985 thru August 1986) was 3.73 inches above the mean of 37 years. September, 1985 was the wettest month with 5.35 inches, 3.74 inches above the mean. All other months were above average except December, March, April, June and August.

The warmest months were June and August with June being 5.5 degrees and August 3 degrees above the mean for those months. July, considered one of the warmest months, was 4.1 degrees below the 37 year mean. The coldest day in 1986 was November 10 (-8 degrees) and the warmest May 30 (93 degrees).

In this report several tables of climatic data will be found. A complete listing follows:

Table 1 - Summary of climatic data by months for 1985-86 crop year and averages for the period 1949-86.

Table 2 - Summary of average temperatures on a crop year basis by month and year.

Table 3 - Summary of maximum temperatures on a crop year basis by month and year.

Table 4 - Summary of minimum temperatures on a crop year basis by month and year.

Table 5 - Total precipitation in inches on a crop year basis by month and year.

Table 6 - Precipitation by day for crop year, September 1, 1985 thru August 31, 1986.

Table 7 - Frost free period from 1950 through 1986.

Table 8 - Temperature extremes from 1950 through 1986.

Table 9 - Average temperature by month and year from January 1950 through December 1986.

Table 10 - Total precipitation (inches) by months and years from January 1950 thru December 1986.

Table 1. Summary of climatic data by months for 1985-86 crop year (September thru August) and averages for the period 1949-86 at the Northwestern Agricultural Research Center, Kalispell, MT.

ITEM	Sept. 1985	Oct. 1985	Nov. 1985	Dec. 1985	Jan. 1986	Feb. 1986	Mar. 1986	Apr. 1986	May 1986	June 1986	July 1986	Aug. 1986	Total or Average
Precipitation (inches)													
Current Year	5.35	1.55	1.61	0.51	2.39	2.33	0.50	1.34	2.92	1.83	2.09	0.81	23.23
Avg. 1949 to 1985-86	1.61	1.39	1.44	1.67	1.56	1.22	1.09	1.41	2.24	2.82	1.44	1.61	19.50
Mean Temperature (F)													
Current Year	47.8	40.8	18.6	18.3	25.4	25.6	40.6	43.8	53.7	63.9	59.9	66.1	42.0
Avg. 1949 to 1985-86	53.4	43.3	32.5	25.7	21.9	28.0	33.6	43.0	51.5	58.4	64.0	63.1	43.2

Last killing frost in spring

1986	May 16 (31 degrees F)
Avg. 1949-86	May 26

First killing frost in fall

1986	September 7 (31 degrees F)
Avg. 1949-86	September 13

Frost Free Period

1986	114 days
Avg. 1949-86	111 days

Maximum summer temperature: 93 degrees F on May 30, 1986

Minimum winter temperature: 21 degrees F below zero on December 1, 1985

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, 1986..

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
1984-85	49.5	40.0	32.6	20.6	19.2	19.0	30.8	44.8	53.7	57.6	68.3	60.2	41.4
1985-86	47.8	40.8	18.6	18.3	25.4	25.6	40.6	43.8	53.7	63.9	59.9	66.1	42.0
MEAN	53.4	43.3	32.5	25.7	21.9	28.0	33.6	43.0	51.5	58.4	64.0	63.0	

Mean temperature for all years = 43.2

Table 3. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1986.

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
1984-85	63.9	52.2	40.4	28.2	25.3	29.1	42.7	56.8	68.7	73.2	88.0	75.0	53.6
1985-86	60.4	51.3	26.7	25.2	34.0	36.6	51.6	55.1	66.1	78.5	73.0	84.1	53.6
MEAN	68.4	55.2	40.1	32.5	29.4	36.4	43.5	54.7	64.9	71.9	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, 1986.

	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
1984-85	35.2	27.7	24.7	13.0	13.2	9.0	18.8	32.7	38.7	42.0	48.5	45.5	29.1
1985-86	35.2	30.2	10.6	11.4	16.9	14.5	29.6	32.5	41.3	49.3	46.8	48.1	30.5
MEAN	38.4	31.5	24.8	18.9	14.4	19.5	23.8	31.2	38.2	44.8	47.7	46.5	

Mean temperature for all years = 31.6

Table 5. Summary of precipitation records at the Northwestern Agricultrual Reserch Center on a crop year basis, September 1, 1949 thru August 31, 1986.

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
1984-85	2.15	2.25	1.40	1.29	0.31	1.28	0.90	1.31	2.81	1.89	0.35	1.62	17.56
1985-86	5.35	1.55	1.61	0.51	2.39	2.33	0.50	1.34	2.92	1.83	2.09	0.81	23.23
MEAN	1.61	1.39	1.44	1.67	1.56	1.22	1.09	1.41	2.24	2.82	1.44	1.61	

Mean precipitation for all crop years = 19.48

Table 6. Precipitationby day for crop year, Septemberr 1,1985 through August 31,, 1986. Northwestern Agricultural Research Center, Kalispell, MT.

DATE	SEPT. 1985	OCT. 1985	NOV. 1985	DEC. 1985	JAN. 1986	FEB. 1986	MAR. 1986	APR. 1986	MAY 1986	JUNE 1986	JULY 1986	AUG. 1986
1			0.05		0.07	0.12						
2	0.01	0.60	0.16	0.01	0.12	0.19		0.06				
3		0.13	0.03	0.29	0.19	0.04			0.29	T	0.04	
4	0.01		0.20	T	T	0.10			1.25		T	0.13
5		0.02	0.09			0.05			0.57	0.06	0.09	
6	0.90	0.01	0.10		0.19				0.02	0.10		
7	0.54	0.12	0.11	0.05	T		0.05					
8	0.11		0.16				0.10			0.40		
9	0.07		0.02		0.01					0.41	0.14	
10						0.01	0.11	0.02			0.41	
11	0.02								0.03		0.54	0.05
12	0.97	0.05		0.07			0.02				0.18	
13	0.45			0.03		0.07	0.02				0.05	
14	0.02								0.04		0.05	
15	0.68	0.03		0.02		0.54	0.03			0.25	0.03	
16	0.05		0.09	0.04	0.05	0.35		0.53				
17	0.30	0.01	0.18		0.09	0.04		0.02			0.14	
18	0.75				0.13	0.03		0.03	0.08		0.05	
19	0.04		0.01						0.05			
20	0.22		0.03		0.14			0.01				
21	0.02	0.15	0.08		0.19	T			0.45	0.08		
22	0.08		T			0.23			0.14			
23	0.11	0.08			0.06	0.09		0.10			0.18	
24		0.08	T		T	0.33						
25		0.15	0.03			0.01	0.14					
26		0.03	0.09			0.13		0.16				
27		0.02	0.18					0.18			0.02	
28		T	T		0.06			0.17		0.02	0.17	
29					0.04			0.02		0.51		
30				T	0.75		0.01	0.04				0.06
31		0.07		T	0.30		0.02					0.57
TOTAL	5.35	1.55	1.61	0.51	2.39	2.33	0.50	1.34	2.92	1.83	2.09	0.81

Table 7. Frost free period at the Northwestern Agricultural Research Center from 1950 thru 1986.

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
1985	May 13	26	Sept. 7	32	117
1986	May 16	31	Sept. 7	31	114
Mean for years	May 26	30	Sept. 13	30	111

Table 8. Temperature extremes at the Northwestern Agricultural Research Center, Kalispell, MT from 1950-1986.

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
1985	Jan. 30	-24	July 9,11,23	94
1986	Nov. 10	-8	May 30	93

Table 9. Summary of temperature records at the Northwestern Agricultural Research Center, January 1950 thru December 1986.

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
1985	19.2	19.0	30.8	44.8	53.7	57.6	68.3	60.2	47.8	40.8	18.6	18.3	39.9
1986	25.4	25.6	40.6	43.8	53.7	63.9	59.9	66.1	50.2	43.0	30.3	24.9	44.0
MEAN	21.9	28.0	33.6	43.0	51.6	58.4	64.0	63.0	53.3	43.4	32.2	25.7	

Mean temperature for all years = 43.2

Table 10. Summary of precipitation records at the Northwestern Agricultural Research Center, Kalispell, MT, January 1950 thru December 1986.

	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
1985	0.31	1.28	0.90	1.31	2.81	1.89	0.35	1.62	5.35	1.55	1.61	0.51	19.49
1986	2.39	2.33	0.50	1.34	2.92	1.83	2.09	0.81	3.63	0.80	1.78	0.63	21.05
Mean	1.56	1.22	1.09	1.41	2.24	2.82	1.44	1.61	1.68	1.38	1.44	1.66	

Mean annual precipitation for 36 years = 19.54

CHEMICALS USED IN HERBICIDE STUDIES 1986-87, NWARC, KALISPELL,MT

Common name	Trade name	Chemical name	Company
AC 222,293	Assert	m- toluic acid, 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-methyl ester and p-toluic acid, 2(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-methyl ester	Am. Cyanamide
	AC 263,499	no chemistry available	Am. Cyanamide
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)amino]carbonyl]benzenesulfonamide	DuPont
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
Diflufenican	------	2,4-difluoro-2-(&,&,&-trifluoro-m-tolyloxy) nicotinanilide	Rhone-Poulenc
DPX-M6316	DPX-M6316	No chemistry available	Dupont
DPX-L 5300	DPX-L 5300	No chemistry available	DuPont
DPX-R 9674	DPX-R 9674	No chemistry available	DuPont
EPTC	Eptam	S-ethyl dipropylthiocarbamate	Stauffer
Ethephon	Cerone	(2-chloroethyl) phosphonic acid	Union Carbide
Glyphosate	Roundup	N-(phosphonomethyl) glycine	Monsanto
Glyphosate + 2,4-D	Landmaster	N-(phosphonomethyl) glycine + (2,4-dichlorophenoxy)acetic acid	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)oxyl]acetic acid	Union Carbide
Metribuzin	Sencor or Lexone	4-amino-6-tert-butyl-3-(methylthio)-as triazin-5(4H)one	Mobay DuPont

CHEMICALS USED IN HERBICIDE STUDIES 1986-87, NWARC, KALISPELL,MT

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
SC 0051	Tycor	no chemistry available	Stauffer
DPX - R7910	Surge	no chemistry available	DuPont
	SMY 1500	no chemistry available	Mobay
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: Combination wild oat and broadleaf herbicide study.

YEAR/PROJECT: 1986/754 Weed Control in Farm Crops

PROJECT PERSONNEL: Leader - Vern R. Stewart, N. W. Agric. Res. Center, Kalispell, MT
Todd K. Keener - Research Specialist, NWARC, Kalispell

SUMMARY: The broadleaf herbicides when used with diclofop resulted in reduced wild oat control, whereas when used in combination with AC 222,293 and triallate there was 86 to 95 percent wild oat control. All the broadleaf herbicides provided excellant control of the broadleaf weeds present. No antagonism was apparent between the wild oat and broadleaf herbicides.

RESULTS:

AC 222,293, triallate, and diclfop were evaluated in combination with 2,4-D, MCPA, bromoxynil, and R 9674 for control of broadleaf weeds and wild oats in Ingird spring barley. Weed species in the test site were a high natural population of wild oats (Avena fatua), with a moderate population of wild buckwheat (Polygonum convulvulus), henbit (Lamium amplexicauli), night flowering catchfly (Silene noctiflora), lambsquarter (Chenopodium album), and field pennycress (Thlaspi arvense). The phenoxy herbicides were applied as separate treatments because of the growth stage of the barley and the weed species.

The combinations of broadleaf herbicides plus AC 222,293 or triallate gave better yields and wild oat control than the diclofop combinations (except where bromoxynil was combined with diclofop). The high wild oat populations in those combinations with out wild oat control caused significant yield reductions.

The values given in table 4 (in the last column) were obtained by taking the price of barley per bu ($1.35) X yield minus the herbicide cost and minus the value of the check. The combination of R 9674 plus AC 222,293 resulted in the highest return per acre of all treatments tested, however 2,4-D in combination with AC 222,293 provided equal return. Dollar return was quite low where broadleaf herbicides were used alone which is due in part to the wild oat competition. Tables 1 through 4.

Table 1. Agronomic data from the combination herbicide study conducted on the Northwestern Agricultural Research Center, Kalispell, MT in 1986.
Date seeded: April 29, 1986 Date harvested: August 27, 1986

Treatment	Rate Lb/a	Appln 3/ Type	Yield Bu/A	Test Wt Lb/Bu	% Plump	Vigor 4/	% Stand	Height Inches
Bromoxynil	.38	P1	70.1	49.9	85.3	10.0	100	35.2
Bromoxynil	.5	P1	69.3	50.3	86.0	10.0	97.5	36.2
Bromoxynil + AC 222,293 1/	.38+ .45	P1	99.6a	48.8	83.5	8.5b	90.0	36.8
Bromoxynil + MCPA	.38+ .38	P1/P2	68.4	50.0	87.3	9.9	100.0	36.6
Bromoxynil+ MCPA AC 222,293	.38+ +.38+.45	P1/P2/P1	102.7a	49.1	83.3	9.0	90.0	34.7
Bromoxynil + MCPA	.25+ .25	P1/P2	53.9	49.3	81.3	9.9	97.5	35.8
Bromoxynil	.25	P1	65.1	46.8	82.0	9.8	95.0	35.3
AC 222,293	.45	P1	108.3a	49.2	86.3	8.4b	86.3	35.4
Diclofop	.75	P1	96.4a	50.2	86.0	9.5	93.8	35.2
Bromoxynil + diclofop	.38+ .75	P1	103.1a	50.1	85.0	9.3	96.3	35.6
2,4-D + AC 222, 293	.3 + .45	P2/P1	113.8a	50.2	86.3	8.5b	87.5	36.1
2,4-D + diclofop	.3 + .75	P2/P1	99.4a	50.1	87.3	9.3	91.3	35.9
R 9674 + 2/ AC 222,293	.125oz +.45	P1	115.7a	50.0	84.3	8.0b	76.3b	36.0
R 9674 + diclofop	.125oz +.75	P1	90.7	49.0	82.8	9.3	93.8	35.4
Bromoxynil + R 9674	.25 + .125oz	P1	48.1b	49.6	85.0	9.9	100	38.3
Bromoxynil + MCPA + R 9674	.25+ .25+.125 oz	P1/P2/P1	65.0	49.5	81.0	9.8	93.8	37.8
MCPA + AC 222, 293	.3 + .45	P2/P1	111.2a	50.0	84.5	8.0b	81.3b	35.9
MCPA + diclofop	.3 +	P2/P1	99.0a	50.0	84.8	9.0	81.3b	35.0
Triallate	1.25	PPI	106.6a	50.7	86.0	9.0	83.8b	37.4
Triallate + R 9674	1.25+ + .125oz	PPI/P1	107.6a	50.0	84.3	9.3	75.0b	36.4
Triallate + bromoxynil	1.25+ .38	PPI/P1	103.3a	50.7	83.5	8.5b	76.3b	36.5
Triallate + bromox +MCPA	1.25+ .38+.38	PPI/P1/ P2	98.3a	49.5	83.3	8.8	75.0b	35.3
Triallate + 2,4-D	1.25+ .3	PPI/P2	108.2a	50.1	84.0	8.5b	87.5	36.5
MCPA	.3	P2	73.4	49.7	82.8	9.8	96.3	35.9
R 9674	.125oz	P1	63.2	49.0	67.0	10.0	96.3	36.6
Check	----	---	63.4	50.2	83.5	10.0	98.8	36.0
Weeded check 7/	----	---	71.1	50.5	91.0	9.6	93.8	35.5

Treatment	Rate Lb/a	Appln 3/ Type	Yield Bu/A	Test Wt Lb/Bu	% Plump	Vigor 4/	% Stand	Height Inches
		$\bar{X}$	87.9	49.7	93.95	9.23	90.1	36.1
		LSD .05	20.8**	11.5	15.18	1.02**	14.43**	6.45
		C.V.%	8.41	1.35	4.88	3.94	5.69	2.95

** Indictes statistical significance at the .05 level
a/ Values significantly greater than the check at the .05 probability level
b/ Values significantly less than the check at the .05 probability level

1/ All Assert plots (AC 222,293) applied with DM 710 surfactant
2/ R 9674 = Matrix herbicide (duPont Chemical). Applied with R-11 surfactant .25% V/V
3/ Application types:
P1 = early post emergence application
P2 = late post emergence application (MCPA and 2,4-D trtmts)
PPI = preplant incorporated
P1/P2 or PPI/P1/P2 would indicate respective timings of a combination of treatments
See below for application data
4/ Vigor rating, 0-10 scale, ocular reading
0 = dead plants (due to chemical injury)
10 = normal healthy plants
5/ Wild oat readings: Ocular readings except panicle counts
Press = weed pressure ratings taken 6/8 and 7/19, 0-10 rating indicating the severity of the wild oat infestation.
0 = indicates no wild oat pressure
10 = severe wild oat infestation

% control = % wild oat control taken 7/19 and 8/16 based on ocular observation

pans/ ft2 = number of wild oat panicles per square foot

6/ % broadleaf weed control based on ocular reading
BUCK = wild buckwheat, Polygonum convulvulus
HEN = henbit, Lamium amplexicaule
NFC = nightflowering catchfly, Silene noctiflora
LMQTR= lambquarter, Chenopodium album
FNWD = fanweed, Thalspi arvense

7/ Weed control obtained in weeded check by hand cultivation

Application data:

Appln	PPI	P1(early post)	P2(late post)
Date	4-29	5-27	6-3
Air temp	40	84	78
Soil temp	39	73	80
Wind mph	2 SW	0	0
Rel hum.	54	25	20
Soil moisture	v. good	good	fair-good

Cloud cover	ovrcst	clear	clear
Weed stages:			
	Silene	4 lvs	6-8 lvs
	Wild oat	1 1/2- 2 1/2 lv	3-4 lvs
	Henbit	2-4 lvs	4-8 lvs
	Buckwht	1 lf	3-5 lvs
	Fanweed	2-4 lvs	5-7 lvs
	Lamqtr	2 lvs	4-5 lvs
	Crop(barley	2-3 "	4 inches

General data:

plots were 10' x 15'
tractor mounted research type sprayer
volume of sprayer 24.85 gpa, nozzles 8003, pressure 32 PSI
Flathead fine sandy loam soil, pH 7.7, O.M. 4.2.
Crop variety - Ingrid spring barley seeded at 50 #/A
Previous crop: Ingrid spring barley, 90 bu/a yield

Table 2. Combination Herbicide Study (Cont'd)

Treatment	Rate Lb/a	Appln 3/ Type	Wild Oat Ratings 5/ Press 6/8	Press 7/19	% Cntl 7/19	% Cntl 8/16	# Pans / ft2
Bromoxynil	.38	P1	8.9	10.0	0b	0	15.3
Bromoxynil	.5	P1	8.4	8.5	0b	0	15.5
Bromoxynil + AC 222,293 1/	.38+ .45	P1	.8b	.8b	96.3a	87.0a	8.8b
Bromoxynil + MCPA	.38+ .38	P1/P2	7.0	6.9	18.8	0	11.3
Bromoxynil+ MCPA AC 222,293	.38+ +.38+.45	P1/P2/P	.8b	.5b	98.0a	75.8a	4.8b
Bromoxynil + MCPA	.25+ .25	P1/P2	4.7b	7.8	10.0	0	14.8
Bromoxynil	.25	P1	5.6b	6.0	7.5	0	10.8
AC 222,293	.45	P1	1.8b	0b	99.8a	94.3a	1.5b
Diclofop	.75	P1	2.8b	2.8b	86.3a	73.8a	7.8b
Bromoxynil + diclofop	.38+ .75	P1	2.5b	2.4b	81.3a	71.3a	7.0b
2,4-D + AC 222, 293	.3 + .45	P2/P1	0b	.3b	99.5a	92.5a	2.0
2,4-D + diclofop	.3 + .75	P2/P1	2.0b	2.8b	82.5a	68.8a	5.8a
R 9674 + 2/ AC 222,293	.125oz +.45	P1	0b	0b	99.5a	94.3a	1.3b
R 9674 + diclofop	.125oz +.75	P1	3.6b	3.5b	72.5a	55.8a	8.5b
Bromoxynil + R 9674	.25 + .125oz	P1	9.9	10.0	0	3.8	15.0
Bromoxynil + MCPA + R 9674	.25+ .25+.125 oz	P1/P2/P	7.9	8.4	18.8	0	12.0
MCPA + AC 222, 293	.3 + .45	P2/P1	0b	0b	99.3a	92.3a	2.0b
MCPA + diclofop	.3 +	P2/P1	1.3b	1.8b	80.0a	75.0a	5.3a
Triallate	1.25	PPI	.8b	.8b	86.3a	89.8a	2.8b
Triallate + R 9674	1.25+ + .125oz	PPI/P1	.25b	.5b	91.0a	90.8a	2.8b
Triallate + bromoxynil	1.25+ .38	PPI/P1	0b	1.5b	94.5a	92.5a	4.3
Triallate + bromox +MCPA	1.25+ .38+.38	PPI/P1/ P2	.25b	2.2b	93.8a	86.0a	2.3
Triallate + 2,4-D	1.25+ .3	PPI/P2	1.0b	.8b	92.3a	94.8a	2.8b
MCPA	.3	P2	6.5	5.0b	7.5	0	11.5
R 9674	.125oz	P1	6.2	9.0	5.0	0	8.8
Check	----	---	9.4	9.8	0	0	13.5
Weeded check 7/	----	---	6.0	4.5b	61.3	99.5	0
	$\bar{X}$		3.74	3.93	58.6	53.2	7.09
	LSD .05		3.58**	4.05**	21.7**	15.2**	4.59**
	C.V.%		22.98	36.57	13.17	10.13	22.98

Table 3. Combination Herbicide Study (Cont'd)

Treatment	Rate Lb/a	Appln 3/ Type	-- Broadleaf Weed Ratings 6/-- BUCK	HEN	NFC	LMQTR	FNWD
Bromoxynil	.38	P1	100a	100	100a	100	100
Bromoxynil	.5	P1	100a	100	100a	100	100
Bromoxynil + AC 222,293 1/	.38+ .45	P1	100a	100	100a	100	100
Bromoxynil + MCPA	.38+ .38	P1/P2	100a	87.5	100a	100	100
Bromoxynil+ MCPA AC 222,293	.38+ +.38+.45	P1/P2/P	100a	100	100a	100	100
Bromoxynil + MCPA	.25+ .25	P1/P2	98.8a	100	100a	100	100
Bromoxynil	.25	P1	100a	97.5	100a	100	100
AC 222,293	.45	P1	100a	100	72.5a	93.8	97.5
Diclofop	.75	P1	91.3a	71.3	70.0a	72.5	88.8
Bromoxynil + diclofop	.38+ .75	P1	100a	100	97.5a	100	100
2,4-D + AC 222, 293	.3 + .45	P2/P1	100a	97.5	95.0a	100	100
2,4-D + diclofop	.3 + .75	P2/P1	97.5a	75.0	83.8a	96.3	97.5
R 9674 + 2/ AC 222,293	.125oz +.45	P1	100a	100	100a	100	100
R 9674 + diclofop	.125oz +.75	P1	100a	100	100a	100	100
Bromoxynil + R 9674	.25 + .125oz	P1	100a	100	100a	100	100
Bromoxynil + MCPA + R 9674	.25+ .25+.125 oz	P1/P2/P	100a	100	100a	100	100
MCPA + AC 222, 293	.3 + .45	P2/P1	100a	100	95.0a	100	100
MCPA + diclofop	.3 +	P2/P1	95.0a	85.0	97.5a	100	100
Triallate	1.25	PPI	66.3a	72.5	55.0a	62.5	70.0
Triallate + R 9674	1.25+ + .125oz	PPI/P1	100a	100	100a	91.3	100
Triallate + bromoxynil	1.25+ .38	PPI/P1	100a	97.5	100a	100	100
Triallate + bromox +MCPA	1.25+ .38+.38	PPI/P1/ P2	100a	100	100a	100	100
Triallate + 2,4-D	1.25+ .3	PPI/P2	90.0a	77.5	87.3a	100	100
MCPA	.3	P2	93.8a	87.5	100a	100	100
R 9674	.125oz	P1	96.3a	100	100a	100	100
Check	----	---	0	0	0	0	0
Weeded check 7/	----	---	47.5a	75.0	72.5a	75.0	75.0
		X	93.5	92.5	92.6	95.1	95.6
		LSD .05	25.0**	24.7	23.4**	25.3	26.8
		C.V.%	9.49	9.50	8.97	9.46	9.95

Table 4. Combination Herbicide Study (Cont'd)

Treatment	Rate Lb/a	Appln 3/ Type	Herb Cost	$ Return Per Acre	Net $ Return Above Check
Bromoxynil	.38	P1	7.80	94.21	1.26
Bromoxynil	.5	P1	10.38	93.14	-2.45
Bromoxynil + AC 222,293 1/	.38+ .45	P1	19.80	133.86	28.85
Bromoxynil + MCPA	.38+ .38	P1/P2	8.63	91.93	-1.88
Bromoxynil+ MCPA AC 222,293	.38+ +.38+.45	P1/P2/P	20.63	138.03	32.43
Bromoxynil + MCPA	.25+ .25	P1/P2	5.75	71.44	-18.52
Bromoxynil	.25	P1	5.19	87.49	-2.91
AC 222,293	.45	P1	12.00	145.56	48.62
Diclofop	.75	P1	12.00	129.56	32.55
Bromoxynil + diclofop	.38+ .75	P1	19.80	138.57	33.80
2,4-D + AC 222, 293	.3 + .45	P2/P1	12.60	152.95	55.44
2,4-D + diclofop	.3 + .75	P2/P1	12.60	133.59	36.00
R 9674 + 2/ AC 222,293	.125oz +.45	P1	14.67	155.50	55.94
R 9674 + diclofop	.125oz +.75	P1	14.67	121.90	22.19
Bromoxynil + R 9674	.25 + .125oz	P1	7.86	64.64	-28.43
Bromoxynil + MCPA + R 9674	.25+ .25+.125 oz	P1/P2/P	8.42	87.36	-6.27
MCPA + AC 222, 293	.3 + .45	P2/P1	13.85	149.45	50.68
MCPA + diclofop	.3 +	P2/P1	13.85	133.06	34.21
Triallate	1.25	PPI	10.78	143.27	47.54
Triallate + R 9674	1.25+ + .125oz	PPI/P1	13.45	144.61	46.22
Triallate + bromoxynil	1.25+ .38	PPI/P1	18.58	138.83	35.29
Triallate + bromox +MCPA	1.25+ .38+.38	PPI/P1/ P2	19.41	132.12	27.71
Triallate + 2,4-D	1.25+ .3	PPI/P2	11.38	145.42	49.10
MCPA	.3	P2	1.85	98.65	11.65
R 9674	.125oz	P1	2.67	84.94	-2.94
Check	----	---	0	85.21	0
Weeded check 7/	----	---	5000	95.56	10.35

PROJECT TITLE: Crop Tolerance Study of L 5300 and R 9674 applications to spring barley

YEAR/PROJECT: 1986/754 Weed Control in Farm Crops

PROJECT PERSONNEL: Leader - Vern R. Stewart, N. W. Agricultural Research Center , Kalispell, MT
Todd K. Keener - Research Specialist, NWARC
Cooperators - duPont Chemical Co.

SUMMARY:

In an evaluation of crop tolerance to R 9674 (Matrix) and L 5300 (Express) there were no significant differences in yield, test weight, % plump, height, and weed control.

RESULTS

Several rates of R 9674 and L 5300 were tested for weed control and crop tolerance in Ingrid spring barley. No crop injury or adverse effects were recorded in yield, test weight, % plump and height. All treatments gave excellant broadleaf weed control.

Table 1. Agronomic data from the duPont Herbicide Study grown on the Northwestern Agricultural Research Center, Kalispell,MT in 1986. Seeded April 29,1986 Harvested August 27,1986. Field R-13.

Treatment 2/	Rate oz/A	Yield Bu/A	Test Wt Lb/Bu	% Plump	HT (")
R 9674	.125	110.4	52.06	91.75	37.50
L 5300	.25	109.1	51.81	92.00	38.58
L 5300	.75	108.2	50.69	89.25	38.19
L 5300	.125	108.0	51.88	92.75	40.65
R 9674	1.0	106.3	51.69	89.50	38.58
L 5300	.50	104.8	50.38	89.75	37.80
R 9674	.50	103.3	51.19	90.00	38.88
L 5300	.25	102.3	51.19	91.25	39.57
Bromox MCPA	.38+ .38	99.71	51.13	89.50	37.70
R 9674	.38	99.52	51.50	91.75	38.68
Check	---	98.70	52.19	91.00	38.58
R 9674	.25	95.35	51.31	89.75	37.20

Treatment 2/	Rate oz/A	Yield Bu/A	Test Wt Lb/Bu	% Plump	HT (")
SUM STATS:					
OVERALL MEAN		103.8	51.42	90.69	38.49
F-RATIO TRTS		.7398	1.787	1.757	1.228
P-VALUE TRTS		.6946	.0900	.1035	.3079
CV (SE/MEAN)		5.349	.7940	.9960	2.221
LSD (0.05)		15.98	1.175	2.599	2.460

** Indicates statistical significance at the .01 level

1/ Percent weed control by ocular rating

FANWD = Fanweed (Thalspi arvense)
HENBT = Henbit (Lamium amplexicauli)
CHKWD = Chickweed (Stellaria media)
LMQTR = Lambquarter (Chenopodium album)
NFRCF = Nightflowering catchfly (Silene noctiflora)
WBUCK = Wild buckwheat (Polygonum convulvulus)

2/ Treatments R 9674 (Matrix) L 5300 (Express)

Treatment 2/	Rate oz/A	Percent Weed Control 1/ FANWD	HENBT	CHKWD	LMQTR	NFRCF	WBUCK
R 9674	.125	100.0	95.00	100.0	97.50	97.50	100.0
L 5300	.25	100.0	100.0	100.0	100.0	100.0	100.0
L 5300	.75	100.0	100.0	100.0	100.0	100.0	100.0
L 5300	.125	100.0	97.50	100.0	97.50	97.50	100.0
R 9674	1.0	100.0	100.0	100.0	100.0	100.0	100.0
L 5300	.50	100.0	100.0	100.0	100.0	100.0	100.0
R 9674	.50	100.0	100.0	100.0	100.0	100.0	100.0
L 5300	.25	100.0	97.50	100.0	100.0	100.0	100.0
Bromox MCPA	.38+ .38	100.0	87.50	75.00	100.0	100.0	100.0
R 9674	.38	100.0	97.50	100.0	100.0	100.0	100.0
Check	---	.0000	.0000	.0000	.0000	.0000	.0000
R 9674	.25	100.0	100.0	100.0	100.0	100.0	100.0

Treatment 2/	Rate oz/A	FANWD	HENBT	CHKWD	LMQTR	NFRCF	WBUCK
		------ Percent Weed Control 1/ ----					
SUM STATS:							
OVERALL MEAN		91.67	89.58	89.58	91.25	91.25	91.67
F-RATIO TRTS		9006**	57.98**	16.27**	770.3**	770.3**	.9E+16
P-VALUE TRTS		.0000	.0000	.0000	.0000	.0000	.0000
CV (SE/MEAN)		.3E-6	4.170	8.056	1.135	1.135	.3E-06
LSD (0.05)		.8E-6	10.75	20.76	2.981	2.981	.8E-06

Application data:

Date of application: May 27,1986
Temperatures: Air 85 F, Soil 80 F
Rel humidity 25 %, Wind 0-3 mph (SW)
Clear sky, top soil dry, sub-soil good moisture

Weed stages: WBUCK 2-4 LVS
FANWD 6-8 LVS
CHKWD 6-8 LVS
HENBT 4 LVS
NFRCF 6 LVS
LMQTR 4-8 LVS

Research type sprayer, 24.85 gpa in H20 as carrier

Avenge applied 6/9/86 (.75 # ai/A)

PROJECT TITLE: The effect of M 6316, L 5300, and R 9674 as post applications to four spring barley and wheat varieties.

YEAR/PROJECT: 1986/754 Weed Control in Farm Crops

PROJECT PERSONNEL: Leader - Vern R. Stewart, N.W. Agricultural Research Center, Kalispell, MT
Todd Keener - Research Specialist
Cooperators - DuPont Chemical Company

Summary

In testing high rates of M6316 (Harmony), L 5300 Express, and R 9674 (Matrix) for crop injury to four varities of spring barley and wheat it was found that spring barley was more susceptible to the rates of treatments tested. Spring wheat did not show significant crop injury in responce to the herbicide applications. All of the spring barley varieties were affected by one or more of the treatments.

Results

M6316, L 5300, and R 9674 were applied double and triple normal use rates to four spring barley and wheat varieties for evaluation of crop tolerance. Although yields and test weights of spring wheat were generally reduced with the higher rates (except Alex) there were no statistically significant differences in the reductions. Height in spring wheat was not affected by herbicide treatment. Table 1.

In spring barley the high rates of M 6316, L 5300, and R 9674 did not adversely effect yields and test weights. Percent plump was significantly reduced in Menuet and Gallatin barley with L 5300 and R 9674 treatments. The two rates of bromoxynil plus MCPA, tested as standards for comparison, were injurious to all the barley varities in either yield, test weight, or percent plump. Height of spring barley was not adversely effected by any treatment. Broadleaf weed control was excellant for all treatments. Table 2.

Application data: Date applied May 28, 1986
air temp 72 F, soil temp 68 F, Relative humidity 34%,
wind 0 - 3 mph, sunny clear skies, top soil slightly dry,
sub soil - good moisture, plots seeded with research type double disced drill to 1 " depth. Chemicals applied with research type sprayer in 24.85 gpa with H2O as carrier.

Growth stages of plants:
wild buchwheat (Polygonum convulvulus) 1-2 lvs
fanweed (Thlaspi arvense) 4-8 lvs
lambsquarter (Chenopodium album) 4-6 lvs
henbit (Lamium arvense) 2 lvs
silene (Silene noctiflora) 4 lvs
wheat 5-8 lvs, tillering, 5-6 " tall
barley 3-8 lvs, tillering, 5-6 " tall

Table 1. Agronomic data from the DuPont Variety Study grown on the Northwestern Agricultural Research Center, Kalispell, MT. 1986 R-13

Treatment	Rate	Yield	Test Wt	% Plp	Ht	Yield	Test Wt	Ht
	Ingrid					Newana		
M 6316	.75 oz	130.6	52.2a	93.3	34.7	81.9	60.2	29.9
M 6316	1.0 oz	127.8	52.6a	92.3	33.8	75.9	60.2	30.9
L 5300	.5 oz	147.8a	52.4a	92.0	34.0	70.0	60.0	29.7
L 5300	1.0 oz	128.3	51.1	91.3	34.9	64.5	60.3	31.1
R 9674	.75 oz	132.2	52.3a	93.5	35.1	80.1	58.7	31.5
R 9674	1.0 oz	136.9	52.0a	93.0	36.6	72.6	60.0	30.5
Brom+MCPA	.75+.75	111.3b	51.1	88.3b	33.5	44.8	59.5	29.5
Brom+MCPA	1.5+1.5	103.3b	48.0b	89.3b	35.3	78.3	59.7	30.7
Check	-----	129.0	51.4	92.8	35.1	71.0	59.7	30.3
	Menuet					Alex		
M 6316	.75 oz	121.4	52.6	93.3	30.2	69.2	59.0	35.0
M 6316	1.0 oz	119.8	52.1	92.8	30.7	75.9	59.4	37.2
L 5300	.5 oz	133.2a	52.5	92.5	30.2	70.9	58.9	37.2
L 5300	1.0 oz	102.4	52.2	88.0b	31.9	76.3	59.5	36.1
R 9674	.75 oz	121.2	52.6	93.5	30.9	79.6	58.9	36.3
R 9674	1.0 oz	130.0a	52.3	93.8	30.2	87.4	58.8	36.4
Brom+MCPA	.75+.75	116.7	51.3b	91.3	30.5	84.3	58.9	37.7
Brom+MCPA	1.5+1.5	86.0b	49.1b	89.8b	31.7	76.6	58.8	36.8
Check	-----	110.3	52.4	92.5	30.0	78.5	59.0	36.4
	Lewis					Olaf		
M 6316	.75 oz	120.0	52.5	91.3	30.8	69.6	58.8	30.6
M 6316	1.0 oz	125.4	52.6	92.0	32.6	71.6	58.8	32.0
L 5300	.5 oz	119.1	52.1	91.3	33.9	66.5	58.9	31.1
L 5300	1.0 oz	121.4	52.1	90.8	33.1	65.2	59.0	31.5
R 9674	.75 oz	126.5	52.6	92.3	33.1	74.4	58.8	31.1
R 9674	1.0 oz	127.7	52.8a	90.5	32.5	69.5	58.7	32.4
Brom+MCPA	.75+.75	133.5	52.4	91.8	33.6	74.2	59.1	31.2
Brom+MCPA	1.5+1.5	124.5	49.6b	89.0b	34.0	66.2	58.8	29.3
Check	-----	128.4	52.2	91.0	31.2	62.4	58.3	30.1
	Gallatin					Owens		
M 6316	.75 oz	133.4	52.4	89.8	32.4	98.4	59.2	30.8
M 6316	1.0 oz	149.9a	52.7	91.5	32.1	85.9	59.2	28.8
L 5300	.5 oz	126.3	52.3	89.3	31.1	93.3	59.0	28.0
L 5300	1.0 oz	125.0	52.0	88.0b	32.9	86.8	59.3	28.8
R 9674	.75 oz	144.0	52.4	91.3	34.5	98.2	59.0	28.1
R 9674	1.0 oz	133.6	52.0	89.0b	33.0	91.1	59.1	28.3
Brom+MCPA	.75+.75	136.7	51.9b	88.0b	32.8	97.5	58.7	28.8
Brom+MCPA	1.5+1.5	130.2	50.1b	87.0b	32.4	87.2	58.9	28.9
Check	-----	134.9	52.5	90.8	31.7	86.1	58.7	28.6
	X	125.8	51.9	91.0	32.7	78.1	59.2	31.7
	F 1/	2.392*	27.3**	5.61**	1.26	1.48	1.85	.335
	L.S.D.	12.62	.55	1.58	NS	NS	NS	NS

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

Table 2. Broadleaf weed control for the DuPont Study

Treatment	Rate	% Broadleaf Control 1/				
		FW	HB	LQ	SL	BW
M 6316	.75 oz	100	100	100	100	100
M 6316	1.0 oz	100	100	100	100	100
L 5300	.5 oz	100	100	100	100	100
L 5300	1.0 oz	100	100	100	100	100
R 9674	.75 oz	100	100	100	100	100
R 9674	1.0 oz	100	100	100	100	100
Brom+MCPA	.75+.75	100	100	100	100	100
Brom+MCPA	1.5+1.5	100	100	100	100	100
Check	-----	Check plot hand weeded 2/				

1/ Weed scores by ocular observation
WB = wild buchwheat (Polygonum convulvulus)
FW = fanweed (Thlaspi arvense)
LQ = lambsquarter (Chenopodium album)
HB = henbit (Lamium arvense)
SL = silene (Silene noctiflora)
2/ Check plot hand weeded to assimilate weed free conditions

PROJECT TITLE: Winter wheat herbicide evaluation

YEAR/PROJECT: 1986/754 Weed Control in Farm Crops

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

SUMMARY:

Test weight was significantly less in plots treated pre-emergence surface with 1.0 # ai/A of SC 0051. Percent stand was also significantly reduced with preplant incorporated applications of SC 0051 at .5 and 1.0 lb ai/A and with pre emergence surface applications at 1.0 lb.

RESULTS:

SC 0051 was tested at pre-plant incorporated, pre-emergemce surface, and post applications in comparison to fluorochloridone, chlorsulfuron, and bromoxynil plus MCPA. Yields responses were not significantly differentin comparing different tratments to the check. SC 0051 (1.0 PES) significantly reduced test weights from that of untreated plots. Percent stand was significantly reduced with the applications of SC 0051 at PES (1.0 #) and Pre-I (.5 and 1.0 lb). Good broadleaf weed control was obtained in all treatments except SC 0051 at .5 lb ai/A (post appln.) and the fluorochloridone treatment.

Table 1. Agronomic data from the Winter Wheat Herbicide Study grown on the North western Agricultural Research Center in Kalispell, MT in 1986. Seeded September 20, 1986 Harvested July 31, 1986

Treatment 3/	Rate #/A	Appln Type 1/	Yield Bu/A	Test Wt Lb./Bu	HT (")	% Stand	Percent Weed Control 2/ GRMWL	FANWD	WBUCK
Bromox + MCPA	.38	Post	70.94	59.73	39.07	98.75	100.0	100.0	100.0
Clorsulf	.125 oz	PES	70.78	60.08	39.96	93.75	100.0	100.0	100.0
Fluorochl	.38	PES	70.44	59.75	38.98	86.25	100.0	100.0	46.25
SC 0051	.25	Post	69.76	60.17	39.07	95.00	96.25	100.0	97.50
SC 0051	.5	PES	68.55	59.57	40.45	96.25	100.0	97.50	97.50
SC 0051	1.0	Pre-I	67.75	59.80	37.80	62.50b	100.0	100.0	100.0
Check	---	---	66.55	60.00	38.68	100.0	.0000	.0000	.0000
SC 0051	.5	Post	65.71	59.00	39.57	100.0	47.50	50.00	50.00
SC 0051	1.0	PES	65.49	58.22b	39.17	70.00b	100.0	100.0	98.75
SC 0051	.5	Pre-I	65.41	59.60	38.78	73.75b	98.75	100.0	100.0

Treatment 3/	Rate #/A	Appln Type 1/	Yield Bu/A	Test Wt Lb./Bu	HT (")	% Stand	Percent Weed Control 2/ GRMWL	FANWD	WBUCK
SUMMARY STATISTICS:									
OVERALL MEAN			68.14	59.59	39.15	87.6	84.25	84.75	79.00
F-RATIO TRTS			.7674	2.250*	.5954	7.177	14.67	13.33	11.18
CV (SE/MEAN)			3.785	.6507	2.408	5.911	10.48	10.87	13.23
L.S.D. .05			7.484	1.125	2.736	15.03	25.62	26.73	30.33

* Indicates statistical significance at the .05 level
b/ Values significanctly less than the check at the .05 level

1/ Application types: PES = pre emergence surface
Pre-I = pre plant incorporated
Post = post

2/ Percent weed control by ocular observation
GRMWL = Gromwell (Lithospermum arvense)
FANWD = Fanweed (Thlaspi arvense)
WBUCK = Wild buckwheat (Polygonum convulvulus)

3/ Treatments: SC 0051 Stauffer Chemical experimental
Fluorochl = Flourochloridone (Racer) Stauffer Chemical
Chlorsulf = Chlorsulfuron (Glean) DuPont Chemical

Application data:

Type:	Pre-I	PES	Post
Date:	9/20/85	10/7/85	4/18/86
Air temp	45	33	52
Soil temp	42	42	52
Wind	0	5	4-6
Rel Hum.	38	41	40
Soil moisture	good	fair	v. good
Sky	prt cldy	prt cldy	cldy
Weed stages	-----	-----	GRMWL 4-8 lvs, 1
			FANWD 4 lvs, 1/2-1"
			WBUCK 3-4 lvs, 1/2-1"

PROJECT TITLE: Preliminary Evaluation of R 7910 (Surge) in Winter Wheat

YEAR/PROJECT: 1986/754 Weed Control in Farm Crops

PROJECT PERSONNEL: Leader - Vern R. Stewart, N. W. Agri. Res. Center, Kalispell, MT.
Research Specialist - Todd Keener, NWARC, Kalispell, MT.

SUMMARY:
Good jointed goatgrass (Aegilops cylindrica) control was achieved with post emergence applications of R 7910 (Surge) at the rates of 16, 24, and 32 oz ai/A.

RESULTS:
R 7910 (Surge) was applied post emergence to winter wheat plots which had a light infestation of jointed goatgrass. Effective control was observed at all the rates tested. Other broadleaf weeds suppressed or controlled by the herbicide applications were lambsquarters (Chenopodium album), annual sow thistle (Sonchus oleraceus), wild buckwheat (Polygonum convulvulus), and pineapple weed (Matricaria matricariodes). Table 1.
The higher rates of R 7910 did appear to thin the winter wheat stand. Note: The population of goatgrass in this study was very light.

Table 1. Agronomic data from the Surge herbicide study grown on the Oscar Buller farm, Kalispell, MT. in 1986

Treatment	Rate oz ai/A	% goatgrass control	% stand wheat
R 7910	16	100	93
R 7910	24	100	91
R 7910	32	92	83
Check	--	0	100

Application data:
date April 18, 1986 air temp 52 F soil temp 50 F
Rel Hum. 30% Wheat 4-5 lf, 2-2 1/2 " tall
Soil moisture - good Goat grass 4-7 lvs, 1- 1 1/2 " tall

PROJECT TITLE: Broadleaf herbicide study in winter wheat

YEAR/PROJECT: 1986/754 Weed Control in Farm Crops

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

SUMMARY:

Bromoxynil, bromoxynil plus MCPA, and diflufenican combined with bromoxynil and MCPA performed equally well in an evaluation for crop response broadleaf weed control in Winridge winter wheat.

RESULTS:

Bromoxynil, bromoxynil plus MCPA, and diflufenican plus bromoxynil and MCPA was applied to winter wheat (Post emerg. applns) for observation of weed control and the effect on the crop. No significant reductions were recorded in yield, height, and % stand. Bromoxynil plus MCPA plus diflufenican (.25 + .25 + .094) did have a test weight significantly less than the check. Broadleaf weed control was excellant for all treatments.

Table 1. Agronomic data from the Broadleaf Herbicide Study grown on the Northwestern Agricultural Research Center in Kalispell, MT in 1986. Seeded September 20, 1985 Harvested July 31, 1986. R-13

Treatment	Rate #/A	Yield Bu/A	Test Wt Lb/A	HT (")	% Stand
Bromox + MCPA +Diflu 1/	.188+.188 +.094	72.86	60.61	37.80	100.0
Bromox + MCPA	.25+.25	70.49	60.71	38.09	100.0
Bromox + MCPA	.38+.38	69.73	60.48	39.47	100.0
Bromox + MCPA +Diflu	.25+.25 +.063	69.49	61.31	37.80	100.0
Bromox + DPX 9674	.25+ .0078	68.18	61.10	37.80	97.50
Bromox + MCPA +Diflu	.188+.188 .063	67.82	61.41	37.50	100.0
Bromox + Diflu	.25+.125	67.49	61.07	37.50	98.75
Bromox +MCPA +Diflu	.25+.25 .094	66.24	59.52	36.81	100.0
Bromox + MCPA +Diflu	.375+.375 .063	62.71	60.75	34.74	98.75
Check		62.64	60.81	36.22	100.0

SUM STATS:				
OVERALL MEAN	67.76	60.78	37.37	99.50
F-RATIO TRTS	.8442	2.218	1.584	1.000
P-VALUE TRTS	.5839	.5279E	.1701	.4641
CV (SE/MEAN)	5.208	.5915	2.654	.8784
LSD (0.05)	10.24	1.043	2.879	2.536

Treatment	Rate #/A	Gromwell 2/ 5/21	Gromwell 2/ 7/8	Fanweed 2/ 5/21	Fanweed 2/ 7/8	Buckwheat 2/ 5/21	Buckwheat 2/ 7/8
Bromox + MCPA +Diflu	.188+.188 +.094	100.0	100.0	100.0	100.0	98.75	100.0
Bromox + MCPA	.25+.25	100.0	100.0	100.0	100.0	100.0	87.50
Bromox + MCPA	.38+.38	100.0	100.0	100.0	100.0	98.75	100.0
Bromox + MCPA +Diflu	.25+.25 +.063	100.0	100.0	100.0	100.0	100.0	100.0
Bromox + DPX 9674	.25+ .0078	100.0	100.0	100.0	100.0	100.0	100.0
Bromox + MCPA +Diflu	.188+.188 .063	100.0	100.0	100.0	100.0	100.0	97.50
Bromox + Diflu	.25+.125	100.0	100.0	100.0	100.0	100.0	100.0
Bromox +MCPA +Diflu	.25+.25 .094	100.0	100.0	100.0	100.0	100.0	100.0
Bromox + MCPA +Diflu	.375+.375 .063	100.0	100.0	100.0	100.0	97.50	98.75
Check		50.00	87.50	50.00	100.0	5.000	.0000
OVERALL MEAN		95.00	98.75	95.00	100.0	90.00	88.38
F-RATION TRTS		3.000	1.000	3.000	.0000	313.5	115.3
P-VALUE TRTS		.1298E	.4641	.1298E	.0000	.0000	.0000
CV (SE/MEAN)		9.609	4.003	9.609	.0000	1.875	3.297
LSD (0.05)		26.49	11.47	26.49	.0000	4.896	8.455

1/ Diflu = diflufenican (Stauffer Chemical Co.)

2/ % Weed control taken on two dates (5/21/86 and 7/18/86), ocular ratings
Gromwell = Lithospermum arvense
Fanweed = Thlaspi arvense
Wild buckwheat = Polygonum convulvulus

PROJECT TITLE: Herbicide evaluations on a new seeding of alfalfa

YEAR/PROJECT: 1986/754 Weed Control in Farm Crops

PROJECT PERSONNEL: Leader - Vern R. Stewart, N. W. Agric. Res. Center
Kalispell, MT.
Research Specialist: Todd Keener, NWARC, Kalispell

SUMMARY:

Bromoxynil, 2,4-DB, and AC 263,499 applied to a new seeding of alfalfa did not significantly effect hay yields. Percent broadleaf composi- was significantly reduced in all treated plots in comparison to the check.

RESULTS:

Post applications of bromoxynil, 2,4-DB, and AC 263,499 to a new seeding of alfalfa caused no significant reduction in hay and pure alfalfa yield. Yields were in the range of 1.19 to 1.41 tons per acre. Height was significantly reduced early in the season by all the applications of bromoxynil and the high rate of 2,4-DB. Most height reduction was outgrown by harvest time but was still found significantly less in the bromoxynil + 2,4-DB plots and where 2,4-DB was used at the high rate. The percent composition of alfalfa and grass were not altered significantly yet all broadleaf herbicides treatments significantly reduced percent broadleaf composition of hay yields. Table 1. Broadleaf weed control was excellant for all broadleaf treatments. Table 2.

Table 1. Agronomic data from the evaluation of herbicides on a new seeding of alfalfa grown on the Northwestern Agricultural Research Center in 1986. Field y-6.

Date planted: May 16th, 1986 Date harvested: July 20, 1986

Treatment	Rate # ai	Appln type	Yield Tons/A Hay	Alf	Height(") 7/8	7/21	% Composition ALF	GRS	BLF 1/
Bromoxynil	.25	Post	1.31	1.22	19.3b	26.0	94.4	5.6	0b
Bromoxynil	.38	Post	1.32	1.13	20.0b	26.0	85.4	14.6	0b
Bromoxynil	.5	Post	1.21	1.10	19.7b	25.7	90.8	9.1	.1b
Bromoxynil + 2,4-DB	.25/.5	Post	1.41	1.22	20.7b	25.0b	86.9	12.8	.3b
Bromoxynil + 2,4-DBX	.38/.38	Post	1.24	1.06	18.0b	25.0b	85.7	14.2	.3b
Bromoxynil + 2,4-DB	.38/.5	Post	1.30	1.02	18.7b	25.0b	80.7	19.3	0b
2,4-DB	.38	Post	1.31	1.21	23.6	28.3	92.1	7.2	.7b
2,4-DB	.5	Post	1.27	1.18	18.7b	25.0b	80.7	19.3	0b
AC 263,499	.1	Post	1.26	1.19	24.3	29.0	94.7	0	5.3b
Bromoxynil + AC 263,499	.25/.1	Post	1.19	1.19	20.0	26.0	100.0	0	0b
Check	----	----	1.24	.99	24.3	27.7	79.8	6.7	13.5
		$\bar{X}$	1.28	1.14	21.2	26.6	89.5	8.6	1.9
		LSD .05	.32	.277	1.97**	2.28**	17.1	17.2	3.30**
		CV %	8.48	8.25	3.15	2.91	6.50	67.4	59.1
		F 3/	2.10	4.83**	4.57**	4.51**	1.17	1.10	13.43

Table 2.

Treatment	Rate # ai	Appln type	Percent Weed Control 1/ SHPRS	SILN	FANW	LMBQT	BUCK 2/
Bromoxynil	.25	Post	100	100	100	100	100
Bromoxynil	.38	Post	100	100	100	100	100
Bromoxynil	.5	Post	100	100	100	100	100
Bromoxynil + 2,4-DB	.25/.5	Post	100	100	100	100	100
Bromoxynil + 2,4-DBX	.38/.38	Post	100	100	98.3	100	100
Bromoxynil + 2,4-DB	.38/.5	Post	100	100	100	100	100
2,4-DB	.38	Post	100	100	100	100	83.3
2,4-DB	.5	Post	93.3	100	100	100	70.0
AC 263,499	.1	Post	100	100	100	100	95.0
Bromoxynil + AC 263,499	.25/.1	Post	100	100	100	100	100
Check	----	----	0	0	0	0	0
		X	90.3	90.9	90.8	90.9	86.2
		LSD .05	2.97	----	1.48	----	----
		CV %	1.11	----	.554	----	----

1/ % Weed composition determined by hand separation of a 500- 1000 gram sub-sample

2/ Weed species rated for control: SHPRS = Sheperdspurse
SIL = Silene (night flowering catchfly)
FNWD = Fanweed
LMBQT = Lambsquarter
BUCK = Buckwheat

3/ F value for treatment comparison

** Indicates statistical significance at the .01 level.

b = values significantly less than the check at the .05 level

Application data:

All applications post emmergence

Date 6/5/86
Air temp 60 F
Soil temp 64 F
Wind 3mph from the NE
Humidity 62 %
Sky: overcast
Soil : top moisture very good, subsoil good
Crop stage: 4 - 5th trifoliate

Weed stages:
SHPRS 1 1/2 " tall
SIL 1 " tall
FNWD 1 1/2 " tall
LMBQT 1 - 2 " tall
BUCK 2 1/2 " tall

Max/Min Temps
6-5-86 82/53
6-6-86 74/55
6-7-86 74/50
6-8-86 76/50
6-9-86 63/52

PROJECT TITLE: Landmaster Herbicide Study

YEAR/PROJECT: 1986/754 Weed Contol in Farm Crops

PROJECT PERSONNEL: Leader - Vern R. Stewart, N. W. Agri. Res. Center, Kalispell, MT.
Research Specialist - Todd K. Keener, NWARC, Kalispell

SUMMARY:

In the second season of evaluations after herbicide applications no significant differences were discovered in yield comparing rates and application types (spring versus fall). Percent grass and alfalfa composition in the first cutting was significantly altered with both fall and spring applications of Landmaster.

RESULTS:

Tons per acre of hay or pure alfalfa was significantly altered in the second season of harvest and the second season after Landmaster applications. Tons per acre alfalfa yield for fall applications was significantly greater than alfalfa yields for spring applications. In analyzing percent species composition it was found that for the first harvest the decrease in percent grass and subsequent increase in percent alfalfa was significant when compared to the check plots. Ocular observations also indicated significant differences in percent alfalfa and percent grass with Landmaster applications. Both species composition and ocular observations for the first cut indicate that the fall applications of Landmaster were more effective in significantly decreasing grass composition and increasing alfalfa composition. There were no significant differences obvious in the data obtained from the second cutting.

Table 1. Agronomic data from second year evaluations on the Landmaster Herbicides Study grown on the Northwestern Agricultural Research Center in 1986. First harvest June 18, 1986 Second harvest July 31,1986

FIRST HARVEST

TREATMENT			YIELD T/A 1/ HAY	YIELD T/A 1/ ALF	% COMPOSITION 1st CUT 2/ % BRDLF	% COMPOSITION 1st CUT 2/ % GRS	% COMPOSITION 1st CUT 2/ % ALF	% STAND (OC. OBS.) 3/ % ALF	% STAND (OC. OBS.) 3/ % GRS	% STAND (OC. OBS.) 3/ % BRDLF
Landmaster	40 oz	Fall	1.52	1.19a	2.8	18.8b	78.4a	93.3a	6.3b	.3
Landmaster	108 oz	Fall	1.41	1.33a	2.2	3.8b	94.0a	81.3a	15.3b	1.0
Check	----	Spr.	1.37	.54	6.1	54.7	39.2	36.0	59.7	4.3
Check	----	Fall	1.31	.35	4.0	69.1	26.8	8.3	90.7	1.0
Landmaster	54 oz	Spr.	1.30	.84	6.6	28.8b	64.6a	62.0	32.3b	5.7
Landmaster	108 oz	Spr.	1.25	.70	3.3	40.2	56.5	63.0	31.7b	5.3
Landmaster	54 oz	Fall	1.23	1.13a	1.3	7.0b	91.7a	93.7a	5.7b	.7
Landmaster	40 oz	Spr.	1.18	.46	4.5	56.7	38.9	54.0	40.0	6.0
SUMMARY STATISTICS:										
OVERALL MEAN			1.32	.826	3.9	34.92	61.20	61.46	35.21	3.04
F RATIO TRTS			1.12	5.26**	.476	9.731**	9.799**	9.314**	10.62**	.9850
CV (SE/MEAN)			7.71	19.26	.838	22.23	13.23	15.58	25.12	82.93
LSD (0.05)			.309	.483	0.81	23.55	24.55	29.04	26.83	7.651

Table 2. Agronomic data from second year evaluations on the Landmaster Herbicides Study grown on the Northwestern Agricultural Research Center in 1986.
First harvest June 18, 1986 Second harvest July 31,1986

SECOND HARVEST

TREATMENT			YIELD T/A		% COMPOSITION 2cd CUT			% STAND (OCULAR OBSRV.)			
			HAY	ALF	% BRDLF	% GRS	% ALF	% ALF	% GRS	% BLF	% OPEN
Landmaster	40 oz	Fall	.59	.55	1.0	5.4	93.6	90.0	1.7	3.7	4.7
Landmaster	108 oz	Fall	.71	.69	0.4	2.1	97.5	96.3	1.0	1.0	1.7
Check	----	Spr.	.47	.39	3.8	12.5	83.7	74.0	19.3	6.7	.0
Check	----	Fall	.30	.26	3.0	11.8	85.2	65.0	25.7	4.3	5.0
Landmaster	54 oz	Spr.	.44	.37	2.1	14.6	83.2	75.0	11.7	5.0	8.3
Landmaster	108 oz	Spr.	.56	.48	9.6	4.2	86.2	79.3	10.0	4.3	5.7
Landmaster	54 oz	Fall	.57	.53	1.1	6.2	92.6	93.3	2.7	2.3	1.7
Landmaster	40 oz	Spr.	.41	.35	7.8	7.5	84.7	83.3	10.7	5.0	4.3
SUMMARY STATISTICS:											
OVERALL MEAN			.51	.45	3.6	8.1	88.3	82.0	10.3	4.0	3.9
F-RATIO TRTS			.99	1.44	1.5	1.4	1.32	1.53	1.48	1.4	.94
CV (SE/MEAN)			25.29	25.5	74.8	45.2	5.35	10.5	70.5	35.6	70.2
LSD (0.05)			.3887	.35	8.2	11.1	14.3	26.2	22.1	4.36	8.34

1/ Yield in tons per acre of either hay (total forage components) or alfalfa (just alfalfa component alone).
2/ % composition by species as derived by weight of hand separated plot samples
3/ % stand observations made 6/18/86 and 8/5/86 (ocular observations) of 1 SQ FT area, three made per plot.

Application data:

	Fall	Spring
type :	Fall	Spring
date :	10/3/84	5/10/85
air :	60 F	53 F
soil :	64 F	56 F
wind :	2-3 mph	3 mph
Rel hum:	23 %	26 %
stage Quack	2-4"	5-7 "
" Dandelions	3 " dia	5-6 " dia
" Thistles	2-3 "	3-4 "
	alfalfa	5-6 "
	henbit	6 "

General: volume 26.86 gpa, tractor mounted sprayer 2.64 mph, 32 psi, plots 15 x 200', seeded with John Deere no-till drill

PROJECT TITLE: Sethoxydim Herbicide Study

YEAR/PROJECT: 1986/754 Weed Control in Farm Crops

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

SUMMARY:

Several rates of sethoxydim evaluated as single or multiple applications to alfalfa did not significantly effect yield of hay per acre but did significantly reduce percent quackgrass composition at the high rate (.5 lb ai/A) and at all multiple applications.

RESULTS:

Sethoxydim was applied post emergence to quackgrass at .2, .3, .4, and .5 lb ai/A as single applications and as multiple treatments at the rates of .5+.3, .5+.5, and .3+.3+.3 lb ai/A. Yield of hay and pure alfalfa in the first and second cutting was not effected significantly by any applications. In the first cutting percent grass composition was reduced and percent alfalfa composition was significantly increased with all multiple applications of sethoxydim was well as with the high single-rate application. Second cutting percent grass composition was reduced significantly with five of the seven treatments and alfalfa compostion was significantly increased with the multiple and higher rates of sethoxydim. Percent quackgrass control was increased significantly through the first cutting with all treatments, and all but two treatments did the same through the second cutting. The only treatment providing adequate quackgrass control through the third cutting was three sequential applications of sethoxydim at the .3 lb ai/A rate.

Application data:

date	5/14/86	7/1/86	8/20/86	Research type sprayer, 24.85 gpa
air temp	39	56	76	32 psi, 8003 nozzles
soil temp	42	62	75	
Rel Hum	49%	45%	14%	
Wind	3-4 mph	0	0	
sky	prtly cld	clear	clear	
plants QG	10-12"	5-7 "	3-5 "	
ALF	8-10 "	4-6 "	4 "	

Table 1. Agronomic data from the Sethoxydim Herbicide Study on alfalfa. Northwestern Agricultural Research Center, Kalispell, MT in 1986. First cut: June 11, 1986

Treatment	Rate #/A	Yield Tons/A 1/ Hay	Alf	Species Composite 2/ Brdf	Grs	Alf	% Quack Control 3/ 6/9	7/28	10/31
Check		2.43	1.65	.6	31.5	67.9	00	00	00
Sethox.	.3+.3+.3	2.08	1.84	1.4	10.2b	88.4a	73a	98a	82
Sethox.	.5+.3	1.93	1.84	1.5	3.2b	95.3a	98a	96a	27
Sethox.	.2	1.86	1.43	.8	21.9	77.3	30a	33a	7
Sethox.	.5	1.69	1.58	2.5	4.4b	93.1a	99a	13	8
Sethox.	.3	1.69	1.33	2.0	18.1	79.9	67a	17	33
Sethox.	.4	1.65	1.51	1.1	7.8b	91.1a	93a	23a	25
Sethox.	.5+.5	1.64	1.50	2.0	5.9b	92.1a	99a	99a	17
SUM STATS:									
MEAN		1.288	1.154	1.41	8.02	.905	69.8	48.1	24.79
F-RATIO TRTS		1.447	.6747	.8161	3.391*	3.59*	29.5**	40.1**	2.386
CV (SE/MEAN)		12.19	14.07	47.07	42.27	5.91	9.69	13.7	66.88
LSD (0.05)		.6915	.6762	2.194	16.49	15.3	20.5	20.0	50.30

1/ Yield in tons/acre hay = all forage components considered
alfalfa = only the alfalfa component considered

2/ Species composition percentages determined by hand separation of a plot subsample Brdf = broadleaf weeds (mainly dandelion and sheperspurse)
Grs = grass species (quackgrass)
Alf = alfalfa component

3/ Quackgrass control in percent control, rated ocularly

Table 2. Agronomic data from the Sethoxydim Herbicide Study on alfalfa. Northwestern Agricultural Research Center, Kalispell, MT in 1986. Second harvest: July 28, 1986

Treatment	Rate	Yield Tons/A 1/ Hay	Alf	Species Composition 2/ Brdf	Grs	Alf	% Quack Control 3/ 6/9	7/28	10/31
Check		1.49	1.17	1.4	18.6	80.0	0	0	0
Sethox.	.3+.3+.3	1.06	1.02	1.8	1.0b	97.2a	73a	98a	82
Sethox.	.5+.3	1.41	1.37	2.1	0b	97.9a	98a	96a	27
Sethox.	.2	1.29	1.19	0	7.8b	92.2a	30a	33a	7
Sethox.	.5	1.35	1.12	0	16.8	83.2	99a	13	8
Sethox.	.3	1.27	1.12	0	11.8b	88.2	67a	17	33
Sethox.	.4	1.34	1.23	0	7.7b	92.3a	93a	23	25
Sethox.	.5+.5	1.11	1.02	5.6	0b	94.4a	99a	99a	17
MEAN		1.870	1.585	1.53	.1286	.8560	69.8	48.1	24.7
F-RATIO TRTS		.2848	.2612	.7287	14.1**	4.732**	29.5**	40.1**	2.38
CV (SE/MEAN)		21.18	19.72	159.7	24.37	3.251	9.69	13.7	66.8
LSD (0.05)		.8274	.6903	6.831	5.933	8.930	20.5	20.0	50.3

1/ Yield in tons/acre hay = all forage components considered
alfalfa = only the alfalfa component considered

2/ Species composition percentages determined by hand separation of a plot subsample Brdf = broadleaf weeds (mainly dandelion and sheperspurse)
Grs = grass species (quackgrass)
Alf = alfalfa component

3/ Quackgrass control in percent control, rated ocularly

PROJECT TITLE: Third Year Evaluations of a Chlorsulfuron (Glean)Plantback Study 1/

YEAR/PROJECT: 1986/754 Weed Control in Small Grains

PROJECT PERSONNEL: Vern R. Stewart, Northwestern Agricultural Research Center, Kalispell, MT
Research Specialist - Todd Keener, NWARC, Kalispell, MT.

SUMMARY:

Three years after chlorsulfuron applications to spring wheat twelve crops were planted into the test area and were found to vary in sensitivity to chemical carryover. Most sensitive to residual chlorsulfuron were lentils, sugar beets, flax and sunflowers.

RESULTS:

As an indication of chemical residue in the soil twelve crops were planted to a test area that had been treated three years previously with a range of rates of chlorsulfuron. Visual observations taken during the growing season showed several crops still very sensitive to higher rates of chlorsulfuron three years after application. Very sensitive to chlorsulfuron residue were lentils, alfalfa, sugar beets and flax. Found to be moderately susceptible to crop injury and yield decrease due to chemical residue were potatoes, garbanzo beans, pinto beans, and sunflowers. Least sensitive to chlorsulfuron residue were barley, faba beans, and corn.

Percent yields (biomass in most cases) were effected significantly by the higher rates of chlorsulfuron residue in lentils, alfalfa, sugar beets, flax, potatoes, garbanzo beans, sunflowers and corn. Table 1.

Plant height was seen to be significantly reduced in plots where high rate applications were made and then planted back to lentils, garbanzo beans, and alfalfa. Table 2.

1/ This research was conducted in part by Dan Buckhart, former graduate student in Weed Science at Montana State University under Dr. Pete Fay, Assoc. Professor or Weed Science.

Table 1. Agronomic data from the Dupont Plantback study established on the Northwestern Agricultural Research Center, Kalispell, MT in 1986. 1/

Treatment	Barley		Lentil		Alflafa		Sugarbeets	
	% YLD	% INJ	% YLD	% INJ	% YLD	% INJ	% YLD	% INJ
Chlors 1 oz	98.9a	6.7a	21.8a	100b	19.7a	80.3c	18.4a	81.7b
Chlors 1/2oz	104.4a	2.7a	29.6ab	84.1b	51.9ab	48.4b	36.3a	63.7b
Chlors 1/4oz	99.5a	4.8a	85.7bc	21.0a	83.1bc	23.6ab	89.1b	15.2a
Chlors 1/8oz	97.6a	5.4a	75.2abc	13.5a	96.8c	13.0a	96.0b	8.1a
Chlors 1/16oz	92.6a	7.8a	84.2abc	11.3a	101.4c	11.8a	90.3b	10.2a
Check	100.0a	0a	100.0c	0a	100.0c	0a	100b	0a

Treatment	FLAX		POTATO		SAFFLOWER		FABAS	
	% YLD	% INJ	% YLD	% INJ	% YLD	% INJ	% YLD	% INJ
Chlors 1 oz	29.6a	70.4b	65.0a	34.3b	103.5a	12.3a	86.0a	20.9a
Chlors 1/2oz	50.1ab	49.9c	93.8ab	10.1a	103.4a	7.2a	95.3a	21.9a
Chlors 1/4oz	79.1bc	20.9b	94.5ab	11.0ab	83.1a	32.0a	99.6a	12.3a
Chlors 1/8oz	108.8c	10.4ab	101.2b	9.2a	106.3a	11.9a	101.9a	3.7a
Chlors 1/16oz	98.3c	10.4ab	37.2ab	16.6ab	110.9a	14.6a	106.4a	9.7a
Check	100.0c	0a	100.0b	0a	100.0a	0a	100.0a	0a

Treatment	GARBANZOS		PINTOS		SUNFLOWERS		CORN	
	% YLD	% INJ	% YLD	% INJ	% YLD	% INJ	% YLD	% INJ
Chlors 1 oz	64.0a	36.1c	72.2a	30.4b	30.7a	69.3c	77.1a	23.2b
Chlors 1/2oz	71.3a	30.5c	75.7a	24.3ab	71.7b	32.0b	84.0ab	16.0ab
Chlors 1/4oz	74.8ab	25.3bc	80.4a	19.6ab	90.8bc	11.6ab	90.8ab	13.1ab
Chlors 1/8oz	78.1ab	21.9abc	91.3a	8.7ab	104.8c	5.7a	97.4ab	6.2ab
Chlors 1/16oz	100.2b	4.4ab	99.7a	14.1ab	103.1bc	4.0a	92.0ab	6.4ab
Check	100.0b	0a	100.0a	0a	100.0bc	0a	100.0b	0a

Overall Crop Injury (across the 12 crops)

Treatment	% INJ
Chlors 1 oz	47.1d
Chlors 1/2oz	32.5c
Chlors 1/4oz	17.5b
Chlors 1/8oz	9.8ab
Chlors 1/16oz	10.3ab
Check	0a

1/ Numbers followed by the same letter are significantly different at the 5% level using the LSD test

% YLD = % yield of check
% INJ = 5 injury of check

Table 2. Height measurements (CM) from the Chlorsulfuron plantback study, 1986, Kalispell, MT.

TREATMENT [2]	FLAX	SAFFLWR	PINTO	LENTIL	BARLEY	GARBZ
CHLORS 1 OZ	65.50	88.50	35.75	11.50b	99.25	41.25b
CHLORS 1/2 OZ	58.50	91.50	34.75	16.75b	97.50	41.75b
CHLORS 1/4 OZ	68.50	97.50	35.50	43.75	100.0	52.75
CHLORS 1/8 OZ	68.25	94.25	38.00	42.25	98.00	56.00
CHLORS 1/16OZ	68.75	93.75	48.50a	48.00	93.00	50.50b
CHECK	72.25	95.00	39.25	50.25	97.00	62.50
OVERALL MEAN	66.96	93.42	38.63	35.42	97.46	50.79
F-RATIO TRTS	.1101	.5364	3.106*	15.45**	.4787	5.361**
CV (SE/MEAN)	21.01	4.521	7.529	12.09	3.636	7.021
LSD (0.05)	42.40	12.73	8.766	12.90	10.68	10.75

TREATMENT [2]	FABAS	CORN	ALFAL	SPUDS	BEETS	SUNFWR
CHLORS 1 OZ	103.3	178.3	18.75b	37.25	25.75	133.3
CHLORS 1/2 OZ	103.8	165.0	24.00b	48.50	51.75	153.0
CHLORS 1/4 OZ	112.8	157.8	59.00	53.50	52.50	181.5
CHLORS 1/8 OZ	124.5	164.0	65.00	57.50a	57.25	186.5
CHLORS 1/16OZ	124.3	165.8	61.75	58.00a	47.50	196.3
CHECK	108.5	143.8	75.25	44.50	46.00	207.5
OVERALL MEAN	112.8	162.4	50.63	49.88	46.79	176.3
F-RATIO TRTS	2.188	1.634	7.424**	3.765*	2.325	1.123
CV (SE/MEAN)	5.744	5.454	16.95	8.362	15.49	14.94
LSD (0.05)	19.54	26.70	25.86	12.57	21.84	79.41

* Indicates statistical significance at the .05 level
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .05 level.
b/ Values significantly less than the check at the .05 level

PROJECT TITLE: Spring Barley Growth Regulator Study

YEAR/PROJECT: 1986/756 Small Grain Production

PROJECT PERSONNEL: Leader - Vern R. Stewart, N. W. Agri. Res. Center, Kalispell, MT.
Research Specialist - Todd Keener

SUMMARY:

There were no significant differences found in yield, test weight, % plump, spikes per foot, kernals per head and 1000 kernal weight when applying Cerone growth regulator to Ingrid spring barley at stage 6 and 8 of the Feeks development scale.

RESULTS:

The growth regulator Cerone was applied to Ingrid spring barley at stages 6 and 8 of the Feek's development scale. Although yield was highest in those plots which recieved no Cerone, and in those plots treated earlier with Cerone, the differences were not significant. Percent plump, test weight, spikes per foot, kernals per head and 1000 kernal weights did not differ significantly when treatments were compared to the check. Cerone applied at growth stage 8 reduced plant height significantly when compared to other treatments.

Table 1. Agronomic data from the Cerone Growth Regulator Study grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1986. Seeded April 29,1986 Harvested August 27, 1986. Field No. R-13

TREATMENT	RATE #/A	STAGE APPLN	YIELD BU/A	TEST WT LB/BU	% PLUMP	HT (")	SPIKES /FT 1)	KERNALS /HD 2)	1000 K WT. 3)
Check	---	-	105.3	51.50	91.50	39.27	13.18	24.80	44.61
Cerone	.125	6	96.58	51.19	91.25	38.88	14.15	24.83	43.22
Cerone	.185	6	96.35	52.63	91.00	37.01	12.65	23.72	44.67
Cerone	.125	8	95.45	50.88	91.75	36.52b	12.53	22.92	44.50
Cerone	.185	8	95.15	51.25	91.75	33.76b	14.18	23.57	45.06
OVERALL MEAN			97.76	51.49	91.45	37.09	13.34	23.97	44.41
F-RATIO TRTS			1.322	1.454	.2727	8.497**	.3764	1.255	1.578
CV (SE/MEAN)			3.770	1.085	.6825	2.036	9.703	3.075	7.565
LSD (0.05)			11.36	1.722	1.923	2.327	3.987	2.271	.899

** Indicates statistical significance at the .05 level
b/ Values significantly less than the check at the .05 level
NOTE: Stage of applications were stages 6 and 8 of the Feeks grain development scale
1/ Spikes per foot = # of tillers per foot of row (3 counts per plot)
2/ Kernals per head = the average # of kernals per head (10 counts/plot)
3/ 1000 K WT = 1000 kernal weight

PROJECT TITLE: Spring Barley Variety Trials

YEAR/PROJECT: 1986/756 Small Grains Production

PROJECT PERSONNEL: Leader - Vern R. Stewart, N.W. Agric. Res. Center, Kalispell, MT.
Research Specialist - Todd K. Keener, N.W.A.R.C., Kalispell, MT.
Cooperators - Dr. Tom Blake and Pat Hensleigh, Plant and Science, Bozeman, MT.

SUMMARY: To determine the adaptability of new and introduced spring barley varieties to northwestern Montana variety trials are grown at the Nothwestern Agricultural Research Center and offstation locations. It is these data collected over many years that aid in recommending varieties for northwestern Montana.

The spring barley nurseries grown at Kalispell this season were the Intrastate and Early Yield Nurseries. Two offstation nurseries were grown, one at the Western Agricultural Research Center, and the other on the Rodney Vannoy farm in Greenough, MT.

Favorable spring moisture and a warm growing season contributed to high yields this season. Warmer than normal temperatures may have caused reduced height and a reduction in number of tillers.

RESULTS: Intrastate Spring Barley -

Yields were good for the Intrastate Spring Barley Nursery, although they have been higher at this location. Only three varieties (VD 415082, Kimberly, and Mt 81616) produced 100 bu/A or better while last year 15 varieties exceeded the 100 bu/A mark. Any reduction in yield or height may be attributed to higher than normal temperatures during the month of May. The yields ranged from 39.9 to 105 bu/A with the average being 81.4 bu/A (about 15 bu/Aless than last year's average). Five varieties were significantly less than Purcell in yield.

Test weights were very good and four varieties exceeded 55.5 lbs/bu (VD 2481, CB 8444, BE 17, and BE 15). Percent plump were generally very good. Height averages for this nursery were below normal indicating a response to the warm May weather. Table 1.

Early Yield Trial -

Sixty four spring barley varieties were evaluated under dryland conditions and found to range in yield from 112 to 155 bu/A. Lewis was used as a check variety. None of the entries yielded significantly higher while six varieties yielded significantly less.

Test weights were very good with all entries exceeding 51 lbs/bu. Percent plump averaged 97 percent. Plant height and heading date varied by variety. With lodging at a minimum only four varieties had significantly more lodging than Lewis. Table 2.

Offstation - Missoula County

The 1986 offstation irrigated spring barley nursery in Missoula County was located on the Rodney Vannoy farm. Yields were good for the area although the nursery was effected by a high population of Columbia ground squirrels. Ingrid yielded the highest at this location and was used as a check. There were eleven varieties that yielded significantly less. Test weights were average for the majority of the nursery although the weights ranged from 45 lbs/bu (for Steptoe and Klages) and went as high as 60 lbs/bu for Piroline. Table 3.

Ravalli County -

Good yields were obtained from the nursery grown on the Western Agricultural Research Center in Corvallis. Six varieties yielded significantly higher than Ingrid (85.24 bu/A) with MT 81616 having the highest of 116.7 bu/A. Test weights were average for the nursery with Steptoe having the low at 45.5 lb/bu and Bowman having the highest at 51.9 lbs/bu. Percent plumps were lower than normal due to dry seeding conditions, a warmer than normal growing season, and uneven irrigation. The lodging index is determined by multiplying lodging severity X prevalence divided by 9. Table 4.

In combining data from the two locations Ingrid yielded the highest and also had a high test weight. Spirit and MT 81616 performed well at both locations. Table 5.

Table 1. Agronomic data from the 1986 Intrastate Spring Barley Nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT. Date Seeded: April 9, 1986 Date harvested August 12, 1986

VARIETY	YIELD BU/A	TEST WT LB/BU	% PLUMP	PLNT HT INCHES	HEADING DATE
VD415082 SI 212-75/VDH222-69	105.12	53.00	100.00	27.17	168.33
CI 15687 KIMBERLY	100.83	52.50	97.00	31.10	171.67a
MT 81616 TR440/CLARK	100.29	52.00	98.00	30.45	170.67a
CI 10083 INGRID	97.48	54.50	99.00	29.13	168.33
MT 83491 CLARK/MT 41279	96.23	53.50	97.00	26.90	170.67a
MT 13104 GALLATIN	96.17	54.80	96.00	31.36	165.67
MT138575 HECTOR/KLAGES	95.87	52.30	98.00	27.03	165.00
CI 15478 KLAGES	95.44	52.00	98.00	29.79	169.67a
MT 83592 CLARK/ID765988	94.56	53.00	96.00	27.43	168.67a
BA 4038 BUSCH AG 4038	94.42	51.50	99.00	27.43	167.00
CI 15229 STEPTOE	92.79	49.50	99.00	27.82	162.67b
NA 18 PREMIER	91.90	52.50	99.00	27.82	169.33a
MT140523 HECTOR/KLAGES	91.87	52.00	96.00	27.30	166.67
MT328202 STEPTOE/KLAGES	91.35	50.50	99.00	32.02a	168.00
VD 02481 VANDERHAVE 024-81	89.54	55.50	98.00	25.07	170.33a
MT328203 STEPTOE/KLAGES	89.21	51.50	99.00	29.53	167.67
MT 83518 CLARK/LAMONT	89.10	54.00	100.00	26.90	168.67a
MT831598 ID765988/TR450	87.58	53.30	98.00	27.30	166.67
MT 83533 CLARK/LAMONT	87.21	52.50	99.00	25.59	167.67
MT831616 ID 765988/TR450	87.17	51.00	96.00	26.51	170.00a
MT 81161 LEWIS/KLAGES/SUMMIT	86.50	51.80	96.00	27.17	167.00
CI 16181 PURCELL 1/	86.48	52.00	98.00	27.69	166.67
GS 1 COLUMBIA (GERMAIN S	86.42	47.20	99.00	21.26b	167.00
MT 729 SUMMIT	86.19	53.80	98.00	28.74	169.00a
MT 83435 CLARK/TR250	85.77	53.00	97.00	28.35	167.67
VD 22872 PISTON	85.02	53.50	97.00	27.03	169.67a
VD405282 ARAMIR/VDH222-69/AT	84.87	52.50	100.00	25.33	168.67a
CB 8444 CEBECO 8444	84.54	55.00	100.00	24.15	169.33a
MT 4126 KIMBERLY//HEC/KGS	83.85	51.50	96.00	26.90	170.00a
PI483237 BOWMAN	83.71	51.80	98.00	29.92	167.00
VD 23878 SPIRIT	83.60	53.50	97.00	26.77	169.00a

Table 1. (Cont'd)

VARIETY	YIELD BU/A	TEST WT LB/BU	% PLUMP	PLNT HT INCHES	HEADING DATE
CI 9558 PIROLINE	83.50	54.00	97.00	29.40	165.00
CI 15857 CLARK	82.75	51.50	96.00	28.74	167.67
MT 81502 CLARK/KLAGES/ZEPHYR	82.54	52.50	98.00	26.64	166.67
CI 13827 SHABET	82.54	52.50	97.00	29.92	169.33a
MT 32442 HYPANA/UNITAN//HECT	81.73	51.80	99.00	33.73a	171.67a
MT 83424 CLARK/TR450	81.54	52.00	98.00	26.77	168.33
MT 81619 TR440/CLARK	81.23	52.50	94.00	23.62b	168.33
CI 15856 LEWIS	79.69	54.00	98.00	28.22	166.33
BE 1 COMPANA	79.44	52.30	98.00	27.03	167.67
VD404382 ARAMIR*VDH 256-73/A	79.38	54.00	99.00	27.17	168.00
CB 2 BELLONA	79.15	54.30	98.00	25.07	171.33a
MT 81143 HECTOR/KLAGES//KLAG	78.88	54.50	98.00	27.95	165.00
MN 36 ROBUST	78.21	50.50	98.00	28.74	167.00
CI 15514 HECTOR	77.00	53.30	95.00	25.33	167.00
BA 529 BUSCH AG 529	74.35	54.00	95.00	30.18	170.33a
NF 1 FLEET	73.96	52.00	95.00	21.52b	170.33a
PI483238 HAZEN	73.63	51.30	99.00	27.43	166.33
BE 17 WANUBET M1	73.63	59.50	26.00	32.28a	168.67a
CB 8331 CEBECO 8331	73.13	53.30	98.00	26.25	171.33a
VD 3 MENUET	72.98	53.00	98.00	24.54	169.00a
VD403582 VANDERHAVE 4035-82	72.27	53.80	98.00	24.41	169.33a
CI 15860 KARLA	70.67	49.00	93.00	27.17	167.00
MT 83444 CLARK/TR450	69.81	52.80	96.00	26.77	168.00
MT 83422 CLARK/TR450	69.67	53.50	98.00	25.59	170.67a
BE 15 WANUBET 080	68.38	60.70	75.00	30.05	169.33a
CI 6398 BETZES	67.06	53.00	94.00	30.58	171.33a
BE 6 WANUPANA	66.92	53.30	95.00	23.88b	170.33a
MT 41279 KIMBERLY//HECTOR/KL	65.48	52.80	97.00	26.90	170.00a
MT 81192 HECTOR/KLAGES//KLAG	64.67b	53.30	99.00	26.77	172.00a
CI 15773 MOREX	63.17b	50.80	96.00	29.40	164.33b
BZ584-40 WESTERN PLANT BREED	59.94b	49.00	97.00	25.07	164.33b
BE 1000 PROWASHONUPANA	49.79b	48.80	80.00	19.82b	172.33a
BE 7 WASHONUPANA	39.90b	44.00	46.00	24.80	170.00a
MEANS	81.38	.00	.00	27.32	168.42
F TEST FOR VAR. 2/	2.43**	.00	.00	3.66**	9.11**
C.V.	9.51	.00	.00	4.93	.41
LSD (0.05)	21.66	.00	.00	3.77	1.92

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

Table 2. Agronomic data from the 1986 Spring Barley Early Yield Trial grown on the Northwestern Agricultural Research Center, Kalispell, MT
Date seeded: April 7, 1986 Date harvested: August 13, 1986

VARIETY	YIELD BU/A	TEST WT LB/BU	% PLUMP	PLNT HT INCHES	HEADING DATE	LODGING INDEX
MT851195 MT 41918 / TR 450	155.29	52.70	98.00	37.01	167.33b	.00
MT851032 HARRINGTON / CLARK	153.15	53.40	98.00	37.93a	169.67	.00
MT851080 MT 354582 / TR 604	152.75	52.20	97.00	36.09	166.33b	.00
MT851219 ID 810264 / MT 4126	148.44	51.20	95.00	35.83	167.67b	.00
MT851012 CLARK / WA 877178	147.44	52.00	97.00	38.06a	168.00b	17.03a
MT851161 MT 41918 / MT 41279	147.23	52.40	96.00	35.17	170.00	.00
MT851177 MT 41918 / BRIDGER	145.46	51.60	98.00	33.99	170.00	.00
MT851211 ID 786871 / HARRING	145.33	51.80	97.00	37.27	170.00	.00
MT851039 HARRINGTON / MT 412	145.23	51.80	96.00	36.22	166.00b	9.43
MT851163 MT 41918 / MT 41279	144.98	52.40	97.00	33.73	167.33b	.00
MT851200 MT 41918 / TR 604	144.79	52.80	97.00	37.93a	173.00a	.00
CI 15229 STEPTOE	144.25	47.20	98.00	29.92b	165.00b	.00
PI483237 BOWMAN	143.56	52.80	97.00	34.65	166.67b	.00
CI 15856 LEWIS	143.56	53.50	97.00	36.35	170.00	.00
MT851128 MT 41279 / BRIDGER	142.63	52.20	97.00	33.86	168.00b	.00
MT851196 MT 41918 / TR 450	142.58	52.50	96.00	36.09	168.33b	.00
MT851142 MT 4126 / ID 789009	142.31	51.50	94.00	35.56	166.33b	.00
MT851051 HARRINGTON / MT 419	142.08	52.60	98.00	37.93a	168.00b	.00
MT851224 ID 810264 / MT 4191	141.58	53.20	98.00	34.78	170.00	.00
MT851031 HARRINGTON / CLARK	141.02	53.00	99.00	36.35	169.33	.00
MT851214 ID 786871 / MT 3545	140.73	52.40	98.00	36.09	172.67a	1.10
MT851011 CLARK / WA 877178	140.08	51.80	97.00	34.51	169.00	5.90
MT851221 ID 810264 / MT 4191	139.75	53.40	100.00	36.09	169.67	.00
MT851108 MT 41279 / MT 4126	138.98	52.60	99.00	32.41b	171.33	.00
MT851216 ID 810264 / MT 4126	138.71	51.70	98.00	34.65	169.67	.00
MT851048 HARRINGTON / MT 419	138.65	52.00	98.00	35.70	168.33b	5.57
MT851209 MT 41921 / BRIDGER	137.79	52.40	97.00	33.99	172.67a	.00
MT851132 MT 41279 / TR 215	137.48	52.80	96.00	34.91	171.00	.00
MT851105 MT 41279 / MT 4126	136.75	52.50	97.00	34.65	169.67	.00
MT851090 MT 354585 / MT 4126	136.52	53.40	97.00	34.25	170.00	1.47
MT851088 MT 354585 / MT 4126	136.48	52.10	94.00	35.70	170.00	.00
CI 15478 KLAGES	136.06	52.00	97.00	38.32a	172.33a	.00
MT851220 ID 810264 / MT 4191	135.67	51.60	96.00	38.71a	169.00	4.63
MT851202 MT 41921 / MT 35458	135.46	52.50	97.00	37.27	170.00	.00
MT851071 MT 354582 / TRIUMPH	135.13	50.60	94.00	37.14	168.00b	3.70
MT851087 MT 354585 / MT 3545	131.52	51.30	94.00	34.51	170.00	.00
MT851050 HARRINGTON / MT 419	131.31	52.30	98.00	39.63a	167.33b	.00
MT851188 MT 41918 / TR 215	131.10	52.70	97.00	34.65	170.00	.00
MT851238 39-2 / 39-2	131.08	53.10	98.00	37.66	167.33b	.00
MT851133 MT 41279 / TR 453	130.96	55.30	95.00	37.14	171.33	.00
MT851068 MT 354582 / MT 4127	128.90	52.60	96.00	34.51	167.00b	.00
MT851217 ID 810264 / MT 4126	128.71	51.60	96.00	36.88	169.00	8.90
MT851205 MT 41921 / MT 35458	128.23	52.30	98.00	35.96	167.00b	.00
MT851005 CLARK / ID 810264	128.19	51.90	96.00	36.88	166.67b	18.90a
MT851103 MT 41279 / CLARK	127.94	51.90	96.00	34.12	171.33	.00
MT851127 MT 41279 / BRIDGER	127.69	51.80	96.00	36.35	169.00	12.97a
MT851244 39-6 / 39-6	127.67	53.80	99.00	42.78a	170.00	1.87
MT851083 MT 354585 / MT 3545	127.60	51.00	96.00	38.32a	166.33b	2.20

Table 2. (Cont'd)

VARIETY	YIELD BU/A	TEST WT LB/BU	% PLUMP	PLNT HT INCHES	HEADING DATE	LODGING INDEX
MT851106 MT 41279 / MT 4126	127.38	52.60	96.00	33.07	170.33	.00
MT851084 MT 354585 / MT 3545	126.83	51.50	98.00	36.88	166.67b	1.10
MT851077 MT 354582 / TR450	126.65	52.30	97.00	37.53	168.00b	.00
MT851094 MT 354585 / DIAMONT	126.38	51.70	96.00	34.38	169.33	.00
MT851139 MT 41279 / TR 604	125.27	52.70	98.00	32.55b	168.33b	.00
MT851223 ID 810264 / MT 4191	124.90	51.10	97.00	37.53	170.67	1.47
MT851245 39-6 / 39-6	124.56	52.50	99.00	38.98a	167.33b	.00
MT851014 CLARK / BRIDGER 82	124.27	50.40	94.00	36.09	166.67b	35.00a
MT851118 MT 41279 / WA 10698	123.90	51.10	93.00	36.48	169.33	.00
MT851162 MT 41918 / MT 41279	122.90	52.80	97.00	34.65	170.00	.00
MT851237 39-2 / 39-2	121.65	51.80	99.00	38.32a	170.00	.00
MT851156 MT 41918 / MT 35458	119.21	51.80	96.00	36.48	167.00b	.00
MT851203 MT 41921 / MT 35458	118.81	52.80	98.00	34.12	169.67	.00
MT851115 MT 41279 / WA 10698	118.58	51.60	95.00	33.60	169.00	8.33
MT851013 CLARK / WA 877178	114.62	51.70	97.00	35.30	166.33b	8.33
MT851243 39-6 / 39-6	112.65	51.40	98.00	35.70	167.00b	.00
MEANS	134.65	.00	.00	35.94	168.88	2.31
F TEST FOR VAR.	1.78	.00	.00	2.30	13.29	2.13
C.V. 2: (S OF MEAN/MEAN)*100	5.44	.00	.00	3.66	.29	171.98
LSD (0.05)	20.51	.00	.00	3.68	1.39	11.12

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

Table 3. Agronomic data from the irrigated offstation spring barley nursery grown on the Rodney Vannoy farm, Greenough, MT. in 1986.
Date seeded April 22, 1986 Date harvested August 5, 1986

CI or State #	VARIETY	YIELD BU/A	TEST WT LB/BU	% PLUMP	% STAND	PLNT HT INCHES
CI 10083	INGRID 1/	94.18	49.90	98.00	100.00	25.98
NA 18	PREMIER	84.74	48.33	98.00	100.00	24.67
VD 23878	SPIRIT	72.24	49.10	98.00	100.00	21.26b
CI 15857	CLARK	69.77	47.60b	90.00	100.00	22.97
VD 3	MENUET	69.14	49.07	96.00	100.00	23.10b
CI 9558	PIROLINE	65.94b	50.23	100.00	100.00	23.62
CB 2	BELLONA	64.44b	49.00	99.00	98.33	21.39b
PI483237	BOWMAN	61.60b	48.43	99.00	100.00	22.57
MT 81616	TR440/CLARK	61.24b	46.77b	95.00	100.00	21.39b
MT 13104	GALLATIN	59.17b	48.63	99.00	91.67	25.59
CI 15856	LEWIS	57.24b	48.67	97.00	100.00	23.10
CI 15478	KLAGES	54.57b	45.97b	82.00	93.33	24.41
CI 15773	MOREX	53.27b	46.47b	96.00	100.00	24.93
MN 36	ROBUST	45.37b	46.23b	93.00	100.00	24.15
CI 15229	STEPTOE	42.57b	43.40b	92.00	88.33	19.03b
CI 15514	HECTOR	25.93b	46.80b	88.00	76.67	22.44
	X	61.34	47.79	---	96.77	23.16
	F 2/	3.34**	6.71**	---	1.91	2.01*
	C.V.	14.39	1.42	---	4.85	5.55
	L.S.D.	25.50	1.96	---	13.54	3.71

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

Table 4. Agronomic data from the the irrigated offstation spring barley nursery grown of the Western Agricultural Research Center in Corvallis, MT. in 1986.
Seeded April 22, 1986 Harvested August 14, 1986

CI or State #	VARIETY	YIELD BU/A	TEST WT LB/BU	% PLUMP	PLNT HT INCHES	LODGING INDEX
MT 81616	TR440/CLARK	116.71a	47.90	75.00	31.76	3.90
MN 36	ROBUST	110.71a	50.60	86.00	34.65	.00
CI 15773	MOREX	110.38a	49.60	81.00	33.73	.00
VD 23878	SPIRIT	105.38a	49.10	64.00	32.28	1.10
PI483237	BOWMAN	105.24a	51.90	94.00	32.15	.00
VD 3	MENUET	101.44a	51.40	81.00	31.63	.70
CI 15856	LEWIS	97.28	51.40	82.00	32.28	3.30
CI 15229	STEPTOE	94.51	45.50	84.00	30.45	3.30
CI 15857	CLARK	94.01	49.90	71.00	32.81	1.10
CI 9558	PIROLINE	92.58	52.00	82.00	33.33	1.30
CI 15478	KLAGES	88.64	49.10	65.00	35.43	.00
CI 15514	HECTOR	87.78	50.90	71.00	31.50	1.30
CB 2	BELLONA	86.37	50.10	79.00	31.10	.00
NA 18	PREMIER	85.31	48.50	57.00	32.55	.00
CI 10083	INGRID 1/	85.24	50.40	69.00	33.20	.00
MT 13104	GALLATIN	78.58	51.10	88.00	30.71	.00
	X	96.26	---	---	32.47	---
	F 2/	4.01**	---	---	1.58	---
	C.V.	5.71	---	---	3.34	---
	L.S.D.	15.89	---	---	3.13	---

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

Table 5. Agronomic data from the Missoula and Ravalli County off station irrigated spring barley nurseries, 1986.

CI or State #	Variety	Yield			Test Weight		
		Miss	Rava	$\bar{X}$	Miss	Rava	$\bar{X}$
CI 10083	INGRID	94.18	85.24	89.71	49.90	50.40	50.15
NA 18	PREMIER	84.74	85.31	85.31	48.33	48.50	48.42
VD 23878	SPIRIT	72.24	105.38	88.81	49.10	49.10	49.10
CI 15857	CLARK	69.77	94.01	81.89	47.60	49.90	48.75
VD 3	MENUET	69.14	101.44	85.29	49.07	51.40	50.24
CI 9558	PIROLINE	65.94	92.58	79.26	50.23	52.00	51.12
CB 2	BELLONA	64.44	86.37	75.41	49.00	50.10	49.55
PI483237	BOWMAN	61.60	105.24	83.42	48.43	51.90	50.17
MT 81616	TR440/CLARK	61.24	116.71	88.98	46.77	47.90	47.34
MT 13104	GALLATIN	59.17	78.58	68.88	48.63	51.10	49.87
CI 15856	LEWIS	57.24	97.28	77.26	48.67	51.40	50.04
CI 15478	KLAGES	54.57	88.64	71.61	45.97	49.10	47.54
CI 15773	MOREX	53.27	110.38	81.83	46.47	49.60	48.04
MN 36	ROBUST	45.37	110.71	78.04	46.23	50.60	48.42
CI 15229	STEPTOE	42.57	94.51	68.54	43.30	45.50	44.45
CI 15514	HECTOR	25.93	87.78	56.86	46.80	50.90	48.85
	X	61.34	96.26		47.79	49.96	

CI or State #	Variety	% Plump			Height (")		
		Miss	Rava	$\bar{X}$	Miss	Rava	$\bar{X}$
CI 10083	INGRID	98.00	69.00	83.50	25.98	33.20	29.59
NA 18	PREMIER	98.00	57.00	77.50	24.67	32.55	28.61
VD 23878	SPIRIT	98.00	64.00	81.00	21.26	32.28	28.77
CI 15857	CLARK	90.00	71.00	80.50	22.97	32.81	27.63
VD 3	MENUET	96.00	81.00	88.50	23.10	31.63	27.37
CI 9558	PIROLINE	100.00	82.00	91.00	23.62	33.33	28.48
CB 2	BELLONA	99.00	79.00	89.00	21.39	31.10	26.25
PI483237	BOWMAN	99.00	94.00	96.50	22.57	32.15	27.36
MT 81616	TR440/CLARK	95.00	75.00	85.00	21.39	31.76	26.58
MT 13104	GALLATIN	99.00	88.00	93.50	25.59	30.71	28.15
CI 15856	LEWIS	97.00	82.00	89.50	23.10	32.28	27.69
CI 15478	KLAGES	82.00	65.00	73.50	24.41	35.43	29.92
CI 15773	MOREX	96.00	81.00	88.50	24.93	33.73	29.33
MN 36	ROBUST	93.00	86.00	89.50	24.15	34.65	29.40
CI 15229	STEPTOE	92.00	84.00	88.00	19.03	30.45	24.74
CI 15514	HECTOR	88.00	71.00	79.50	22.44	31.50	26.97
	X	95.00	76.81		23.16	32.47	

PROJECT TITLE: 1986 Montana Oat Variety Performance Trial

YEAR/PROJECT: 1986/756 Small Grains Production

PERSONNEL:

Project Leader - Vern R. Stewart, N. W. Agric. Res. Center, Kalispell

Cooperators - Greg Carlson, Northern Agric. Res. Center, Havre
Grant Jackson, Central Agric. Res. Center, Mocassin
Jerry Berman, Eastern Agric. Res. Center, Sidney
Gil Stallknecht, Soutern Agric. Res. Center, Huntley
Tom Blake, Plant and Soil Science, Bozeman

SUMMARY

To determine the adaptability of new and introduced oat varieties to Montana the Northwestern Uniform Oat Nursery is grown throughtout the state in nine locations under irrigated, high moisture, and dryland conditions.

Oat nurseries throughout the state grown under irrigated , high moisture, and dryland conditions had higher than average yields this year. The average yields were slightly higher (appro. 4.5 bu) than those of the previous year. Favorable growing conditions and adequate soil moisture prevailed in most locations this season contributing to high yields and test weights.

RESULTS

Irrigated or high moisture conditions

The variety ID 75861 was the highest yielding statewide in the Uniform Oat Nursery for the last three years. Border, Cascade, ID742608, ID 805807, Otana, Monida, Appaloosa, and ID 783965 all had yields above 160 bu/A. Several varieties had test weights in excess of 38 lb/ bu (Calibre, IL 753402, Porter, ID 82063). Seven varieties had higher statewide averages for test weights than Otana. Heading date means did not vary greatly across the state, and were similar to the previous year's. Oat heights for irrigated locations were greater this season than in years when precipitation was less. Sandy, Calibre, and Cascade which were all above 45 inches in height this season (Table 1 through 4).

Dryland

Dryland yields were higher this year at all locations. The yields recorded statewide were approximately double the 1985 yields. Ten varieties had yields in excess of 80 bu/A with ID 805807 having the highest statewide average yield. Otana was tenth in yield when averaged across the nine locations (80.36 bu/A). Test weights were also high across the state. The variety IL 753402 had the highest test weight mean of 39.51 lb/Bu, Otana second at 39.34 lb/Bu, and Calibre third at 39.34 lb/ Bu. Heading of most oat varieties was similar to previous years . Height at dryland locations was in most cases greater than other years. Otana, Sandy, Dumont, Calibre, and Cascade all exceeded 31 inches in height (Tables 5 through 8).

Table 1. Summary of Yield data from the Uniform Northwestern Oat Nursery grown under irrigation or high moisture conditions in Montana in 1986.

CI or State #	Variety	Kalispell	Huntley	Sidney	Bozeman	Mean
ND 1001	Steele	157.52	116.82	99.96	158.58	133.22
CI 9081	Random	185.54	136.57	117.72	192.45	158.07
ID 751170	Monida (75Ab1170)	198.29	147.10	135.42	170.85	162.92
SD 790188	Sandy	170.72	117.35	100.50	159.18	136.94
CI 9252	Otana	198.17	139.33	105.78	208.90	163.05
CI 8263	Cayuse	177.22	154.98	122.16	167.20	155.39
W 78286	Dumont	183.16	128.53	107.82	148.78	142.07
CI 9297	Appaloosa	189.66	164.81	122.94	171.80	162.30
OT 308	Calibre (S 7886)	207.49	127.77	103.86	169.28	152.10
WA 6394	WA 6394	177.47	151.75	127.02	179.63	158.97
CI 9401	Ogle	129.94	136.88	112.62	181.58	140.26
IL 753402	Coker 227/3/CI50	154.52	139.76	113.16	177.45	146.22
CI 9412	Porter	164.40	150.91	124.02	187.58	156.73
W 80474	Riel (RH 3057/OT	172.90	118.40	108.84	162.43	140.64
ND 820603	Froker/RL 3038/2	161.21	144.57	128.16	169.35	150.82
ID 742608	Cayuse/Otana (74	196.92	168.10	124.86	181.98	167.97
CI 6611	Park	172.34	117.69	115.14	161.00	141.54
ID 804725	Cayuse/74/Ab1956	159.15	145.68	109.26	173.18	146.82
OT 726	Cascade	212.74	141.58	120.66	206.13	170.28
PA 796766	Egdolon 26/Noble	142.14	133.98	94.14	192.28	140.61
ID 815792	74Ab2608/Cayuse	172.78	158.95	117.18	168.33	154.31
ID 805807	74Ab2608/Cayuse	175.09	173.51	120.54	197.43	166.64
ID 766843	K71299/3/Otana/2/	177.22	152.81	110.70	176.30	154.26
ID 75861	Cayuse/Otana (75	206.55	148.34	129.90	209.95	173.69
CI 467882	Border ID 742300	179.66	176.10	129.12	201.43	171.58
ND 810917	Froker/RL 3038	161.52	143.16	124.50	169.65	149.71
ID 783965	Aurora NYCRR com	168.78	143.27	120.12	213.68	161.46
ID 80988	74Ab1952/74Ab2608	166.46	153.73	121.56	193.75	158.88
	Mean	175.50	144.01	116.70	180.36	
	F value	5.37**	4.69**	6.21**	2.67**	
	C.V.	4.77	5.27	3.52	5.94	
	L.S.D.	23.74	21.12	11.66	30.13	

Table 2. Summary of Test Weight data from the Uniform Northwestern Oat Nursery grown under irrigation or high moisture conditions in Montana in 1986.

CI or State #	Variety	Kalispell	Huntley	Sidney	Bozeman	Mean
ND 1001	Steele	35.63	38.68	34.67	34.60	35.89
CI 9081	Random	36.93	37.78	32.17	35.80	35.67
ID 751170	Monida (75Ab1170)	37.87	37.33	33.00	36.80	36.25
SD 790188	Sandy	38.53	38.70	36.43	37.40	37.76
CI 9252	Otana	38.10	38.73	34.33	38.00	37.29
CI 8263	Cayuse	36.17	36.88	33.83	33.00	37.22
W 78286	Dumont	37.60	39.00	36.07	37.10	37.44
CI 9297	Appaloosa	35.77	36.88	32.50	34.50	34.91
OT 308	Calibre (S 7886)	39.47	40.73	35.67	39.10	38.74
WA 6394	WA 6394	36.53	37.33	33.67	35.70	35.81
CI 9401	Ogle	30.60	37.08	34.50	35.30	34.37
IL 753402	Coker 227/3/CI50	39.20	39.95	36.83	39.70	38.92
CI 9412	Porter	38.77	41.13	36.17	38.80	38.72
W 80474	Riel (RH 3057/OT	36.03	39.68	37.17	37.20	37.52
ND 820603	Froker/RL 3038/2	36.43	40.28	38.00	38.20	38.23
ID 742608	Cayuse/Otana (74	36.43	39.33	33.67	32.70	35.53
CI 6611	Park	35.47	37.25	34.67	37.10	36.12
ID 804725	Cayuse/74/Ab1956	36.67	38.88	33.83	35.50	36.22
OT 726	Cascade	37.77	38.68	34.00	34.10	36.14
PA 796766	Egdolon 26/Noble	35.47	37.23	35.50	36.30	36.13
ID 815792	74Ab2608/Cayuse	37.93	38.55	35.33	34.30	36.53
ID 805807	74Ab2608/Cayuse	35.80	39.88	33.83	35.40	36.23
ID 766843	K71299/3/Otana/2/	36.37	38.00	31.33	32.80	34.63
ID 75861	Cayuse/Otana (75	37.03	39.30	32.17	34.00	35.63
CI 467882	Border ID 742300	36.50	38.53	33.50	37.70	36.56
ND 810917	Froker/RL 3038	37.33	38.73	35.50	35.10	36.67
ID 783965	Aurora NYCRR com	37.03	38.08	35.23	35.80	36.53
ID 80988	74Ab1952/74Ab2608	35.10	38.75	33.17	33.70	35.18
	Mean	37.05	38.62	34.53	0	
	F value	1.54	4.43**	14.14**	0	
	C.V.	5.02	1.42	2.17	0	
	L.S.D.	5.27	1.55	1.23	0	

Table 3. Summary of Heading Date data from the Uniform Northwestern Oat Nursery grown under irrigation or high moisture conditions in Montana in 1986.

CI or State #	Variety	Kalispell	Huntley	Sidney	Bozeman	Mean
ND 1001	Steele	166.33	169.00	183.00	183.25	175.4
CI 9081	Random	167.00	169.00	183.00	183.00	175.5
ID 751170	Monida (75Ab1170)	170.33	174.00	184.00	185.00	178.3
SD 790188	Sandy	166.67	170.00	182.67	183.00	175.6
CI 9252	Otana	170.33	174.00	184.33	184.25	178.2
CI 8263	Cayuse	169.00	175.00	184.00	183.25	177.8
W 78286	Dumont	170.33	175.00	184.67	184.75	178.7
CI 9297	Appaloosa	172.67	175.00	184.67	184.75	179.3
OT 308	Calibre (S 7886)	170.00	174.00	189.00	185.50	179.6
WA 6394	WA 6394	172.33	175.00	186.33	184.50	179.5
CI 9401	Ogle	165.33	168.00	179.33	181.00	173.4
IL 753402	Coker 227/3/CI50	165.33	168.00	180.67	181.00	173.8
CI 9412	Porter	169.67	174.00	186.33	184.25	178.6
W 80474	Riel (RH 3057/OT	169.00	175.00	182.33	182.75	177.3
ND 820603	Froker/RL 3038/2	169.33	173.00	184.67	183.25	177.6
ID 742608	Cayuse/Otana (74	172.00	175.00	188.33	186.00	180.3
CI 6611	Park	172.00	175.00	187.67	186.00	180.2
ID 804725	Cayuse/74/Ab1956	171.67	174.00	184.00	183.50	178.3
OT 726	Cascade	170.33	174.00	185.67	185.50	178.9
PA 796766	Egdolon 26/Noble	168.00	170.00	185.33	183.25	176.6
ID 815792	74Ab2608/Cayuse	166.67	170.00	182.00	182.50	175.3
ID 805807	74Ab2608/Cayuse	172.00	175.00	185.67	185.75	179.6
ID 766843	K71299/3/Otana/2/	167.00	169.00	181.00	181.50	174.6
ID 75861	Cayuse/Otana (75	170.00	175.00	184.33	185.25	178.6
CI 467882	Border ID 742300	171.33	175.00	186.33	184.25	179.2
ND 810917	Froker/RL 3038	168.67	174.00	184.33	183.50	177.6
ID 783965	Aurora NYCRR com	169.00	174.00	185.67	184.00	178.2
ID 80988	74Ab1952/74Ab2608	169.33	174.00	185.00	185.00	178.3
	Mean	169.35	0	184.44	183.91	
	F value	20.07**	0	9.94**	19.23	
	C.V.	.28	0	.38	.17	
	L.S.D.	1.36	0	2.00	.90	

Table 4. Summary of Height data from the Uniform Northwestern Oat Nursery grown under irrigation or high moisture conditions in Montana in 1986.

CI or State #	Variety	Kalispell	Huntley	Sidney	Bozeman	Mean
ND 1001	Steele	40.42	47.00	40.67	45.57	43.42
CI 9081	Random	38.71	43.00	39.33	43.11	41.04
ID 751170	Monida (75Ab1170)	40.03	43.00	39.33	41.73	41.02
SD 790188	Sandy	46.46	45.00	44.00	46.06	45.38
CI 9252	Otana	43.96	44.00	42.00	45.37	43.83
CI 8263	Cayuse	35.30	44.00	40.00	41.93	40.31
W 78286	Dumont	41.60	46.00	39.67	44.49	42.94
CI 9297	Appaloosa	35.43	44.00	36.67	38.68	38.69
OT 308	Calibre (S 7886)	43.57	48.00	43.00	45.47	45.01
WA 6394	WA 6394	36.75	42.00	37.00	41.04	39.20
CI 9401	Ogle	30.31	40.00	37.00	39.76	36.77
IL 753402	Coker 227/3/CI50	31.76	36.00	35.33	38.29	35.35
CI 9412	Porter	37.80	41.00	39.67	43.70	40.54
W 80474	Riel (RH 3057/OT	42.65	43.00	40.67	44.00	42.58
ND 820603	Froker/RL 3038/2	36.35	43.00	37.00	38.29	38.66
ID 742608	Cayuse/Otana (74	35.43	42.00	38.33	40.35	39.03
CI 6611	Park	40.81	47.00	41.00	44.09	43.22
ID 804725	Cayuse/74/Ab1956	25.85	33.00	33.00	35.04	31.72
OT 726	Cascade	44.88	48.00	42.33	46.95	45.54
PA 796766	Egdolon 26/Noble	31.10	37.00	35.33	36.61	35.01
ID 815792	74Ab2608/Cayuse	31.10	40.00	37.00	37.11	36.30
ID 805807	74Ab2608/Cayuse	30.31	40.00	39.00	38.98	37.07
ID 766843	K71299/3/Otana/2/	32.81	36.00	32.33	36.81	34.49
ID 75861	Cayuse/Otana (75	33.46	39.00	38.00	40.94	37.85
CI 467882	Border ID 742300	36.35	38.00	38.67	39.07	38.02
ND 810917	Froker/RL 3038	36.22	43.00	40.00	40.55	39.94
ID 783965	Aurora NYCRR com	32.28	42.00	36.33	40.35	37.74
ID 80988	74Ab1952/74Ab2608	27.30	35.00	33.67	35.04	32.75
	Mean	36.39	0	38.44	41.05	
	F value	21.68**	0	9.94	20.29	
	C.V.	3.19	0	.38	1.86	
	L.S.D.	3.30	0	2.00	2.15	

Table 5. Summary of Yield from the Uniform Northwestern Oat Nursery grown under dryland conditions in Montana in 1986.

C.I. or State #	Variety	Mocca	Havre	Huntl	Sidney	Sid RC	Mean
ND 1001	Steele	52.25	64.83	71.16	90.42	72.93	70.31
CI 9081	Random	69.60	76.15	86.74	97.56	84.81	82.97
ID 751170	Monida (75Ab1170)	63.69	74.60	77.19	108.48	86.97	82.19
SD 790188	Sandy	41.90	59.33	53.86	83.16	75.30	62.71
CI 9252	Otana	66.08	67.62	83.51	98.58	86.01	80.36
CI 8263	Cayuse	59.38	82.67	85.72	99.36	76.77	80.78
W 78286	Dumont	69.58	66.19	54.25	96.12	80.25	73.28
CI 9297	Appaloosa	67.19	78.04	93.93	106.56	88.17	69.14
OT 308	Calibre (S 7886)	63.29	71.75	69.95	104.40	84.69	78.82
WA 6394	WA 6394	58.98	69.62	78.63	97.86	76.53	76.32
CI 9401	Ogle	59.15	83.73	83.31	88.74	67.20	76.43
IL 753402	Coker 227/3/CI50	55.17	64.04	86.77	77.70	66.00	69.94
CI 9412	Porter	62.02	68.63	91.92	83.70	78.93	77.04
W 80474	Riel (RH 3057/OT	48.44	65.74	58.79	86.34	71.25	66.11
ND 820603	Froker/RL 3038/2	36.92	52.63	84.82	96.36	75.99	69.34
ID 742608	Cayuse/Otana (74	66.96	76.38	78.54	102.60	85.83	82.06
CI 6611	Park	52.29	59.64	71.53	83.40	74.94	68.36
ID 804725	Cayuse/74/Ab1956	47.96	68.66	68.93	88.98	67.47	68.40
OT 726	Cascade	72.33	81.60	78.43	101.64	82.32	83.26
PA 796766	Egdolon 26/Noble	44.13	48.68	74.57	89.82	70.83	65.61
ID 815792	74Ab2608/Cayuse	56.62	72.54	95.77	100.80	76.95	80.54
ID 805807	74Ab2608/Cayuse	64.79	80.29	90.09	104.82	82.35	84.47
ID 766843	K71299/3/Otana/2/	61.56	67.82	89.19	83.46	69.48	74.30
ID 75861	Cayuse/Otana (75	51.94	73.49	82.54	105.06	77.97	78.20
CI 467882	Border ID 742300	61.19	77.39	85.61	111.24	84.72	84.03
ND 810917	Froker/RL 3038	59.29	56.92	81.92	93.12	77.67	73.78
ID 783965	Aurora NYCRR com	74.90	75.38	85.58	88.32	84.63	81.76
ID 80988	74Ab1952/74Ab2608	53.98	81.54	78.59	94.62	73.80	76.51
	Mean	58.63	70.21	79.35	95.12	77.88	
	F value	3.12**	4.29**	12.03**	4.41**	6.64**	
	C.V.	9.00	6.27	3.97	4.45	3.24	
	L.S.D.	14.96	12.49	8.85	12.00	7.155	

Table 6. Summary of Test Weights from the Uniform Northwestern Oat Nursery grown under dryland conditions in Montana in 1986.

C.I. or State #	Variety	Mocca	Havre	Huntley	Sidney	Sid RC	Mean
ND 1001	Steele	33.80	36.73	38.38	35.00	38.50	36.48
CI 9081	Random	34.70	34.17	34.95	33.50	36.50	34.76
ID 751170	Monida (75Ab1170)	39.20	37.97	35.95	35.00	38.00	37.22
SD 790188	Sandy	36.70	38.13	40.40	36.50	40.00	38.35
CI 9252	Otana	39.50	39.53	39.15	38.50	40.00	39.34
CI 8263	Cayuse	36.00	35.80	35.98	35.00	36.00	35.76
W 78286	Dumont	38.40	37.13	37.90	35.00	38.50	37.39
CI 9297	Appaloosa	35.90	34.13	34.18	34.00	36.00	34.84
OT 308	Calibre (S 7886)	39.30	37.97	39.95	39.50	39.00	39.14
WA 6394	WA 6394	37.40	37.13	37.15	30.50	36.00	35.64
CI 9401	Ogle	35.50	36.00	36.28	33.50	36.50	35.56
IL 753402	Coker 227/3/CI50	39.20	39.63	39.70	38.50	40.50	39.51
CI 9412	Porter	37.80	37.60	38.05	35.00	40.00	37.69
W 80474	Riel (RH 3057/OT	36.40	38.00	39.57	37.00	39.00	37.99
ND 820603	Froker/RL 3038/2	32.30	34.67	38.50	36.50	40.00	36.39
ID 742608	Cayuse/Otana (74	38.30	38.50	37.08	35.50	37.00	37.28
CI 6611	Park	34.70	35.63	38.08	36.00	38.00	36.48
ID 804725	Cayuse/74/Ab1956	38.20	35.37	37.03	34.50	36.00	36.22
OT 726	Cascade	38.70	36.70	36.83	34.00	37.00	36.65
PA 796766	Egdolon 26/Noble	31.70	33.27	37.05	34.50	37.50	34.80
ID 815792	74Ab2608/Cayuse	38.00	35.67	36.45	36.00	38.50	36.92
ID 805807	74Ab2608/Cayuse	35.70	37.83	37.73	36.00	37.50	36.95
ID 766843	K71299/3/Otana/2/	38.30	38.00	37.05	34.50	38.50	37.27
ID 75861	Cayuse/Otana (75	37.60	37.30	36.62	34.50	38.00	36.80
CI 467882	Border ID 742300	38.00	35.50	35.90	34.50	37.50	36.28
ND 810917	Froker/RL 3038	37.60	36.57	38.48	35.50	38.00	37.23
ID 783965	Aurora NYCRR com	34.10	36.33	36.98	32.00	37.00	35.28
ID 80988	74Ab1952/74Ab2608	37.70	35.57	35.82	35.50	37.50	36.42
	Mean	0	36.67	37.40	0	0	
	F value	0	10.09**	11.31**	0	0	
	C.V.	0	1.37	1.21	0	0	
	L.S.D.	0	1.42	1.27	0	0	

Table 7. Summary of Heading Dates from the Uniform Northwestern Oat Nursery grown under dryland conditions in Montana in 1986.

C.I. or State #	Variety	Moccas	Havre	Huntley	Sidney	Sidney RC	Mean
ND 1001	Steele	182.00	175.33	170.00	175.33	181.00	176.7
CI 9081	Random	182.00	175.00	171.00	174.33	179.33	176.3
ID 751170	Monida (75Ab1170)	184.67	183.00	174.00	177.33	183.00	180.4
SD 790188	Sandy	182.00	176.67	172.00	176.67	181.00	177.7
CI 9252	Otana	182.67	176.00	174.00	176.00	182.33	178.2
CI 8263	Cayuse	182.67	176.67	171.00	175.33	181.33	177.4
W 78286	Dumont	182.67	177.00	172.00	177.33	181.67	178.1
CI 9297	Appaloosa	183.33	178.33	174.00	177.33	183.00	179.2
OT 308	Calibre (S 7886)	184.33	177.33	174.00	176.33	182.00	178.8
WA 6394	WA 6394	186.67	181.00	172.00	176.67	182.00	179.7
CI 9401	Ogle	177.67	174.67	169.00	173.33	178.00	174.5
IL 753402	Coker 227/3/CI50	178.00	174.67	169.00	173.67	179.00	174.9
CI 9412	Porter	182.33	176.00	172.00	176.00	181.67	177.6
W 80474	Riel (RH 3057/OT	182.00	175.33	171.00	175.67	181.00	177.0
ND 820603	Froker/RL 3038/2	183.00	177.33	172.00	176.00	181.00	177.9
ID 742608	Cayuse/Otana (74	188.67	181.00	176.00	179.00	186.00	182.1
CI 6611	Park	185.00	177.67	175.00	176.33	181.67	179.1
ID 804725	Cayuse/74/Ab1956	186.33	183.33	172.00	176.33	182.00	180.0
OT 726	Cascade	183.67	179.00	175.00	176.33	182.00	179.2
PA 796766	Egdolon 26/Noble	186.00	178.00	172.00	175.33	181.33	178.5
ID 815792	74Ab2608/Cayuse	181.00	176.00	170.00	174.33	179.00	176.1
ID 805807	74Ab2608/Cayuse	183.00	177.33	174.00	160.00	182.00	175.3
ID 766843	K71299/3/Otana/2/	180.00	175.00	169.00	173.67	178.67	175.3
ID 75861	Cayuse/Otana (75	186.67	178.00	174.00	176.67	183.33	179.7
CI 467882	Border ID 742300	186.67	180.67	174.00	176.33	182.67	180.1
ND 810917	Froker/RL 3038	182.00	176.33	172.00	175.33	181.33	177.4
ID 783965	Aurora NYCRR com	185.33	181.00	174.00	178.33	184.00	180.5
ID 80988	74Ab1952/74Ab2608	188.00	181.00	174.00	176.67	182.00	180.3
	Mean	188.51	177.81	0	175.43	181.54	
	F value	40.20**	4.69**	0	1.17	6.64**	
	C.V.	.23	.66	0	4.45	3.24	
	L.S.D.	1.21	3.20	0	2.24	2.67	

Table 8. Summary of Heights from the Uniform Northwestern Oat Nursery grown under dryland conditions in Montana in 1986.

C.I. or State #	Variety	Moccasin	Havre	Huntley	Sidney	Sid RC	Mean
ND 1001	Steele	29.60	29.80	33.00	27.67	34.00	30.81
CI 9081	Random	26.50	27.23	30.00	25.00	28.67	27.48
ID 751170	Monida (75Ab1170)	26.40	26.97	30.00	26.67	28.67	27.74
SD 790188	Sandy	30.30	33.33	35.00	28.00	33.00	31.93
CI 9252	Otana	32.40	31.82	33.00	28.00	34.33	31.91
CI 8263	Cayuse	23.90	26.73	29.00	21.33	25.67	25.33
W 78286	Dumont	31.20	29.38	34.00	30.33	32.67	31.52
CI 9297	Appaloosa	24.70	23.87	27.00	22.67	27.00	25.05
OT 308	Calibre (S 7886)	31.50	33.06	34.00	26.67	31.00	31.25
WA 6394	WA 6394	24.40	27.59	29.00	22.67	26.00	25.93
CI 9401	Ogle	25.10	26.25	28.00	21.00	24.00	24.87
IL 753402	Coker 227/3/CI50	24.80	24.28	24.00	19.33	25.33	23.55
CI 9412	Porter	28.90	27.62	28.00	23.67	29.00	27.44
W 80474	Riel (RH 3057/OT	29.80	29.42	34.00	28.00	33.33	30.91
ND 820603	Froker/RL 3038/2	20.70	28.25	26.00	22.33	26.33	24.72
ID 742608	Cayuse/Otana (74	25.60	26.12	28.00	22.67	26.67	25.81
CI 6611	Park	28.10	29.17	32.00	26.67	30.00	29.19
ID 804725	Cayuse/74/Ab1956	17.20	21.26	23.00	16.67	20.00	19.63
OT 726	Cascade	30.30	31.98	30.00	29.33	36.33	31.59
PA 796766	Egdolon 26/Noble	20.40	22.27	25.00	18.67	21.33	21.53
ID 815792	74Ab2608/Cayuse	22.70	24.83	27.00	18.00	22.33	22.97
ID 805807	74Ab2608/Cayuse	22.10	24.61	27.00	20.67	24.00	23.68
ID 766843	K71299/3/Otana/2/	21.30	23.99	26.00	19.00	23.00	22.66
ID 75861	Cayuse/Otana (75	20.90	24.21	27.00	20.67	23.33	23.22
CI 467882	Border ID 742300	24.60	27.48	27.00	22.33	27.00	25.68
ND 810917	Froker/RL 3038	27.30	25.92	26.00	23.00	30.00	26.44
ID 783965	Aurora NYCRR com	25.90	26.02	27.00	21.33	27.33	25.52
ID 80988	74Ab1952/74Ab2608	17.50	20.28	22.00	18.00	23.00	20.16
	Mean	25.51	26.92	0	23.23	27.62	
	F value	7.19**	7.59**	0	17.75**	21.52**	
	C.V.	6.07	3.36	0	3.90	3.37	
	L.S.D.	.44	2.56	0	2.57	2.64	

PROJECT TITLE: Spring Wheat Variety Trials

YEAR/PROJECT: 1986/756 Small Grains Production

PROJECT PERSONNEL: Leader - Vern R. Stewart, N.W. Agric. Res. Center, Kalispell, MT.
Research Specialist - Todd Keener, NWARC, Kalispell, MT.

SUMMARY: The Spring Wheat variety nurseries are used to evaluate and test new lines for production in western Montana.

Three nurseries were grown in western Montana this year. The two on station trials (Advanced Yield and Western Regional) had high yields with low disease incidence, except for a late season occurance of leaf rust. The offstation spring wheat nursery grown in Corvallis, MT consisted of twenty three varieties with poor to fair yield.

RESULTS: Western Regional Spring Wheat -

No varities yielded significantly higher than Owens yet there were four varieties yielding significantly less. Table 1. Test weights were good with only two varieties having weights less than 60 lbs/bu. The high yielding variety ID 315 at 130 bu/A had a test weight of 62.1 lbs/bu. The average yield and test weight were 111 bu/A and 61.98 lbs/bu respectively. There was no lodging in this nursery

Advanced Yield Nursery -

Treasure had the highest yield at 146.1 bu/A and was the only variety yielding significantly higher than Newana (118.7 bu/A). Seven varieties (Thatcher, Bronze Chief, Rambo, and Leader included) yielded significantly less than Newana. Test weights, except for Kodiak were all above 61 lbs/bu. Heading dates were all earlier or equal to Newana. Kodiak and Bronze Chief being dwarf varieties did not exceed 26.3 inches in height. Table 2.

Offstation - Coravllis, MT

Yields for the 1986 offstation spring wheat nursery were lower than normal and had a range from 16.63 (Fortuna) to 58.9 bu/A (Owens). Lodging and uneven irrigation not only contributed to lower yields but also lower test weights. The mean for test weights was 54.58 lbs/bu. There were two varieties (Carman and Welsh) that had test weights less than 44 lbs/bu. Table 3.

Table 1. Agronomic data from the Western Regional Spring Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1986. Date seeded: April 7, 1986 Date harvested: August 21,1986 Field X-4.

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	PLNT HT INCHES	LF RUST INDEX
ID000315	ABERDEEN SEL	130.13	62.10	166.00	35.43a	27.00b
ID000266	ABERDEEN SELECTION	127.20	63.40	166.33	33.33	81.00
WA007183	K78504/K79129-33//K	126.25	62.13	168.00a	29.40b	54.00
ID000312	ABERDEEN SEL	123.02	63.27	164.67b	30.45b	81.00
ID000319	ABERDEEN SEL	121.03	62.60	165.00	30.71b	55.00
CI 17903	MCKAY	121.00	61.47b	167.33a	31.76	27.00b
UT402353	WYNNE/ID0125	120.53	61.07b	168.33a	36.09a	83.67
ID000290	MRN/TBR66//ID0107/3	119.77	61.77b	167.67a	31.63	.00b

Table 1. (Cont'd)

	VARIETY	YIELD BU/A	TEST W LB/BU	HEADING DATE	PLNT HT INCHES	LF RUST INDEX
UT001402	UT74S25-910/ID0125	119.65	58.10b	170.00a	33.73	81.33
WA007492	K78504/K74129-33//K	118.30	61.13b	166.00	31.23	54.00
UT402265	WYNNE/ID0125	118.20	61.07b	168.67a	36.75a	81.00
WA007176	K78504/K74129-33//K	118.12	61.33b	167.67a	32.68	54.00
UT001012	UT74S25-943/ID0125	117.67	61.10b	167.33a	35.83a	81.00
WA006831	EDWALL	117.02	61.63b	166.00	31.76	.00b
UT001795	UT74S250910/POWELL	114.95	59.93b	168.67a	34.12	85.00
WA007326	K7205078/CI14193,S6	114.68	61.87	167.67a	33.07	.00b
CI 17904	OWENS	114.43	62.73	166.00	33.07	81.33
ID018151	ABERDEEN SEL.A71531	113.30	60.57b	167.33a	30.97	54.00
ORS08413	HORK/YMH/KA//BB,ORS	111.18	62.70	166.33	29.27b	27.00b
WA007075	K73579/BORAH	111.13	61.53b	165.33	31.23	54.00
ID000303	ABERDEEN SEL	110.55	63.07	166.33	30.45b	54.00
CI 17911	WAVERLY	110.38	61.70b	166.67	30.58b	81.00
WA006920	PENAWAWA	110.28	62.87	166.00	29.79b	.00b
ID000291	BORAH//BORAH/BB'S'	108.22	62.13	165.67	29.92b	.00b
ORS08418	TV18A-CM067/HORK'S'	106.73	63.43	164.00b	30.45b	.00b
WA007328	NHS07664/NDM000004,	106.60	60.40	168.00a	34.12	54.00
ID000271	ABERDEEN SELECTION	102.27	62.87	166.00	32.15	82.67
ID000305	ABERDEEN SEL	101.10	62.80	164.67b	34.91	82.00
ORS08415	MINIVET SIB	99.55	64.37a	166.00	31.50	.00b
OR008508	TANAGER'S',CM30697-	99.45	64.07a	163.67b	30.05b	27.00b
ID000287	A71372S-15-3/A71388	99.10	62.87	165.00	31.76	27.00b
CI 4734	FEDERATION	95.53b	60.57b	167.00	39.50a	54.33
ORS08417	AU/KAL-BB/BON	91.47b	61.93	166.00	28.48b	27.00b
ORS08425	JUP/BJY'S'	90.48b	63.87	164.00b	28.08b	.00b
UT418993	UT74S25-943/ID0125	90.03b	60.83b	168.67a	36.48a	83.33
MEANS		111.41	61.98	166.51	32.31	46.68
F TEST FOR VAR.		3.22**	15.50**	12.90**	11.56**	3.47**
C.V.		.53	.25	2.38	37.03	5.31
LSD (0.05)		16.69	.92	1.18	2.17	48.77

Table 2. Agronomic data from the 1986 Advanced Yield Spring Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT. Date planted: April 7, 1986 Harvested: August 21, 1986. Field X-4.

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	PLNT HT INCHES	LF RUST INDEX
TREA0000	TREASURE	146.08	61.50	168.67	30.71	82.33
SUCC0000	SUCCESS	132.85	63.30	169.33	35.70a	27.00b
NK000000	NK 751	122.40	62.60	164.00b	29.00	81.00
MT 7819	GLENMAN	121.10	62.20	167.33	32.68	85.00
PI469271	WHEATON	120.80	62.50	165.67b	29.00	.00b
CI 17430	NEWANA 1/	118.73	61.90	168.33	29.79	85.00

Table 2. (Cont'd)

VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	PLNT HT INCHES	LF RUST INDEX
MT 8446 MT7336/SHORTANA	118.27	63.20	164.00b	31.50	82.33
MT 8550 RS6880/PONDERA	118.00	62.10	167.33	33.33a	82.33
MT 8319 S1103/MT7448	116.65	63.00	163.33b	34.51a	83.67
CI 17828 PONDERA	116.53	63.30	165.33	32.55	83.67
MT 8561 OLAF/MT7336	115.22	61.50	168.33	32.02	.00b
COPP0000 COPPER	115.22	62.00	164.00b	30.97	.00b
MT 7926 ND 681/MT 6830	115.00	64.20	167.67	40.29a	54.00b
MT 8402 MT7336/SHORTANA	114.83	63.00	164.00b	30.05	54.00b
MT 8336 PM 23/ MT7448	114.62	63.40	165.33	32.81	87.67
MT 8424 MT7336/NORANA	114.30	62.70	166.00	33.46a	83.67
MT 8320 PM 23/ MT7448	114.20	62.80	166.00	33.20	.00b
MT 8529 CI15838/MT7418//P	113.92	63.80	166.00	32.41	82.33
PNR02369 PIONEER 2369	112.02	63.30	166.00	30.71	27.00b
WPBLAKER LAKER	111.90	63.60	167.00	29.92	.00b
MT 8423 CI 15838/MT7418	110.90	62.80	166.00	29.66	83.67
CI 17429 LEW	110.78	64.30	168.33	38.06a	.00b
MT 8537 RS6880/MT7746	108.50	62.90	166.00	34.78a	82.33
MT 8401 MT7421/NEWANA	107.83	63.20	165.00	32.28	27.00b
ND 606 Su28-1*2/3/LEW//T	107.38	62.50	166.67	40.42a	.00b
MT 8327 N2211/MT7448	106.90	62.10	165.33	32.15	54.00b
CI 17282 CROSBY	106.72	64.50	165.67	39.89a	.00b
GRPLKODI KODIAK	106.17	58.30	164.00b	23.36b	54.00b
PI478298 MONROE	104.73	63.30	164.00b	34.91a	27.00b
DT 433 MEDORA	103.93	64.10	166.00	42.65a	27.00b
MT 8520 OLAF/MT7336	102.98	62.30	166.00	34.12a	54.00b
MT 8304 S1103/MT7448	102.87	62.00	163.00b	31.89	83.67
MT 8508 LEN/MT7632	102.57	63.20	163.67b	38.32a	54.00b
MT 8321 PM 23/MT7448	101.95	62.80	166.00	36.61a	81.00
PI 15892 WARD	101.43	63.30	166.00	38.85a	27.00b
MT 8515 MT7421/NEWANA	100.30	62.70	166.00	33.20	83.67
ND 582 STOA	99.78	62.40	166.00	37.93a	54.00b
MT 8434 MT7421/NEWANA	98.70	63.20	165.67	33.73a	.00b
MT 8447 SU73/MT7336	97.95	63.10	165.67	38.06a	81.00
MT 8407 SU73/MT7336	96.45	62.50	165.33	38.32a	54.00b
MT 8363 MT7448/MT7031	95.78	61.50	166.00	32.81	81.00
CI 13596 FORTUNA	94.65	63.60	166.33	38.32a	.00b
CI 10003 THATCHER	93.45	61.90	166.33	42.26a	83.67
GRPLBRCF BRONZE CHIEF	88.35b	61.40	163.67b	26.25b	58.00
MT 8429 MT7421/MT7031	86.13b	62.40	166.67	35.30a	82.33
C982-324 RAMBO	83.75b	60.70	167.00	29.92	27.00b
MT 8533 CI15838/MT7418//P	77.38b	63.00	165.33	32.15	82.33
CANADA LEADER	75.12b	62.70	166.33	39.50a	27.00b
MT 8522 SU73/MT7336	69.88b	62.10	166.00	35.96a	27.00b
MEANS	106.45	.00	165.87	34.01	50.54
F TEST FOR VAR.	2.39**	.00	17.25**	11.31**	4.04**
C.V.	8.54	.00	.21	3.59	32.68
LSD (0.05)	25.53	.00	.97	3.43	46.37

Table 3. Agronomic data from the offstation spring wheat nursery grown on the Western Agricultural Research Center in Corvallis, MT. in 1986.
Date seeded April 22, 1986 Date harvested August 14, 1986

CI or	VARIETY	YIELD BU/A	TEST WT LB/BU	PLNT HT INCHES
CI 17904	OWENS	58.90	58.50	25.59
CI 17911	WAVERLY	55.82	54.57	26.77
MT 7819	GLENMAN	54.60	51.70	30.05
SUCC000	SUCCESS	54.57	54.87	29.66
CI 17903	MCKAY	53.43	54.83	27.56
WRP 8-1	CHALLENGER	52.28	58.70	26.25
CANCARMA	CARMAN	49.87	43.70	31.63
ND 582	STOA	49.78	56.43	28.74
CI 17430	NEWANA 1/	48.98	57.00	26.12
CI 17790	LEN	48.62	55.43	25.85
PI469271	WHEATON	48.38	57.80	26.90
WPB 906R	WESTBRED 906R	44.80	55.30	24.28
CANWELSH	WELSH	44.38	37.90	35.56
CI 17828	PONDERA	44.32	57.40	25.59
NK 751	NK 751	44.05	58.80	25.46
CI 17920	MARSHALL	43.40	57.07	23.88
CI 17910	ALEX	41.92	53.60	33.33
GRPLKODI	KODIAK	41.07	54.90	15.75
GRPLBRCF	BRONZE CHIEF	40.75	55.50	20.87
CI 10003	THATCHER	37.10	54.97	31.89
CANADA	LEADER	32.28	53.90	31.36
CI 17429	LEW	21.07	55.80	32.68
CI 13596	FORTUNA	16.63	56.70	32.02
	X	44.65	54.58	27.73
	F 2/	3.56**	23.67**	29.59**
	C.V.	12.28	1.79	2.94
	L.S.D.	15.63	2.79	2.33

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

PROJECT TITLE: Winter Wheat Variety Evaluations

YEAR/PROJECT 1986/756 Small Grains Production

PERSONNEL: Leader - Vern R. Stewart, N.W. Agricultural Research Center, Kalispell, MT
Research Specialist - Todd K. Keener, N. W. Agri. Res. Center, Kalispell, MT
Cooperators - Oscar Buller, Flathead County
Dean Stipe, Lake County
Ross McIntyre, Ravalli County

SUMMARY:

To determined the adaptability of new and introduced winter wheat varieties to Montana the Western Regional Winter Wheat nurseries are grown at the Kalispell and Stillwater locations. The outstanding varieties from these trials are tested under varying growing conditions of western Montana through off station nursery evaluations. These data are used in making recommendations to the Montana producer.

Continuous snow this year in the Kalispell area was from Nov. 16 to March 3 (105 days). Although conditions appeared favorable for snow mold there was very little incidence of that disease in the winter wheat nurseries. Yields and test weights were good this year in all the nursery locations.

Western Regional Hard Red Wheat Nursery - Kalispell

Yields were equal to last year with the average for the nursery (73.81 bu/A) being just slightly higher than the previous year. Eighteen varieties had yields significantly less than the check variety ,Winridge (83.09 bu/A). No varieties yielded significantly higher than Winridge.

High test weights were recorded this year with 14 varieties having test weights significantly greater than Winridge (61.17 lbs/Bu).

Winter kill, although not severe, was as high as 30% in the varities Winridge, ID 0337, OR 8315, and ID 0338. These % winter kill ratings were taken early in the spring and do not accurately reflect percent stand loss from which to calculate yield loss. The lodging index figure is calculated by multiplying lodging severity (based on a 1-9 scale of degree of lodging) times prevalence (% of plot effected), divided by nine. There was minimal lodging in this nursery. Very little TCK smut was recorded in this nursery. Table 1.

Western Regional Hard Red Wheat - Stillwater

Yields from the Stillwater location were the highest in four years which was a reflection of the good fall and spring moisture with a favorable 1986 growing season. Winter kill averaged 38% for the nursery and a high of 59% was noted for OR 8315. Test weights for ID 298 and WA 7269 exceeded 63 lbs/Bu. Table 2.

Western Regional Soft White Wheat - Kalispell

Yields ranged between 26.8 and 97.9 bu/A with the check variety (Stephens) yielding 79 bu/A. Eight varieties yielded significantly higher than Stephens while six varieties yielded significantly less. Test weights

for the nursery averaged 57.8 lb/bu with Stephens having a test weight of 56.7 lbs/bu. Winter kill was not severe but did occur throughout the nursery at an average of 5.2 % . WA 7163, WA 7126, and WA 7432 had no occurrance of winter kill. Smut was prevalent and was detected in all but four varieties (WA 7431, WA 7432, WA 7434, and WA 7217). OI 754989 had the highest level of smut with 43.8% of the heads showing some infection. Table 3.

Western Regional Soft White Wheat - Stillwater

WA 7431 was the highest yielding entry in the test at 102 bu/A and was the only variety yielding significantly higher than Stephens, the check variety. OI 754022 and OI 754989 were both significantly less in yield than Stephens. Test weights averaged 59.24 lbs/bu with only six varieties varying significantly from Stephens (59.38 lbs/bu). Winter kill was severe in this nursery with percentages as high as 67. 5% in Kharkof. The average for the nursery was 32.6%. This reading was taken in early spring and may not have a relationship to yields obtained. Table 4.

Intrastate Winter Wheat - Kalispell

Yields were excellent for this nursery ranging from 79.5 to 137.7 bu/A. Winridge was used as a check variety and yielded 118.2 bu/A. Two varieties (Neely and MT 84165) yielded significantly higher than Winridge. The test weights for this nursery averaged 61.37 lbs/bu. Several varieties had test weights significantly higher than Winridge. Although winter kill was not severe there was some loss in each variety tested. Lodging was moderate, being observed in 23 of 40 varieties. Leaf rust was detected in all varieties tested and exceeded 50 % severity in eight varieties. Table 5

Off Station Winter Wheat Nurseries

The 1986 off station winter wheat nurseries were grown on the Ross McIntyre farm (Ravalli Co.), the Dean Stipe farm (Lake Co.), and at the Stillwater location near Kalispell. Neely, Lewjain, and MT 79125 were the top three yielding varieties when averaged across the three locations. Neely and Lewjain yielded in the top four entries of each location. Yields were good at each location and representative of the weather conditions for each area. Neely also had the second highest test weight compared across the three locations for the season. Weston had the highest test weight at each location. Percent stands were good at Lake and Ravalli Co. locations but were poor at the Stillwater location. Table 6.

Table 1. Agronomic data from the western regional hard red winter wheat nursery grown on Northwestern Agricultural Research Center in Kalispell, MT in 1986. Seeded September 20, 1986 Harvested August 7, 1986

CI OR STATE	VARIETY	YIELD BU/A	TEST WT LB/BU	HT (")	% WNTR KILL	HEADING DATE	LODGING INDEX 1/	% TCK SMUT 2/
OI 730875	7C/KAVKA2//NORD	88.93	61.08	32.78b	14.75b	158.0b	.0000	.2500
WA 7270	REA SEL 62/ID92	83.48	62.55a	37.20	6.500b	160.5	10.55a	.0000
WINRIDGE 1/CI 17902		83.09	61.17	38.48	32.50	161.8	.0000	.0000
ID 301	HGL/ID5006/4/II	82.57	61.40	29.13b	16.00b	159.0b	.0000	.2500
ID 300	ARBON/3/DM/CLM	81.15	61.28	35.43	5.500b	155.8b	.0000	.0000
WA 7429	ID92/N7403301	80.45	63.05a	40.55	10.50b	161.3	.0000	.0000
ID 297	A68203W-W-1-3-3	80.38	62.50a	38.48	13.25b	160.5	.0000	.1250
OI 602137	OR-DO SEL F 602	79.65	60.05b	24.90b	6.250b	157.5b	.0000	.2500
WA 7430	ID 144/WA7001 N	79.61	62.95a	39.17	14.75b	160.8	.0000	.2500
ID 302	ARBON/3/DM/CLM/	79.30	60.15b	31.99b	5.000b	156.0b	.0000	.0000
MT 79125	UT755079/CST56	79.27	60.78	28.25b	33.25	157.8b	.0000	.1250
WA 7269	WA5514/ITANA//C	78.55	63.45a	37.60	4.250b	159.8	.8250	.0000
BATUM	WA 6816	78.38	58.85b	28.64b	6.750b	161.3	.0000	.0000
ID 0331	RGR/3/II-60-157	76.33	62.40a	38.98	9.500b	156.3b	.0000	.0000
WANSER	CI13844	75.66	62.38a	35.63	8.250b	159.3b	.0000	.1250
WA 6820	GWB 127/GWB236-7	74.95	58.38b	27.76b	5.000b	154.8b	.0000	.0000
ORCR 8313	PROBSTORFER -EXT	74.73	60.48	28.15b	17.25	155.5b	.0000	.0000
UT 152419	MARTONVASARI 3/	74.31	61.72	37.30	8.250b	158.3b	.0000	.0000
ID 0337	A781011W-WA725	73.79b	62.45a	31.59b	30.00	159.0b	.0000	.1250
ID 0335	TK/BURT/4/SM6/	73.26b	62.35a	39.27	14.25b	159.5b	.0000	.0000
ID 0336	ATL 50/4/R/R/2	72.44b	61.50	37.50	18.75	160.0	.0000	.0000
UT 154580	HANSEL//FLEX/UT	71.64b	60.70	32.78b	8.250b	158.5b	.0000	.1250
ID 298	2IT65 OR 2CNN 0	71.10b	63.80a	38.09	10.50b	160.0	31.53a	.0000
ID 0281	HNL///CI14106/6	70.09b	61.42	40.45	8.750b	158.8b	44.58a	.0000
ORCR 8414	PMF//CNO E/GLL	69.46b	61.33	29.04b	8.750b	155.3b	.0000	.5000
UT 146118	HANSEL/ARBON	68.95b	61.17	32.38	21.50	156.5b	.0000	.0000
OR 8315	F60213-76,MEX	68.61b	59.17b	26.57b	33.75	157.0b	.0000	.0000
ID 0333	A75211W-81-1-3T	68.28b	62.07a	38.29	13.75b	157.0b	.0000	.0000
ID 284	2IT65 OR 2CNW 0	68.19b	62.83a	29.63b	5.250b	159.0b	.0000	.0000
ID 299	SNOWMOLD TOLERAN	66.56b	63.13a	38.78	11.75b	158.3b	2.075	.0000
MT 79121	UT 755079/OST56	66.24b	59.65b	28.15b	10.50b	152.3b	.0000	.0000
ID 0332	II-60-156/CI 141	65.95b	61.95a	31.69b	17.25	158.8b	2.200	.0000
ID 0338	SN64/II-60-155/	64.90b	61.85	32.97b	38.00	159.0b	.0000	.0000
MT 79123	UT755079/CST56	64.45b	60.25b	25.10b	22.50	151.0b	.0000	.0000
ORCR 8320	MARNE DESPREZ/C	61.41b	60.12b	25.79b	7.750b	155.3b	.0000	.2500
KHARKOF	CI 1442	60.95b	60.98	43.70a	13.00b	162.8	52.48a	.1250
SUM STATS:								
OVERALL MEAN		73.81	61.43	33.67	14.22	158.1	4.006	.0694
F-RATIO 4/		4.516**	23.25**	19.67**	2.580**	12.67**	15.90**	1.511
CV (SE/MEAN)		4.347	.4413	3.483	40.15	.4540	76.87	137.6
LSD (0.05)		8.996	.7601	3.288	16.01	2.013	8.636	.2679

1/ Lodging scale = lodging severity X prevalence / 9
2/ Ocular rating on TCK smut
3/ Check variety
4/ F value for variety comparison
** Indicates satistical significance at the .01 probability level

a/ Values significantly greater than the check at the .01 level
b/ Values significantly less than the check at the .01 probability level

Table 2. Agronomic data from the western regional hard red winter wheat nursery grown on the Oscar Buller farm in Kalispell, MT in 1986.
Seeded September 25, 1985 Harvested August 18, 1986

CI or State #	VARIETY	YIELD BU/A	TEST WT LB/BU	HT (")	% WNTR KILL
BATUM	WA 6816	89.88	60.45b	28.74b	18.75
WA 7430	ID 144/WA7001 N	85.51	61.93	37.50	32.50
ID 300	ARBON/3/DM/CLM	81.32	62.00	34.45	20.00
WINRIDGE	CI 17902	80.49	62.20	34.06	48.75
ID 0336	ATL 50/4/R/R/2	79.99	61.40b	36.61	36.25
WA 6820	GWB 127/GWB236-7	79.76	60.75b	26.28b	18.75
ID 297	7C/KAVKA2//NORD	79.71	62.30	34.06	37.50
ORCR 8313	A68203W-W-1-3-3	79.15	62.38	29.53b	27.50
ID 298	PROBSTORFER -EXT	77.51	63.60a	35.53	31.25
ID 302	2IT65 OR 2CNN 0	76.57	61.05b	32.19	43.75
UT 154580	ARBON/3/DM/CLM/	76.20	61.85	32.09	48.75
WA 7429	HANSEL//FLEX/UT	75.74	62.40	36.22	27.50
MT 79121	ID92/N7403301	74.94	61.02b	25.69b	37.50
UT 146118	UT755079/CST56	74.36	61.28b	32.48	32.50
ID 301	HANSEL/ARBON	73.90	61.35b	26.87b	40.00
ID 0281	HGL/ID5006/4/II	73.89	62.03	42.62a	22.50
WA 7270	HNL///CI14106/6	73.09	62.38	31.59	31.25
OI 602137	REA SEL 62/ID92	72.99	59.92b	24.41b	53.75
UT 152419	OR-DO SEL F 602	71.64	61.65	34.65	42.50
ID 0337	MARTONVASARI 3/	71.47	62.50	27.07b	57.50
OI 730875	A781011W-WA725	71.25	60.88b	32.38	21.25
ID 0333	A75211W-81-1-3T	70.86	62.02	37.30	42.50
ID 299	SNOWMOLD TOLERAN	70.58	62.70	38.48a	30.00
WANSER	CI13844	70.14	61.95	35.43	43.75
ID 0332	II-60-156/CI 141	68.97	62.18	33.17	53.75
MT 79123	UT755079/CST56	68.78	60.92b	26.77b	38.75
ID 0335	TK/BURT/4/SM6/	68.24	61.58	38.48a	41.25
MT 79125	UT 755079/OST56	67.82	61.08b	25.98b	56.25
ID 0338	SN64/II-60-155/	66.01b	61.40b	31.79	50.00
ID 0331	RGR/3/II-60-157	65.89b	62.13	35.63	32.50
WA 7269	WA5514/ITANA//C	64.95b	63.37a	32.58	32.50
KHARKOF	CI 1442	63.20b	60.20b	40.26a	40.00
ID 284	2IT65 OR 2CNW 0	57.59b	61.73	25.89b	28.75
ORCR 8320	MARNE DESPREZ/C	53.36b	60.98b	25.10b	37.00
ORCR 8414	PMF//CNO E/GLL	48.01b	60.72b	26.18b	37.50
OR 8315	F60213-76,MEX	35.50b	57.05b	23.03b	58.75
SUM STATS:					
OVERALL MEAN		71.09	61.54	31.97	37.59
F-RATIO TRTS 2/		3.970**	23.78**	16.23**	1.468
CV (SE/MEAN)		7.253	.3735	3.902	24.36
LSD (0.05)		14.46	.6444	3.499	25.68

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

Table 3. Agronomic data from the soft white winter wheat nursery grown on the Northwestern Agricultural Research Center in Kalispell, MT in 1986. Seeded September 20, 1985 Harvested August 7, 1986

Variety	Entry #	YIELD BU/A	TEST WT LB/BU	HT (IN)	% WNTR KILL	HEADING DATE	% TCK SMUT 1/
WA 7431	LUKE/BR 704434	97.90a	59.38a	31.40	2.000	163.3a	.0000
LEWJAIN	CI 17909	96.70a	59.90	26.87b	18.25a	163.5a	3.750
DUSTY	PI 486429	95.94a	58.85	28.64	2.000	161.8	1.125
WA 7435	WA4303/PURDUE	95.34a	58.77	22.64b	5.750	160.3	.6250
WA 7436	WA4303/VGR/WA4	93.05a	58.38	21.85b	3.250	162.3a	1.000
OR 842	HYSLOP/CERCO	92.70a	59.53	32.09a	2.000	160.5	1.875
WA 7163	VRM/MO5951/2*O	92.10a	59.20	28.15	.0000	162.0a	.6250
WA 7126	V77254,OASIS/W	91.66a	59.17	29.04	.0000	164.5a	.1250
ORCW 8421	RJB 847/543/YM	90.67a	58.47	26.87b	.7500	162.3a	.3750
ORCW 8417	T. AESTIVUM/TO	89.65	60.43	32.19a	2.250	159.3	1.500
WA 7433	MARIS HUNTSMAN	89.04	58.93	27.17b	1.250	163.8a	2.375
OR 843	HYSLOP/CERCO	88.99	58.33	31.89a	5.750	160.3	1.000
ORCW 8419	6720-10//YAMHI	88.81	59.18	29.23	5.250	162.0a	.7500
WA 7437	PAHA/CI13645/2	88.76	57.75	27.95b	3.250	161.5	.7500
TRES	TRES (WA6698)C	87.18	58.67	28.15	1.750	161.0	.6250
ORCW 8416	NOTTENO/YAMHIL	87.00	59.13	28.05	6.250	162.3a	.2500
WA 7168	CERCO/RAEDER,V	86.99	58.50a	26.67b	9.500	161.0	.3750
WA 7432	VPM1/MOS//CERC	86.47	55.72b	23.43b	.0000	164.8a	.0000
ORCW 8318	1523/DC DWF/RB	83.76	58.65a	30.02	10.75a	161.8	3.250
ORFW 301	DAWS/SM4//MDM/	83.50	56.82	27.76	8.500	159.3	.7500
ORCW 8517	TJB801-12795/S	82.43	58.75a	33.37a	8.750	158.0b	1.000
STEPHENS	CI 17596 2/	79.04	56.72	29.43	1.500	160.3	3.750
OR 8270	MCD/ROMAIN/OR	78.95	55.70b	26.57b	4.500	158.8	3.125
ID 0330	NEELY SPN//SPN	78.86	57.15	30.02	14.50a	159.0	.1250
OR 7996	HYS/YAYLA/WA49	78.15	57.60	29.82	1.250	163.3a	1.375
OR 845	HYSLOP/YAMHILL	78.13	59.68a	29.23	6.000	159.5	.5000
WA 7166	VPM/MO5421*TYE	76.98	55.20b	27.85	3.250	160.0	.1250
WA 7434	WA4303/VKG//82	74.69	56.82	21.46b	2.250	160.3	.0000
WA 7217	VPM/MOS951/2*B	73.41	56.78	25.89b	2.750	162.5a	.0000
ID 0329	NEELY/SPN//SPN	71.99	58.03a	28.84	31.75a	158.0b	.1250
OI 765784	ROMANIA FONDEA	71.03	58.30a	24.41b	4.750	156.0b	2.625
OI 754022	RDL/SU92/KALIA	69.45	56.65	26.97b	6.250	156.0	11.25a
NUGAINES	CI 13968	66.24b	58.65a	26.48b	2.000	160.0	14.25a
ORCW 8314	7C/CND/CAL/3/3	64.85b	56.77	28.15	5.000	159.5	10.25a
KHARKOF	CI 1442	53.56b	57.95a	42.22a	5.500	162.5a	13.75a
MORO	CI 13740	46.46b	58.00a	34.45a	.7500	162.0a	.1250
OI 754989	MNIM/KAL/8B	34.06b	54.02b	25.00b	4.000	160.0	43.75a
ELGIN	CI 11755	26.83b	49.28b	33.17a	5.000	160.8	11.25a

OVERALL MEAN	79.24	57.78	28.51	5.217	160.9	3.645
F-RATIO TRTS	18.17**	37.23**	19.93**	3.287**	13.75**	18.72**
CV (SE/MEAN)	4.856	.5624	2.991	62.51	.3447	49.30
LSD (0.05)	10.78	.9106	2.390	9.139	1.554	5.036

1/ % TCK smut by ocular rating
2/ Check variety
3/ F value for variety comparison
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check at the .01 level
b/ Values significantly less than the check at the .01 level

Table 4. Agronomic data from the soft white winter wheat nursery grown on the Oscar Buller farm in Kalispell, MT in 1986. Seeded September 25, 1985 Harvested August 18, 1986

VARIETY	ENTRY #	YIELD Bu/A	TEST WT Lbs/bu	HT (")	% WNTR KILL
WA 7431	LUKE/BR 704434	101.9a	60.17	26.87	15.00
ORCW 8417	T. AESTIVUM/TO	92.89	62.17a	25.10	21.25
WA 7432	VPM1/MOS//CERC	90.28	57.60b	26.87	10.00
WA 7168	CERCO/RAEDER,V	88.34	58.95	25.10	25.00
OR 8270	MCD/ROMAIN/OR	85.46	58.53	24.90	20.00
MORO	CI 13740	84.39	60.90	26.77	13.75
WA 7436	WA4303/VGR/WA4	84.02	61.13	26.77	30.00
WA 7434	WA4303/VKG//82	82.60	61.03	25.30	26.25
ORCW 8416	NOTTENO/YAMHIL	80.16	60.18	25.39	16.25
WA 7216	V77254,OASIS/W	77.59	59.33	26.77	26.25
WA 7433	MARIS HUNTSMAN	77.54	59.07	24.70	21.25
ORFW 301	DAWS/SM4//MDM/	73.76	59.20	24.11	37.50
LEWJAIN	CI 17909	73.71	60.17	23.82	58.75a
OR 843	HYSLOP/CERCO	73.17	59.83	29.53	38.75
STEPHENS	CI 17596 1/	72.80	59.38	24.51	26.25
DUSTY	PI 486429	71.95	60.60	24.70	36.25
WA 7435	WA4303/PURDUE	71.18	59.80	25.79	28.75
ORCW 8421	RJB 847/543/YM	71.07	59.63	27.26	23.75
OR 7996	HYS/YAYLA/WA49	71.06	58.65	24.90	18.75
ORCW 8318	1523/DC DWF/RB	68.35	58.90	26.77	42.50
WA 7163	VRM/MO5951/2*O	67.40	59.10	25.98	30.00
TRES	TRES (WA6698)C	67.29	60.17	25.69	41.25
ORCW 8517	TJB801-12795/S	67.09	60.07	26.28	22.50
ORCW 8314	7C/CND/CAL/3/3	66.69	58.32	27.07	33.75
OR 842	HYSLOP/CERCO	66.03	60.22	25.00	65.00a
OR 845	HYSLOP/YAMHILL	65.74	60.60	23.03	47.50
OI 765784	ROMANIA FONDEA	65.28	59.58	24.21	21.25
WA 7166	VPM/MO5421*TYE	64.50	59.03	24.80	26.25
ELGIN	CI 11755	62.56	57.53b	26.77	30.00
ORCW 8419	6720-10//YAMHI	62.21	59.80	24.61	37.50
WA 7217	VPM/MOS951/2*B	61.13	58.15	23.52	41.25
ID 0329	NEELY/SPN//SPN	59.96	58.82	23.23	63.75a
NUGAINES	CI 13968	56.88	59.83	25.98	26.25

Tabel 4. (Con'd)

VARIETY	ENTRY #	YIELD Bu/A	TEST WT Lbs/bu	HT (")	% WNTR KILL
ID 0330	NEELY SPN//SPN	54.45	58.33	24.31	67.50a
KHARKOF	CI 1442	54.28	57.13b	32.38	25.00
WA 7437	PAHA/CI13645/2	52.15	58.07	27.26	53.75a
OI 754022	RDL/SU92/KALIA	42.83b	56.78b	24.21	40.50
OI 754989	MNIM/KAL/8B	30.17b	54.40b	24.21	28.75
OVERALL MEAN		69.97	59.24	25.64	32.58
F-RATIO TRTS 2/		2.907**	5.031**	.9527	2.578**
CV (SE/MEAN)		11.60	1.062	7.064	27.63
LSD (0.05)		22.75	1.764	5.076	25.23

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

Table 5. Agronomic data from the Intrastate winter wheat nursery grown on the Northwestern Agricutural Research Center, Kalispell ,MT in 1986. Seeded September 24, 1985 Harvested August 15 1986.

VARIETY	ENTRY PEDIGREE	YIELD BU/A	TEST WT LB/BU	HT (")	HEADING DATE	%WNTR KILL	LODG 1/ INDEX	LF RUST SEVER 2/
NEELY	CI 17860	137.7a	61.97a	44.39	161.3b	4.500	24.08	60.00a
MT 84165	CST//FRD1628/OLESEN(F1	134.8a	61.65a	43.31	155.3b	5.000	8.325	32.50
MT 8039	LCO/FRD//NE69559/WNK	132.0	61.65a	39.17b	160.3b	2.000	.0000	30.00
MT 8030	TXGSA268/FRD//YTD-11	131.7	62.15a	39.47b	159.8b	3.250	.0000	32.50
NUGAINES	CI 13968	128.2	59.75	31.40b	163.5	11.25	.0000	32.50
HAWK	NA 200	127.6	62.05a	34.45b	155.8b	5.000	.0000	32.50
MT 84268	CST//FRD1650/OLESEN(F1	125.2	61.15	41.63	159.3b	1.500	1.100	42.50
BIGHORN	RH 78W296	124.9	61.18	34.35b	161.0b	6.750	.0000	10.00
QT 515	HYBRITECH	124.8	60.75	38.98b	160.3b	6.000	14.85	42.50
MT 80203	YGSS2458/6/FWN	124.6	61.95a	41.63	161.8b	3.250	13.90	42.50
MT 84496	CST//FRD1655/OLESEN(F1	123.8	60.35	44.29	159.8b	3.500	40.05a	55.00a
MT 7951	LANCOTA/WNK//NE68510	120.9	62.13a	40.85b	159.3b	3.250	2.775	40.00
MT 84458	CST//FRD1655/OLESENF13	120.4	61.00	37.30b	155.3b	3.250	8.325	25.00
MT 81139	CST//FRD/OLESEN/3/STR	119.3	61.88a	36.52b	159.8b	5.750	.0000	27.50
THUNDERBIRD	NA 0001	118.6	62.70a	38.29b	155.5b	8.750	.0000	5.000
WINRIDGE	CI 17902 1/	118.2	60.65	44.00	164.0	5.750	9.725	17.50
MT 79123	UT755079/CST5611//TX65	117.2	60.00	32.28b	154.0b	11.50	.0000	25.00
MT 7811	FRD/WNK//MT6928	113.4	60.70	42.32	161.3b	2.000	14.57	79.00a
QT 524	HYBRITECH	113.4	59.58b	41.24	160.3b	4.500	16.50	15.00
CENTURK	CI 15075	111.5	62.58a	41.83	157.5b	4.500	32.23	17.50
ROCKY	NA 1316	111.5	62.25a	42.42	160.0b	4.500	32.22	20.00
ARCHER	NA 201	111.1	58.97b	34.25b	159.3b	3.250	.0000	37.50
MT 80122	SS63283/6*CNN	110.9	61.58	40.85b	161.0b	2.500	.0000	40.00

Table 5. (Cont'd)

VARIETY	ENTRY PEDIGREE	YIELD BU/A	TEST WT LB/BU	HT (")	HEADING DATE	%WNTR KILL	LODG 1/ INDEX	LF RUST SEVER
MT 79121	UT755079/CST56//TX65	109.2	59.65b	34.25b	154.0b	4.000	.0000	47.50a
MT 8003	REDWIN SEL	108.9	62.67a	43.50	161.5b	3.500	.0000	50.00a
REDWIN	CI 17844	108.0	62.80a	44.00	161.3b	2.750	.0000	65.00a
CREE	PI 491532	107.2	62.25a	45.77	160.8b	8.750	45.60a	45.00
NORWIN	PI 491533	106.3	60.83	28.64b	162.8	2.750	.0000	42.50
MT 80459	CST//FRD1628.OLESEN(F1	105.6	61.95a	43.01	156.0b	3.250	31.93	45.00
ROSEBUD	PI 473570	105.2	61.82a	45.96	159.0b	3.250	6.650	42.50
MT 79125	UT755079/CST56//TX65	104.0	58.50b	33.76b	160.3b	5.250	.0000	20.00
WINALTA	CI 13670	100.0b	61.95a	44.49	161.0b	7.000	30.45	35.00
NORSTAR	CI 17735	99.07b	62.42a	45.67	164.3	3.250	47.08a	52.50a
AGASSIZ	ND 7687	98.05b	62.70a	47.34a	160.0b	5.000	11.68	52.50a
ROUGHRIDER	CI 17439	92.60b	62.15a	46.56	161.3b	3.500	24.45	15.00
CITATION	SR 17439	90.25b	60.55	31.10b	152.3b	5.750	.0000	12.50
WARRIOR	CI 13190	87.14b	61.38	45.67	158.8b	6.750	16.25	50.00a
CHEYENNE	CI 8885	82.74b	61.80a	45.77	161.8b	2.750	35.95	42.50
FROID	CI 13872	79.46b	61.53	46.36	162.8	4.500	37.52a	22.50
OVERALL MEAN		112.4	61.37	40.44	159.5	4.705	12.98	35.94
F-RATIO TRTS		5.780	9.647	20.87	33.15	1.117	2.581	2.363
CV (SE/MEAN)		5.271	.5653	2.742	.3129	46.60	73.05	29.36
LSD (0.05)		16.60	.9720	3.107	1.399	6.143	26.56	29.56

1/ Lodging index = lodging severity X prevalance / 9
2/ LF Rust severity = severity of leaf rust within plot
3/ F value for variety comparison
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check (Winridge)
b/ Values significantly less than the check (Winridge).

Table 6. Agronomic data from the Offstation Winter Wheat nurseries grown in Lake, Ravalli, and Flathead Counties in 1986.

VARIETY	YIELD BU/ACRE				TEST WEIGHT LBS/BU			
	LAKE	RAVA	FLAT	$\bar{x}$	LAKE	RAVA	FLAT	$\bar{X}$
NEELY	86.49	46.84	73.77	69.03	61.93	63.07	61.97	62.32
LEWJAIN	74.37	48.03	70.02	62.32	59.93	60.63	59.97	60.18
LUKE	73.07	42.75	48.52	54.78	59.30	56.07	59.87	58.41
MT 79125	73.06	41.60	66.13	60.76	59.27	61.70	60.53	60.50
HAWK	73.00	27.37	58.27	52.88	60.70	63.00	62.07	61.92
MT 8003	70.55	42.88	56.88	56.77	62.03	63.07	61.33	62.14
WESTON	63.00	42.89	71.82	59.24	62.47	64.67	62.63	63.26
WANSER	62.34	38.38	49.47	50.06	60.60	62.93	61.03	61.52
MT 79123	61.85	32.90	55.15	49.97	58.97	61.87	59.93	60.26
NORWIN	61.82	35.51	72.87	56.73	61.33	62.47	61.77	61.86
TRES	56.75	37.02	64.75	52.84	57.47	59.03	59.33	58.68
STEPHENS	55.01	39.32	71.02	55.12	56.87	59.00	58.60	58.16
DAWS	53.29	41.70	59.68	51.56	59.50	60.37	60.10	59.99
HILL 81	51.97	40.42	44.08	45.49	57.57	59.23	57.80	58.20
MT 79121	51.74	39.83	69.10	53.56	59.20	61.40	60.13	60.24
REDWIN	47.78	38.78	64.88	50.48	61.97	62.90	61.53	62.13
MEAN	63.51	39.76	62.27		59.93	61.34	60.55	
F	1.125	1.565	1.600		22.14**	29.41**	23.76**	
L.S.D.	29.13	11.68	21.54		1.070	1.158	.7776	
C.V.	15.88	10.17	11.97		.6180	.6540	.4445	

VARIETY	HEIGHT (INCHES)				PERCENT STAND			
	LAKE	RAVA	FLAT	$\bar{x}$	LAKE	RAVA	FLAT	$\bar{X}$
NEELY	33.33	24.54	31.50	29.79	98.33	100.0	55.00	84.44
LEWJAIN	27.17	21.78	23.88	24.28	76.67	100.0	25.00	67.22
LUKE	27.17	20.60	22.44	23.40	95.00	78.33	22.00	65.11
MT 79125	27.56	24.15	27.43	27.43	93.33	100.0	46.67	80.00
HAWK	27.82	20.21	27.95	25.33	96.67	100.0	30.00	75.56
MT 8003	32.81	23.62	34.51	30.31	95.00	86.67	36.67	72.78
WESTON	35.04	26.90	36.35	32.76	98.33	86.67	75.33	86.78
WANSER	34.65	26.25	32.68	31.19	85.00	95.00	20.00	66.67
MT 79123	25.85	20.08	25.72	23.88	88.33	100.0	50.00	79.44
NORWIN	22.83	17.06	22.44	20.78	95.00	100.0	76.67	90.56
TRES	26.64	18.90	24.15	23.23	95.00	96.67	61.67	84.45
STEPHENS	25.07	20.87	26.90	24.28	80.00	96.67	56.67	77.78
DAWS	26.90	21.00	24.15	24.02	88.33	100.0	29.33	72.56
HILL 81	27.95	22.70	25.72	24.46	66.67	100.0	13.33	60.00
MT 79121	22.70	19.42	26.77	22.96	90.00	100.0	38.33	76.11
REDWIN	31.50	24.28	36.09	30.62	95.00	100.0	48.33	81.11
MEAN	28.44	22.02	28.04		89.79	96.25	41.37	
F	4.881**	8.801**	20.35**		1.399	1.334	3.139	
L.S.D.	5.087	2.670	3.019		21.58	16.37	27.67	
C.V.	6.193	4.203	3.728		8.323	5.891	16.34	

PROJECT TITLE: Dwarf Bunt Tillage Study

YEAR/PROJECT: 1986/756 Small Grain Production

PROJECT LEADER: Vern R. Stewart, Northwestern Agric. Res. Center, Kalispell, MT

PROJECT PERSONNEL: Jim Hoffman (Retired - USDA), Todd K. Keener - Research Specialist

SUMMARY:

Dwarf bunt (Tilletia controversa kuhn) continues to be one of the major problems in cetain winter wheat production areas. Seed treatment and cultural practices have given some control of this disease.

Five tillage techniques are being evaluated in the dwarf bunt tillage study. They are two conventional tillage practices involving fall versus spring plowing, a minimum tillage technique, a local technique using shallow discing tools, and a no-till procedure. The plots were planted after fall seedbed preparation was completed. The first year's yields(and other agronomic data) from this test were made in August of 1984. The second and third year measurements were taken in August also of those years.

In 1984 TCK smut was found at highest levels in plots that had been shallow disced (Claridge Technique). Smut levels were low in 1985 but appeared highest in areas of conventional tillage. Again in 1986 smut levels were low but was highest in conventional tillage plots.

1984 RESULTS:

Smut levels (% smut and number of smut heads/ 3 ft of row) were highest for the first harvest of the TCK Tillage Study in the Claridge Technique tillage practice Yields were significantly higher where some type of tillage was used when compared to No-till. The highest yield, test weight, and number of heads per three feet of row were recorded in the Conventional Tillage I plots and were significantly different from other tillage techniques . Table 2.

1985 RESULTS:

Smut levels were very low in 1985. In the No-till treatment no smut was found. The highest level of smut was found in the Claridge technique treatment. Table 2.

Yields were reduced in the minimum and No-till plots due to severe weed infestation (irregardless of herbicide maintenance sprays) and poor stand.

The greatest number of heads per foot of row was seen in the Claridge tillage plots followed closely by the Conventional II tillage plots. Table 2.

1986 RESULTS:

Smut levels were very low during the 1986 growing season with the highest smut percentages occuring in the Conventional Tillage plots. Table 2. Even though smut levels were low this season, tillage methods may have a long term effect on future levels of smut during years of high disease infestations.

Yields were better this year than previous years, however yields were were completely suppressed in the No-till plots due to weed competition (downy brome and jointed goatgrass). Stands in the No-till plots were poor. The yields from the Minimum Tillage plots did vary significantly from yields obtained in the Conventional Tillage II and the Claridge Technique plots.

All other agronomic measurements were non-siginificant after statistical analysis.

FUTURE PLANS:

The fourth year of tillage practices was completed this fall and winter wheat 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

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 Melroe drill (no-till drill)

Table 2. Agronomic data from the TCK Tillage study grown on the Oscar Buller farm in 1984, 1985, and 1986 in Kalispell, MT.

Tillage tech.	Yield Bu/A			Test Wt. #/Bu	
	1984	1985	1986	1985	1986
Conventional I	40.0a	42.1b	73.6	58.3	62.3
Conventional II	29.7a	47.7a	86.6a	56.8	61.9
Minimum Tillage	26.9a	21.6c	64.3	56.7	59.8
Claridge Tech.	29.8a	41.4b	85.6a	55.6	61.8
No - Till	11.1b	25.2c	-----	54.3	----
X	27.5	35.6	77.5	56.3	61.4
F 2/	4.33*	49.6**	3.65**	1.32	2.82
C.V.	18.28	4.58	7.51	2.33	1.10
L.S.D.	18.07	5.32	19.18	NS	2.35

Table 3. Agronomic data from the TCK Study (cont'd).

Tillage tech.	# Heads/ 3ft			# Smut/ 3ft			% Smut 1/		
	1984	1985	1986	1984	1985	1986	84	85	86
Conventional I	49.5a	40.8a	45.2	2.3	1.4	.4	4.6	3.4ab	1.0
Conventional II	42.8ab	49.2a	49.4	3.2	3.3	.5	7.5	6.8a	1.1
Minimum Tillage	26.8c	29.0c	41.7	1.6	.3	.3	6.0	1.1b	.8
Claridge Tech.	34.2bc	52.1	48.6	6.7	.2	.2	19.6	4.5ab	.5
No- Till	19.6c	38.5ab	---	1.4	0	--	7.1	0b	--
X	34.57	41.9	46.2	3.03	--	.38	8.96	3.15	.8
F 2/	6.89*	3.24*	.58	2.40	--	.29	2.46	3.55	.21
L.S.D.	18.94	16.63	NS	NS	--	NS	NS	4.68	NS
C.V.	13.23	12.17	10.1	46.09	--	70.1	48.5	45.5	---

1/ % Smut determined by dividing number of smut heads/ 3 ft by the number of 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, Multiple Range Test.