FORTIETH ANNUAL REPORT
1988

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

4570 Montana 35
Kalispell, MT 59901

Prepared by

Vern R. Stewart
Professor of Agronomy and Superintendent

Todd K. Keener
Agric. Research Specialist I

Leon E. Welty
Associate Professor of Agronomy

Louise S. Prestbye
Agric. Research Specialist I

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.

Fulltime Staff Members:

	Years in Service
Vern R. Stewart - Supt. & Prof. Agronomy (Began April 1952)	36
Leon E. Welty - Assoc. Prof. Agronomy (Began January 1973)	15
Oscar Buller - Agric. Res. Tech. I (Began January 1984)	4
Jeanette Calbick - Secretary II (Began September 1963)	25
Gary Haaven - Ag Reseach Spec. I (Began April 1982)	6
Todd Keener - Ag Research Spec. I (Began March 1978)	10
Louise Prestbye - Ag Research Spec. I (Began May 1983)	5

Parttime Staff Member:

Vicky Rogers (resigned 12/14/88)

Student Employees:

Ramona Benz (April 15 thru September 15)

Brian Clark (May 24 thru September 9)

Edward Hanson (June 22 thru July 25)

Barbara Hensler (June 13 thru September 15)

Gade Radabah (May 17 thru August 31)

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 1988:

Rottary Cutter, John Deer Model $503	$ 605.20
Case Tractor w/ loader, Model #1394	14,524.00
John Deere 4200 3-bottom/2-way plow	2,100.00
Almaco #50240 Forage Plot harvester w/#50241M Weight-Tronix M-3000 Electronic Scale	21,979.00
Gear Box for Mower	403.20
Hoist for 12' Knapheide Grain Truck	1,743.00
Total	$41,354.40

PHYSICAL PLANT 752

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

The Farm Crew made four metal gates for fences and several metal stakes for field signs.

Remodeling of the existing bathroom and another bathroom was begun in 1988. The addition of two offices, a coffee room, a furnace room, and a utility-shower room will be completed in 1989. All this remodeling is being done in the Crops Research Building.

ACTIVITIES 1988

Date	Activity	Who	Where
1/ 4	Advisory Comm. Planning Meeting	Stewart	Missoula
1/ 5	Flathead Co. Ext. Ser. Adv. Council	Stewart	Kalispell
1/12	Chamber of Commerce Agric. Comm.	Stewart	Kalispell
1/15	Chamber of Commerce Agric. Comm.	Stewart	Kalispell
1/19	Pioneer Hybred Inter. Inc. Meeting	Stewart	Ronan
		Welty	Ronan
1/19	Flathead Co. Pork Producers	Stewart	Kalispell
1/21	N.W. & W. Ag. Res. Centers Adv. Comm.	Stewart	Allentown
		Welty	Allentown
1/25	Straws & Clods	Stewart	Bozeman
		Welty	Bozeman
1/26-28	Annual Planning Conference	Stewart	Bozeman
		Welty	Bozeman
2/ 1	Pesticide Recertification Program	Stewart	Woodside
2/ 2	Pesticide Recertification Program	Stewart	Missoula
2/ 3	Pesticide Recertification Program	Stewart	Ronan
2/ 4	Pesticide Recertification Program	Stewart	Plains
2/ 5	Pesticide Recertification Program	Stewart	Superior
2/ 9	FAC-CRD Meeting	Stewart	Kalispell
2/11	FFA Advisory Committee	Stewart	Kalispell
2/16	Hay Management System Meeting	Stewart	Ronan
		Welty	Ronan
2/17	Hay Management System Meeting	Welty	Dillon
2/18	Producer Meeting	Welty	Deer Lodge
2/19	Producer Meeting	Welty	Corvallis
2/19	Chamber of Commerce Agric. Comm.	Stewart	Kalispell
2/20	Equity Supply Annual Meeting	Welty	Kalispell
2/23	Farm Show Committee Meeting	Stewart	Kalispell
2/24	Equipty Supply Meeting	Stewart	Kalispell
		Welty	Kalispell
2/26	Farm Show Committee Meeting	Stewart	Kalispell
2/29	Producer Meeting	Welty	Superior
	Graduate Student Orals	Welty	Bozeman
3/ 1	Farm Show Banquet	Stewart	Kalispell
3/ 2	Farm Show	Stewart	Kalispell
	Producer Meeting	Welty	Stevensville
3/7-8	Western Society Weed Science Meeting	Stewart	Fresno, CA
3/18	Chamber of Commerce Agric. Comm.	Stewart	Kalispell
3/23	Agricultural Week	Stewart	Kalispell
3/24	Meeting with Eric Torgerson	Stewart	Ethridge
3/25	Meeting with Greg Kushnak, Robert Hunt and Jim Christianson	Stewart	Great Falls
3/29	Producer Meeting	Welty	Superior
3/30	Annual Review	Stewart	Bozeman
4/ 5	Pesticide Recertification Program	Stewart	Ronan
4/ 6	Pesticide Recertification Program	Stewart	Kalispell
4/ 7	Pesticide Recertification Program	Stewart	Eureka
4/26	Flathead Water Program	Stewart	Kalispell

ACTIVITIES 1988 (con't)

Date	Activity	Who	Where
5/ 6	SCS Meeting	Welty	Rock Creek
5/ 9	Low Input Advisory Comm. Meeting	Welty	Bozeman
5/11	SCS Meeting	Stewart	Kalispell
		Welty	Kalispell
5/25	Irrigation Field Day	Stewart	Station
		Welty	Station
6/17	Vo-Ag Teachers of Montana Tour	Stewart	Station
		Welty	Station
6/22	Chamber of Commerce Agric. Comm.	Stewart	Kalispell
6/28	Mont. Wheat & Barley Comm. Tour	Stewart	Station
	Montana AgResearch Adv. Board Meeting	Welty	Bozeman
6/29	Tour Plant Materials Center	Welty	Bridger
6/29-7/1	Summer Conference	Stewart	Bozeman
		Welty	Bozeman
6/30	Field Day	Welty	Bozeman
7/ 7	Make Tape on KGEZ Radio	Stewart	Kalispell
	Make Tape on KEER Radio	Stewart	Polson
7/12	Make Tape on KUFM, KGVO Radio & KPAX-TV	Stewart	Missoula
7/13	MSU Plant Pathology Tour	Welty	Station
7/14	Field Day at Central Agric. Res. Center	Stewart	Moccasin
7/15	Chamber of Commerce Agric. Comm.	Stewart	Kalispell
	Make Tape on KOFI Radio	Stewart	Kalispell
7/21	Field Day Northwestern Agric. Res. Cnt.	Stewart	Station
		Welty	Station
7/27	County Agents Up-Dating Meeting	Stewart	Station
		Welty	Station
8/ 1	Northrup King & Cenex Reps. Tour	Welty	Station
8/24	Annual Conference Comm. Meeting	Stewart	Bozeman
9/6-7	Superintendents Retreat	Stewart	Lewistown
9/18	Locals & Minnesota Farmer Tour	Welty	Station
10/10-11	P&T Committee Meeting	Stewart	Bozeman
10/13	Western Area Weed Assoc. Meeting	Stewart	Ronan
10/21-22	P&T Committee Meeting	Stewart	Corvallis
10/25	Town Hall Meeting	Stewart	Ronan
	Pacific Northwest Forage Workers	Welty	Puyallup, WA
10/30-11/4	Annual Conference	Stewart	Bozeman
		Welty	Bozeman
11/14	N.W. & W. Ag. Res. Cen. Adv. Comm.	Stewart	Allentown
11/18	Chamber of Commerce Agric. Comm.	Stewart	Kalispell
11/28-12/2	ASA Meeting	Stewart	Anaheim, CA
		Welty	Anaheim, CA
12/5-7	Budget, Variety & RCF Meetings	Stewart	Bozeman
	Variety & RCF Meetings	Welty	Bozeman
12/8-9	AERO Meeting	Welty	Lewistown

VISITORS 1988

Date	Visitors	Representing	From
1/13	Brad Brown	Nursery Business	Kalispell
1/15	Les Cooper	Farmer	Kalispell
1/30	Mark Passmore	Farmer	Kalispell
2/12	Francis VanRinsum	Farmer	Kalispell
2/17	Mark Sprat	Water Consultant	Kalispell
2/19	Rod Warner	DuPont	Bozeman
2/22	Roger Whitson	Ciba-Geigy	Fargo, ND
2/29	Mark Passmore	Farmer	Kalispell
3/ 4	Russell Muntifering	Assoc. Director MAES	Bozeman
3/ 7	Dave Iverson	Equity Field Representative	Kalispell
3/ 9	Tom Hoeklebore	U.S. Air Force	Omaha, NE
3/10	Arnold & Marylin Jentz	Farmers	Matador, ND
	Tom & Hanna Hocklebore	U.S. Air Force	Omaha, NE
3/18	John Alton	Farmer	Kalispell
	Jack Peters	Farmer	Kalispell
3/21	Bill Mitton	Federal Employee	Kalispell
	John Roberson	Job Service	Kalispell
4/ 8	Marty Boehn	Elk Reserve	Kalispell
4/11	Clyde Pederson	Farmer	Kalispell
	Mr. Smith	Torgerson Implement	Ethridge
	Mike Schard	Torgerson Implement	Ethridge
4/14	Floyd LaBrant	Farmer	Kalispell
4/18	Bill Mitton	Federal Employee	Kalispell
4/25	Charlene Gregory	Job Applicant	Kalispell
	Jerry Tedrick	Job Applicant	Kalispell
4/27	Bill Ambrose	Farmer	Kalispell
4/30	Ray Ditterline	Plant & Soil Sci., MSU	Bozeman
	Shaun Townsend	Graduate Student	Bozeman
	Robert Dunn	Technician	Bozeman
5/ 2	Vicky Riffenberger	Dept. Natural Res. & Conser.	Helena
	Gary Mahugh	Flathead Electric	Kalispell
5/ 4	Allen Powers	Bureau Reclaimation	Boise, ID
	Gary Mahugh	Flathead Electric	Kalispell
5/ 6	Eric Torgerson	Torgerson Implement	Ethridge
5/ 9	Darlene Nardi	Job Applicant	Kalispell
5/10	Dezi Brown	Nursery Business	Kalispell
5/15	Marvin Hall	Forage Scientist	Moscow, ID
5/16	Wanda Broston	Former Summer Employee	Kalispell
	Les Toews	Farmer	Kalispell
5/17	Gade Radabah	Job Applicant	Kalispell
	Steve Swanger	Job Applicant	Kalispell
5/20	Mal Westcott	Western Agric. Res. Center	Corvallis
	Marty	Technician WARC	Corvallis
	Brian Clark	Job Applicant	Bigfork

VISITORS 1988 (con't)

Date	Visitors	Representing	From
5/25	Vicky Riffenberger	Dept. Natural Res. & Conser.	Helena
	Larry King	Federal Power Administration	Spokane, WA
	Don Graham	Consultant	Missoula
	Monte McVay	Bureau of Reclamation	Boise, ID
	Dale Mahugh	Flathead Electric	Kalispell
	John Thalton	SCS Office	Bozeman
	Heidi Wolf	Job Applicant	Kalispell
5/26	Barbara Hensler	Job Applicant	Kalispell
	Ed Hanson	Job Applicant	Kalispell
6/16	Ken Krueger	Farmer	Kalispell
6/27	Tom Blake	Barley Breeder, MSU	Bozeman
	Luther Talbert	Wheat Breeder, MSU	Bozeman
6/28	Ken Krueger	MT Wheat & Barley Comm. Member	Kalispell
	Frank Daniels	MT Wheat & Barley Comm. Member	Sidney
	Roger Simonson	MT Wheat & Barley Comm. Member	Saco
	Ernest Braumiller	MT Wheat & Barley Comm. Member	Big Sandy
	Rick Sampson	MT Wheat & Barley Comm. Member	Dagmar
	Jim Christianson	MT Wheat & Barley Comm. Secy.	Great Falls
	Cheryl Tuck	MT Wheat & Barley Comm. Secy.	Great Falls
	Harold Tutvedt	N.W. & W. Adv. Comm. Member	Kalispell
	Les Cooper	N.W. & W. Adv. Comm. Member	Kalispell
	James Welsh	Director MAES, MSU	Bozeman
	Tom Blake	Barley Breeder, MSU	Bozeman
	Luther Talbert	Wheat Breeder, MSU	Bozeman
7/ 7	Jim Ryan	Kalispell Weekly News	Kalispell
	Kristi Carda	Eastern Agric. Res. Cnt.	Sidney
7/11	Wayne Fischer	Parson Equipment	Kalispell
	Rod Warner	DuPont	Bozeman
	Mitch Barrington	Cenex Farm & Home	Kalispell
7/13	Tom Hoeklebore Family	U. S. Air Force	Omaha, NE
7/18	Mary Cammeyer	KCFW-TV	Kalispell
	Christine Haymen	KCFW-TV	Kalispell
7/19	Jim Crookshank	Farmer	Austrialia
7/20	Monte Anderson	Hoechst Roussel	Spokane, WA
7/21	Russell Muntifering	Assoc. Director, MAES, MSU	Bozeman
	Pete Thatcher	Special Projects Coor. MSU	Bozeman
	Jack Hanson	Program Officer, MSU	Bozeman
7/25	Philip Gersmehl	University of Minneosta	Minneapolis, MN
7/26	John Orr	ICI	Boise, ID
	Kurt Volker	ICI	Yakima, WA
	Clen Johnson	ICI	California
7/27	Dave Philips	Extension Service	Lewistown
8/ 1	Bill Knipe	Northrup King	Stanton, MN
	Mr. Christianson	Farmers Union	Minneapolis, MN
	Dewey Anderson	Farmers Union	Billings
	Mr. Roofington	Farmers Union	Minneapolis, MN

VISITORS 1988 (con't)

Date	Visitors	Representing	From
8/11	Kevin Kephart Family	South Dakota State University	Brookings, SD
	Grant Jackson Family	Central Agric. Res. Center	Moccasin
8/17	Bob Rogers	Neighbor	Kalispell
8/23	Jim Buechle	Farmer	Kalispell
8/26	Ross Peace	Private Consultant	Fairfield
9/ 2	Paul Smiley	Veterinarian and Farmer	Columbia Falls
9/16	Mars Family		Kalispell & MN
9/28	Allan Taylor	Plant & Soil Sci., MSU	Bozeman
9/29	Eric Torgerson	Torgerson Implement	Ethridge
10/ 4	Kingsbury Colony People	Farmers	Valier
	Mal Westcott & Crew	Western Agric. Res. Center	Corvallis
10/18	Kingsbury Colony People	Farmers	Valier
	Mal Westcott & Crew	Western Agric. Res. Center	Corvallis
11/ 9	Greg Murffet	State Employee	Helena

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DISTRIBUTION OF THE

1988 NORTHWESTERN AGRICULTURAL RESEARCH CENTER REPORT

Copies

1 Plant and Soil Science Department

3 Research Center Staff, N.W. Agricultural Research Center

11 County Extension Agents in Northwestern Montana

Program Coordinator - Richard Williams
Deer Lodge - Barbara Andreozzi
Flathead - Bruce McCallum
Granite - Wesley Williams
Lake - ~~Wilfred Huot~~
Lincoln - Robert Wilson, ~~Mike Zook~~
Mineral - ~~Juanite Cutler~~
Missoula - Gerald Marks
Powell - David Streufert
Ravalli - G. Rob Johnson
Sanders - John Halpop

1 Agricultural Stabilization and Conservation

1 Flathead Chapter Furture Farmers of America

1 Soil Conservation Service

4 Feed Mills

Co-op Supply Inc. - Ronan
Equity Supply Co. - Kalispell
Farmers Union Ex. - Kalispell
Westland Seeds Inc. - Ronan
Lake Glacier View Farm Ronan

1. Western ARC

CLIMATOLOGICAL DATA
NORTHWESTERN AGRICULTURAL RESEARCH CENTER
Kalispell, MT

Northwestern Agricultural Research Center climatological data is recorded and sent to the Atmospheric Administration to be published in the Climatological Data. Daily maximum and minimum temperatures, soil temperatures at four and eight inches and precipitation are recorded. This data has been recorded since January 1949.

The precipitation total (crop year September 1, 1987 thru August 31, 1988) was 5.46 inches below the 39 year average. The only month with above average precipitation was May. August and October were more than an inch below normal. This was the fourth dryest crop year ever recorded.

The temperature mean was very close to normal with 44.5 degrees for the crop year with 43.3 degrees being the long time average.

Since recording of climatological data began there have been five years with years with growing seasons consisting of more than 130 frost free days. The average over the years is 112 days. This crop year we had 131 frost free days.

The warmest daytime temperature for the crop year was 92 degrees on July 22 and August 6. The coldest temperature was 17 degrees below zero on January 6. These were the high and low temperatures for the calendar year of 1988 also.

Following is a list of tables giving a complete description of the weather for the crop year (September 1987 thru August 1988) and 1988 (January thru December).

Table 1. Summary of climatic data by months for 1987-88 crop year (September thru August) and averages for the period 1949-88 at the Northwestern Agricultural Research Center, Kalispell, MT.

Table 2. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 through August 31, 1988. (Average)

Table 3. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 through August 31, 1988. (Maximum)

Table 4. Summary of temperature data at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 through August 31, 1988. (Minimum)

Table 5. Summary of precipitation records at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 through August 31, 1988.

Table 1. Summary of climatic data by months for 1987-88 crop year (September thru August) and averages for the period 1949-88 at the Northwestern Agricultural Research Center, Kalispell, MT.

ITEM	Sept. 1987	Oct. 1987	Nov. 1987	Dec. 1987	Jan. 1988	Feb. 1988	Mar. 1988	Apr. 1988	May 1988	June 1988	July 1988	Aug. 1988	Total or Average
Precipitation (inches)													
Current Year	0.81	0.12	0.91	1.18	0.98	1.03	0.77	1.36	3.60	1.98	1.07	0.13	13.94
Avg. 1949 to 1987-88	1.64	1.34	1.43	1.63	1.52	1.19	1.14	1.40	2.27	2.77	1.52	1.55	19.40
Mean Temperature (F)													
Current Year	56.1	43.2	35.3	25.4	20.5	30.3	37.8	45.7	51.4	60.9	63.7	63.9	44.5
Avg. 1949 to 1987-88	53.4	43.3	32.5	25.7	21.9	28.0	33.8	43.2	51.7	58.5	64.0	63.0	43.3
Last killing frost in spring													
1988					May 3 (30 degrees F)								
Avg. 1949-88					May 24								
First killing frost in fall													
1988									September 12 (30 degrees F)				
Avg. 1949-88									September 13				
Frost Free Period													
1988									131 days				
Avg. 1949-88									112 days				
Maximum summer temperature									92 degrees F on July 22 and August 6, 1988				
Minimum winter temperature									17 degrees F below zero on January 6, 1988				

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, 1988..

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
1986-87	50.2	43.0	30.3	24.9	22.2	27.9	35.0	47.8	55.6	61.6	62.9	59.8	43.4
1987-88	56.1	43.3	35.3	25.4	20.5	30.3	37.8	45.7	51.4	60.9	63.7	63.9	44.5
MEAN	53.4	43.3	32.5	25.7	21.9	28.0	33.8	43.2	51.7	58.5	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, 1988.

Average maximum temperature by month and year
Degrees Fahrenheit

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
1986-87	59.9	54.3	38.0	30.9	29.5	34.2	43.4	61.3	67.9	75.7	76.5	74.9	53.9
1987-88	73.5	59.9	43.0	32.6	29.0	39.3	46.1	58.5	63.8	74.1	79.5	82.6	56.8
MEAN	68.3	55.3	40.1	32.4	29.4	36.4	43.6	55.0	65.0	72.1	80.2	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, 1988.

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
1986-87	40.5	31.6	22.6	18.8	14.9	21.6	26.6	34.2	43.3	47.4	49.4	44.7	33.0
1987-88	38.7	26.5	27.6	18.1	11.5	21.3	29.5	33.0	39.0	47.7	47.9	45.2	32.2
MEAN	38.4	31.4	24.9	18.9	14.3	19.6	24.0	31.3	38.4	44.9	47.7	46.4	

Mean temperature for all years = 31.7

Table 5. Summary of precipitation records at the Northwestern Agricultrual Reserch Center on a crop year basis, September 1, 1949 thru August 31, 1988.

	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
1986-87	3.63	0.80	1.78	0.63	0.38	0.46	3.47	1.15	1.89	1.95	4.85	0.98	21.97
1987-88	0.81	0.12	0.91	1.18	0.98	1.03	0.77	1.36	3.60	1.98	1.07	0.13	13.94
MEAN	1.64	1.34	1.43	1.63	1.52	1.19	1.14	1.40	2.27	2.77	1.52	1.55	

Mean precipitation for all crop years = 19.40

Table 6. Precipitation by day for crop year, September 1, 1987 through August 31, 1988. Northwestern Agricultrual Research Center, Kalispell, MT.

DATE	SEPT. 1987	OCT. 1987	NOV. 1987	DEC. 1987	JAN. 1988	FEB. 1988	MAR. 1988	APR. 1988	MAY 1988	JUNE 1988	JULY 1988	AUG. 1988
1							0.01			0.13		
2			0.05	0.15	0.02		0.08		0.16	0.24		
3			T	0.01	0.02	0.10	0.10	0.04				
4						0.03	0.05	0.08	0.45			
5						T			0.17		0.07	
6					T		0.04	T	0.31		0.20	
7				0.17	0.03	0.13		0.07	0.06			0.10
8					0.03	T						
9					0.09	0.18	T			0.26		
10				0.19	0.02	0.08	0.10		0.03			
11					0.25	0.11						
12			0.04		0.08							
13				T	T							
14			0.09		0.10		0.10		0.23		0.75	
15		0.10		0.07	0.18	0.02	0.12				0.05	
16	T		0.15	0.03		T						
17	T		0.26	0.32	0.05					0.20		
18				0.02	T	0.02		0.06				
19			0.05		0.02			0.06	0.03			
20			T		0.01				0.02			
21			T	0.13								0.03
22							0.08					
23			0.13			0.18		0.02	0.02	0.07		
24						0.18	T	0.20	T			
25			0.14					0.21	0.23			
26	0.03						0.03	0.10		0.12		
27	0.76						0.01		0.16			
28	0.02				T				0.01	0.14		
29				0.04	T		0.03	0.32	0.14	0.52		
30				0.05	0.03		0.02	0.20	0.06	0.30		
31		0.02			0.05				1.52			
TOTAL	0.81	0.12	0.91	1.18	0.98	1.03	0.77	1.36	3.60	1.98	1.07	0.13

Table 7. Frost free period at the Northwestern Agricultural Research Center from 1950 thru 1988.

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
1987	May 22	28	Sept. 17	29	117
1988	May 3	30	Sept. 12	30	131
Mean for years	May 24	30	Sept. 13	30	112

Table 8. Temperature extremes at the Northwestern Agricultural Research Center, Kalispell, MT from 1950-1988.

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
1987	Jan. 16, Dec. 3	- 4	July 27	95
1988	Jan. 6	-17	July 22, Aug. 6	92

Table 9. Summary of temperature records at the Northwestern Agricultural Research Center, January 1950 thru December 1988.

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
1987	22.2	27.9	35.0	47.8	55.6	61.6	62.9	59.8	56.1	43.2	35.3	25.4	44.4
1988	20.5	30.3	37.8	45.7	51.4	60.9	63.7	63.9	53.8	47.5	36.3	23.3	44.6
MEAN	21.9	28.0	33.8	43.2	51.7	58.5	64.0	63.0	53.4	43.5	32.4	25.6	

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 1988.

	Total Precipitation (inches) by Months and Years											
DATE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
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
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
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
1953	1.84	1.14	0.98	2.07	2.00	3.31	T	1.62	0.71	0.03	0.87	1.30
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
1955	1.00	1.31	0.44	0.82	1.18	1.86	3.08	--	1.64	1.89	1.97	2.38
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
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
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
1959	1.95	1.33	0.75	1.62	4.10	1.75	T	0.91	4.22	3.36	4.32	0.34
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
1987	0.38	0.46	3.47	1.15	1.89	1.95	4.85	0.98	0.81	0.12	0.91	1.18
1988	0.98	1.03	0.77	1.36	3.60	1.98	1.07	0.13	2.30	0.62	1.39	1.69
MEAN	1.52	1.19	1.14	1.40	2.27	2.77	1.52	1.55	1.67	1.33	1.42	1.65

Mean annual precipitation for 39 years = 19.43

CHEMICALS USED IN HERBICIDE STUDIES 1987-88, NWARC, KALISPELL,MT

Common name	Trade name	Chemical name	Company
Imazamethabenz (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
Bromoxynil	Brominal /Buctril	3,5-dibromo-4-hydroxybenzonitrile	Rhone Poulenc
CGA 131036	Amber	N-(6-methoxy-4-methyl-1,3,5-triazin-2-yl aminocarbinyl-2-(2-chloroethoxy)bezene sulfonamide	Ciba-Giegy
Chlorsulfuruon	Glean	2-chloro-N[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]benzenesulfonamide	DuPont
Dicamba	Banvel	3,6-dichloro-2-methoxybenzoic acid	
Diclofop-m	Hoelon	2-[4-(2,4-dichlorophenoxy)phenoxy propanoic acid	Hoechst Roussel
Thiameturon (DPX-M6316)	Harmony	3-[[(4-methoxy-6-methyl-1,3,5-triaziin-2-yl)amino carbonyl]amino sulfonyl]-2-thiophenecarboxylic acid	Dupont
DPX-L 5300	Express	Methyl 2 [[[[N-(4-methoxy-6-methyl-1,3,5-triazin-2-yl) methylamino] carbonyl]amino]sulfonyl]benzoic acid	DuPont
DPX-R 9674	Harmony Extra	2:1 ratio of DPX-M6316 + DPX-L5300	DuPont
EPTC	Eptam	S-ethyl dipropylthiocarbamate	Stauffer/ICI
Fenoxaprop	Puma	(+)-2-[4-[(6-chloro-2-benz-oxazoly)oxy] phenoxy]propanoic acid	Hoechst/ Roussel
Glyphosate	Roundup	N-(phosphonomethyl) glycine	Monsanto
Hexazinone	Velpar	3-cyclohexyl-6-(dimethylamino)-1-methyl--1,3,5-triazine-2,4-(1H,3H)-dione	DuPont
MCPA	MCPA	[(4-chloro-o-tolyl)oxyl]acetic acid	As available
Metribuzin	Sencor or Lexone	4-amino-6-tert-butyl-3-(methylthio)-as triazin-5(4H)one	Mobay DuPont

Metsulfuron	Ally	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]benzoic acid	DuPont
	One Shot	Bromoxynil, MCPA, diclfop mixture	Hoechst/ Roussel
Sethoxydim	Poast	2[(1-ethoxyimino)butyl]-5[(2-ethylthio)-propyl]-3-hydroxy-2-cyclohexen-1-one	BASF
	Tiller	Fenoxaprop ethyl, 2,4-Dester, and MCPA ester (see respective chemistries)	Hoechst/ Roussel
Tralkoxydim	PP 604	2-[1-(ethoxyimino)propyl]-3-hydroxy-5-(2,4,6-trimethylphenyl)cyclhex-2-enone	ICI Amers.
2,4-D	2,4-D	(2,4-dichlorophenoxy)acetic acid	Cenex
2,4-DB	2,4-DB	4-(2,4-dichlorophenoxy)butyric acid	Rhone Poulenc

PROJECT TITLE: Stage of growth and application rate evaluation of tralkoxydim (PP604) for the control of wild oats in Gallatin spring barley.

YEAR/PROJECT: 1988/754

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

OBJECTIVE: To determine the effectiveness of tralkoxydim (PP 604) for control of wild oats in spring barley.

SUMMARY:

Testing two rates of tralkoxydim at two levels of crop oil concentrate (C.O.C.) at three application stages (1-3 leaf, 3-5 leaf, tillering of wild oats) on spring barley the 3-5 leaf application stage and the 6 oz ai/A rate with 2% crop oil concentrate treatment was the most effective.

RESEARCH METHODS:

Herbicides were applied post emergence at the 1-3 leaf, 3-5 leaf, and tillering stage of wild oats using a tractor mounted research type sprayer. Plots were 10 feet by 12 feet. Treatments were replicated four times in a randomized complete block. A spray volume of 24.85 gpa was applied using 8002 nozzles at 32 psi. Two rates of tralkoxydim (4 and 6 oz ai/A) were used at two levels of crop oil concentrate (1 and 2% C.O.C.).

Planting data:

Crop: Gallatin spring barley
Seedbed preparation: Fall plow and disc, spring disc and cultivate, seedbed completed with a brillion packer
Previous crop: Spring barley
Planter: Press type drill, 7" spacing
Seeding depth: 1 1/2 inches Seeding rate: 60 lbs/A
Maintenance sprays: Bromoxynil at .375 lb ai/A, 5/20/88
Surfactant or additions: See treatment plan, AL 411F used as C.O.C.

Application data: 1-3 leaf stage

Date: 5/16/88 Air temp: 70 F Soil temp: 70 F Rel. Hum. 15 %
Wind: 0-3,S Cloud cover: clear
Soil moisture: Topsoil - good subsoil - very good

Crop and weed stages at applications:
Barley: 3 leaf
Wild oats (Avena fatua) 15% 1 lf, 80% 2 lf, 5% 3 lf
Broadleaf weeds - cotyledon stages

Application data: 3-5 leaf stage

Date: 5/25/88 Air temp: 53 F Soil temp: 50 F Rel. Hum. 42 %
Wind: 0-2 mph Cloud cover: clear
Soil moisture: Topsoil - moist subsoil - very good

Crop and weed stages at applications:
Barley: 5 leaf
Wild oats: 5% 2 lf, 80% 3 leaf, 20% 4 lf, 5% 5 lf

Application data: Tillering stage

Date: 6/2/88 Air temp: 50 F Soil temp: 46 F Rel. Hum. 44 %
Wind: 0-2 mph Cloud cover: clear
Soil moisture: Topsoil - very moist subsoil - very good

Crop and weed stages at applications:
Barley: 6" tall, tillered, plants wet at appln.
Wild oats: 5 leaf, tillered

RESULTS:

The higher rate of tralkoxydim (6 oz. ai/A) at each growth stage resulted in higher yields, test weights, percent plumps and wild oat control. No significant differences were noted when crop oil concentrate percentages were varied with the same rate. The applications of tralkoxydim made at the 1 to 3, and 3 to 5 leaf stage of growth gave 95 to 99% control of wild oats, with the 1 to 3 leaf stage being the highest. Tralkoxydim applications at the last two stages of growth resulted in plant height reduction of barley. Although excellent wild oat control was seen in the last two application stages, it appears that at the 3 to 5 leaf stage of the grain there was less injury than the tillering stage and resulted in higher yields, test weights and stands. See table 1.

Table 1. Agronomic data from the Tralkoxydim (PP 604) Rate and Stage of Growth Study grown on the Northwestern Agricultural Research Center, Kalispell, MT. R-13

Date planted: April 11, 1988 Harvested: August 15, 1988

Treatment	Rate oz ai/A	Growth Stage	Yield Bu/A	T.W. #/Bu	% Plp	# W.O. /ft2	% W.Oat Control 7/7	7/19	% Stand	HT (")
PP 604 + 1% COC	4	1-3 lf	41.4	50.3	82.5	29.5	31.3	5.0	100	33.4
PP 604 + 1% COC	6	1-3 lf	56.8	51.1	89.4	29.0	56.3	27.5	100	30.8
PP 604 + 2% COC	4	1-3 lf	47.0	50.6	86.8	28.8	42.5	2.5	100	31.5
PP 604 + 2% COC	6	1-3 lf	56.1	51.3	89.7	18.8	58.7	23.8	100	31.3
Check	---	1-3 lf	26.5	50.4	86.0	34.8	.000	0	100	34.1
S.O.G. MEAN 1/			45.6	50.7	86.9	28.2	37.8	11.8	100	32.2
PP 604 + 1% COC	4	3-5 lf	78.7	52.2	94.2	.8	98.7	98.0	96.5	27.3
PP 604 + 1% COC	6	3-5 lf	80.1	52.1	94.3	.5	99.7	99.3	94.3	27.3
PP 604 + 2% COC	4	3-5 lf	77.8	52.6	94.8	.8	99.5	99.0	96.3	28.4
PP 604 + 2% COC	6	3-5 lf	78.8	52.3	95.6	.5	99.7	99.3	91.3	27.3
Check	---	3-5 lf	24.6	49.0	84.4	23.8	.000	0	100	33.0
S.O.G. MEAN 1/			68.0	51.6	92.7	5.3	79.6	79.1	95.7	28.6
PP 604 + 1% COC	4	Tiller	55.7	51.4	92.6	3.8	91.3	95.0	81.8	26.5
PP 604 + 1% COC	6	Tiller	60.3	51.4	94.1	1.0	98.8	97.3	88.8	26.0
PP 604 + 2% COC	4	Tiller	51.2	51.0	92.7	4.0	95.0	94.0	82.5	25.8
PP 604 + 2% COC	6	Tiller	60.6	51.5	92.6	2.8	97.8	97.3	87.0	26.0
Check	---	------	25.1	49.4	80.8	29.0	.000	0	100	34.8
S.O.G. MEAN 1/			50.6	50.9	90.6	8.1	76.5	76.7	88.0	27.8
ALL TRTMT $\bar{X}$			55.0	51.1	90.0	13.8	64.6	55.9	94.5	29.5
LSD			11.2	.99	2.75	6.9	8.33	8.29	5.24	2.36
C.V.			7.15	.68	1.07	17.4	4.58	5.20	1.94	2.80
P-VALUE			.000	.000	.000	.000	.000	.000	.000	.000

1/ S.O.G. MEAN = Mean for 5 treatments within respective stage of growth

PROJECT TITLE: Combination wild oat and broadleaf herbicide study on spring wheat.

YEAR/PROJECT: 1988/754

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

OBJECTIVES:

To evaluate the combination of broadleaf herbicides and wild oat herbcides in combination as tank mixes.

To deterimine the efficacy of the interaction of these herbicides when applied in combination.

SUMMARY:

Harmony Extra and Express combined with PP 604, Assert, Tiller, Puma, and Hoelon all showed potential in providing broadspectrum weed control in Newana spring wheat.

RESEARCH METHODS:

Herbicides were applied post emergence using a tractor mounted research type sprayer. Plots were located in 12 foot drill strips and were 10 feet wide with treatments being applied across the 12 foot strips. Treatments were replicated four times in a randomized complete block. A spray volume of 24.85 gpa was applied using 8002 nozzles at 32 psi. All treatments were applied the same day.

Planting data:

Crop: Newana spring wheat
Seedbed preparation: Fall plow and disc, spring disc and cultivated, seedbed completed with brillion packer
Previous crop: Spring barley
Planter: Press type drill, 7 inch spacing
Seeding depth: 1 1/2 inches Seeding rate: 60 lbs/A
Maintenance sprays: none
Surfactant or additions: See treatment plan

Application data:

Date: 5/23/88 Air temp: 60 F Soil temp: 62 F Rel. Hum. 30 %
Wind: 2-5 mph Cloud cover: partly cloudy
Soil moisture: Topsoil - good subsoil - very good

Crop and weed stages at applications:

Crop: 5 leaf, tillering
Wild oats (Avena fatua) 3 - 4 leaf
Henbit (Lamium amplexicauli) 4 leaves
Lambsquarter (Chenopodium album) 8 leaves
Catchfly (Silene noctiflora) 2-4 leaves
Wild buckwheat (Polygonum convolvulus) 2 leaves
Fanweed (Thlaspi arvense) 8 - 12 leaves

RESULTS:

There was a high population of wild oat and broadleaf weeds through out the study. Where just broadleaf herbicides were applied the wild oat population greatly restricted yields and lowered test weights. Wild oat herbicides applied alone controlled the wild oats fairly well, therefore yields were good in comparison to the check. Harmony Extra and Express combined with Assert, Tiller, Puma, and Hoelon provide excellent broad spectrum weed control. Those broadleaf herbicides combined with PP 604 however, did not effectively control wild oats, therefore yields and test weights were reduced significantly.

Table 1. Agronomic data from the Combination Herbicide Study conducted on the Northwestern Agricultural Research Center in Kalispell, MT in 1988. (Harmony Extra & Express + Wild Oat Herbicides)

Planted: April 11, 1988 Harvested: Augiust 23, 1988

Treatment	Yield Bu/A	T.W. lb/Bu	% W Oat Control
Harmony Extra + Surf(.25%)	20.5	57.8b	.0000
Harmony Extra + Surf(2%) + PP 604	41.7a	59.9	47.50
Harmony Extra + Surf(.25%) + Assert	64.7a	60.8a	97.25
Harmony Extra + Surf(.25%) + Tiller	61.9a	61.0a	85.00
Harmony Extra + Surf(.25%) + Puma	57.4a	60.9a	81.25
Harmony Extra + Surf(.25%) + Hoelon	52.4a	61.0a	85.00
Harmony Extra + Surf(.25%)	19.3	58.3	.0000
Harmony Extra + Surf(2%) + PP 604	25.4	59.7	8.750
Harmony Extra + Surf(.25%) + Assert	52.5a	60.5a	97.00
Harmony Extra + Surf(.25%) + Tiller	47.2a	60.3a	62.50
Harmony Extra + Surf(.25%) + Puma	39.8a	60.4a	73.75
Harmony Extra + Surf(.25%) + Hoelon	46.4a	60.9a	75.00
Express + Surf(.25%)	13.9	56.6b	.0000
Express + Surf(2%) + PP 604	23.0	58.9	6.250
Express + Surf(.25%) + Assert	61.0a	60.9a	90.50
Express + Surf(.25%) + Tiller	51.2a	60.8a	81.75
Express + Surf(.25%) + Puma	43.4a	60.6a	72.50
Express + Surf(.25%) + Hoelon	54.8a	60.8a	83.75
Express + Surf(.25%)	22.9	57.3b	.0000
Express + Surf(2%) + PP 604	30.3	59.6	20.00
Express + Surf(.25%) + Assert	52.4a	60.5a	91.75
Express + Surf(.25%) + Tiller	41.3a	59.7	45.00
Express + Surf(.25%) + Puma	40.8a	60.6a	62.50
Express + Surf(.25%) + Hoelon	40.8a	60.6a	63.75
PP 604 + 2% COC	41.6a	60.5a	60.00
Assert + Surf *	53.1a	60.8a	92.75
Tiller	51.7a	60.7a	70.00
Puma	42.3a	60.7a	58.75
Holeon	46.7a	60.8a	80.50
Check	22.7	59.0	.0000
$\bar{X}$	41.8	60.0	56.48
L.S.D.	11.5	.900	18.09
C.V.	9.73	.533	11.36
P-VALUE	.000	.000	.0000

* Surfactant with Assert R-11, label rate(.25% v/v /gal over 10 gpa solution) Surfactant with Dupont cmpds .25% v/v, R-11 also C.O.C. provided with PP 604, Atplus 411, 2 % v/v.

1/ LQ=Lambsquarter (Chenopodium album), NFC=Night flowering catchfly (Silene noctiflora), FW=Fanweed (Thlaspi arvense), HB=Henbit (Lamium amplexicauli)

Table 2. Broadleaf Weed Control data from the Combination Herbicide Study conducted on the Northwestern Agricultural Research Center in Kalispell, MT in 1988. (Harmony Extra & Express + Wild Oat Herbicides)

Planted: April 11, 1988 Harvested: Augiust 23, 1988

Treatment	% Broadleaf Weed Control/1			
	LQ	NFC	FW	HB
Harmony Extra + Surf(.25%)	100.0	100.0	100.0	100.0
Harmony Extra + Surf(2%) + PP 604	100.0	100.0	100.0	99.50
Harmony Extra + Surf(.25%) + Assert	100.0	100.0	100.0	100.0
Harmony Extra + Surf(.25%) + Tiller	100.0	100.0	100.0	96.25
Harmony Extra + Surf(.25%) + Puma	100.0	100.0	100.0	99.50
Harmony Extra + Surf(.25%) + Hoelon	100.0	100.0	100.0	98.00
Harmony Extra + Surf(.25%)	100.0	100.0	100.0	99.50
Harmony Extra + Surf(2%) + PP 604	100.0	100.0	100.0	100.0
Harmony Extra + Surf(.25%) + Assert	100.0	100.0	100.0	98.50
Harmony Extra + Surf(.25%) + Tiller	100.0	100.0	100.0	99.75
Harmony Extra + Surf(.25%) + Puma	100.0	100.0	100.0	98.75
Harmony Extra + Surf(.25%) + Hoelon	100.0	100.0	100.0	100.0
Express + Surf(.25%)	100.0	100.0	100.0	100.0
Express + Surf(2%) + PP 604	98.75	100.0	100.0	97.50
Express + Surf(.25%) + Assert	95.00	98.75	100.0	95.00
Express + Surf(.25%) + Tiller	100.0	97.50	100.0	93.75
Express + Surf(.25%) + Puma	100.0	100.0	100.0	97.25
Express + Surf(.25%) + Hoelon	98.75	100.0	100.0	94.75
Express + Surf(.25%)	100.0	100.0	100.0	100.0
Express + Surf(2%) + PP 604	100.0	100.0	100.0	100.0
Express + Surf(.25%) + Assert	100.0	100.0	100.0	98.50
Express + Surf(.25%) + Tiller	100.0	100.0	100.0	99.75
Express + Surf(.25%) + Puma	100.0	100.0	100.0	100.0
Express + Surf(.25%) + Hoelon	100.0	100.0	100.0	100.0
PP 604 + 2% COC	93.75	83.75	98.75	73.75
Assert + Surf *	86.25	87.50	96.25	78.75
Tiller	100.0	100.0	100.0	80.00
Puma	61.25	75.00	70.00	55.00
Holeon	63.75	65.00	62.50	43.75
Check	.0000	.0000	.0000	.0000
$\bar{X}$	94.87	95.21	95.88	91.42
L.S.D.	22.54	23.50	22.70	21.37
C.V.	8.441	8.773	8.414	8.304
P-VALUE	.0005	.0063	.0018	.0000

* Surfactant with Assert R-11, label rate(.25% v/v /gal over 10 gpa solution) Surfactant with Dupont cmpds .25% v/v, R-11 also C.O.C. provided with PP 604, Atplus 411, 2 % v/v.

1/ LQ=Lambsquarter (Chenopodium album), NFC=Night flowering catchfly (Silene noctiflora), FW=Fanweed (Thlaspi arvense), HB=Henbit (Lamium amplexicauli)

PROJECT TITLE: Wild oat and broadleaf herbicide study on spring barley.

YEAR/PROJECT: 1988/754

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

SUMMARY:

Four wild oat herbicides were combined with bromoxynil or Harmony Extra with excellent broadleaf weed control and varying degrees of wild oat control. HOE 7113 (Puma) and Tiller are injurious to spring barley.

RESEARCH METHODS:

Herbicides were applied post emergence using a tractor mounted research type sprayer. Plots were 10 feet by 12 feet with treatments being replicated four times in a randomized complete block. A spray volume of 24.85 gpa was applied using 8002 nozzles at 32 psi.

Planting data:

Crop: Gallatin spring barley
Seedbed preparation: Fall plow and disc, spring disc and cultivated, Seedbed finished with brillion packer
Previous crop: Spring barley
Type of planting: Press-type drill
Seeding depth: 1 1/2 inches Seeding rate: 60 lbs/A
Maintenance sprays: none
Surfactant or additions: see test details

Application data:

#1 Application stage: 1-3 leaf wild oats
Date: 5/19/88 Air temp: 57 F Soil temp: 65 F Rel. Hum. 32 %
Wind: 2.5mph Cloud cover: clear
Soil moisture: Topsoil - good subsoil - very good
Crop and weed stages at applications:
Barley: 4-5 leaf
Wild oats (Avena fatua) 2 1/2 to 3 leaf
Broadleaf Weeds: 1st true leaves up to 1" in diameter

#2 Application stage: 3-5 leaf of wild oats
Date: 5/25 Air temp: 53 F Soil temp: 50 F Rel. Hum. 42 %
Wind: 0-2mph Cloud cover: clear
Soil moisture: Topsoil - moist subsoil - very good
Crop and weed stages at applications:
Crop: 4-6 leaf, 5-6" tall, pre-tiller
Wild oats (Avena fatua) 3 lf (80%), 4 lf (10%), 5 leaf (10%)
Lambsquarter (Chenopodium album) 6-8 leaves
Henbit (Lamium amplexicauli) 4 leaves
Night flowering catchfly (Silene noctiflora) 2-6 leaves
Fanweed (Thlaspi arvense) 4-6 leaves

RESULTS:

Yields of treatments varied trom 64.0 to 93.7 bu/A with the check yielding 35.0 bu/A (all treatments were significantly different than the check). Addition of Moract surfactant to Hoelon treatments increased yields and wild oat control. Hoelon plus Harmony Extra treatment resulted in higher yields and better wild oat contol than Hoelon plus bromoxynil Tiller alone and with broadleaf herbicides all performed about the same with Tiller plus bromoxynil giving the highest yield. HOE 7113 alone or combined with Harmony Extra were about equal but HOE 7113 plus bromoxynil was very injurious to spring barley. Assert alone gave good yields and weed control but when combined with bromoxynil and Harmony Extra decreased yields and wild oat control.

Table 1. Agronomic data from the wild oat and broadleaf herbicide study on spring barley, NWARC, Kalispell, MT. Field R-13.
Planted: April 11, 1988 Date harvested: August 18,1988

Treatment	Rate # ai/A	Stage	Injury 1/ Crop	Injury 1/ W Oat	% Broadleaf LQ	% Broadleaf NFC	Weed Control 2/ FW	Weed Control 2/ HB
Hoelon	.75	1-3 leaf	.2500	7.875	.0000	.0000	.0000	.0000
Hoelon + Moract	.75 + 1 pt	1-3 leaf	1.250	8.750	.0000	.0000	.0000	.0000
Hoelon	1.0	1-3 leaf	1.000	8.875	.0000	.0000	.0000	.0000
Hoelon + Moract	1.0 + 1 pt	1-3 leaf	.7500	8.375	.0000	.0000	.0000	.0000
One Shot	1.1	1-3 leaf	.3750	8.250	75.00	72.50	73.75	88.75
Hoelon + * Harmy Xtra+ S	1.0 + .012	1-3 leaf	2.375	9.750	100.0	100.0	100.0	99.50
Tiller	.66	3-5 leaf	4.875	9.750	100.0	77.50	100.0	95.75
Tiller + Brom	.66 + .25	3-5 leaf	3.125	9.375	98.75	98.75	100.0	93.75
Tiller + * Harmy Xtra + S	.66 + .012	3-5 leaf	2.250	9.375	100.0	100.0	100.0	98.25
Tiller + Banvel	.66 + .063	3-5 leaf	2.500	7.000	100.0	100.0	100.0	98.25
HOE 7113 (PUMA)	.20	3-5 leaf	6.875	10.00	.0000	.0000	.0000	.0000
HOE 7113 + Bromox.	.20 .25	3-5 leaf	8.500	10.00	97.50	97.50	98.75	63.75
HOE 7113 + * Harmy Xtra + S	.20 + .012	3-5 leaf	4.750	9.875	100.0	100.0	100.0	92.00
Assert + surf	.45	3-5 leaf	1.000	5.000	93.75	95.00	100.0	96.00
Assert + bromox + surf	.45 + .25	3-5 leaf	.8750	6.000	100.0	100.0	100.0	98.75
Assert + * Harmy Xtra+ S	.45 + .012	3-5 leaf	2.000	6.375	100.0	100.0	100.0	100.0
Check	-----	3-5 leaf	.0000	.0000	.0000	.0000	.0000	.0000
		$\bar{X}$	2.515	7.919	70.00	68.60	70.44	64.99
		LSD	1.757	1.414	3.827	15.72	1.181	18.80
		CV	24.57	6.281	1.923	8.059	.5896	10.17
		P-VALUE	.0000	.0000	.0000	.0000	.0000	.0000

1/ Injury 0-10, 0 = no injury, 10 = dead plants
2/ LQ=Lambsquarter (Chenopodium album), NFC=Night flowering catchfly (Silene noctiflora), FW=Fanweed (Thlaspi arvense), HB=Henbit (Lamium amplexicauli)
* Harmony Extra applications have .25% v/v Atplus 411 (S)

Table 2. Agronomic data from the wild oat and broadleaf herbicide study on spring barley, NWARC, Kalispell, MT. Field R-13
Planted: April 11, 1988 Date harvested: August 18,1988

Treatment	Rate # ai/A	Stage	Height (Inches)	% Wild Oat Control 7/5	7/15	% Barley Stand
Hoelon	.75	1-3 leaf	30.38	65.00	75.00	100.0
Hoelon + Moract	.75 + 1 pt	1-3 leaf	29.38	85.00	80.00	98.75
Hoelon	1.0	1-3 leaf	29.38	76.25	78.75	100.0
Hoelon + Moract	1.0 + 1 pt	1-3 leaf	30.63	90.00	86.75	98.75
One Shot	1.1	1-3 leaf	30.75	76.25	66.25	100.0
Hoelon + * Harmy Xtra+ S	1.0 + .012	1-3 leaf	28.75	85.00	80.00	100.0
Tiller	.66	3-5 leaf	27.63	97.00	96.50	92.50
Tiller + Brom	.66 + .25	3-5 leaf	27.25	97.25	98.50	91.25
Tiller + * Harmy Xtra +S	.66 + .012	3-5 leaf	28.50	91.00	92.25	93.75
Tiller + Banvel	.66 + .063	3-5 leaf	29.25	87.50	88.00	95.00
HOE 7113 (PUMA)	.20	3-5 leaf	28.38	98.50	99.22	90.00
HOE 7113 + Bromox.	.20 .25	3-5 leaf	24.75	98.50	97.25	63.75
HOE 7113 + Harmy Xtra +S*	.20 + .012	3-5 leaf	28.63	96.00	97.22	93.75
Assert + surf	.45	3-5 leaf	27.38	93.25	89.25	93.75
Assert + bromox + surf	.45 + .25	3-5 leaf	27.38	84.75	81.75	93.75
Assert + * Harmy Xtra+ S	.45 + .012	3-5 leaf	28.00	81.25	83.00	92.50
Check	-----	3-5 leaf	31.0	.0000	.0000	100.0
		$\bar{X}$	28.67	82.50	82.85	93.97
		LSD	2.768	9.742	13.46	6.231
		CV	3.395	4.153	5.713	2.332
		P-VALUE	.0433	.0000	.0000	.0000

* Harmony Extra applications have .25% v/v Atplus 411 (Moract)
Assert applications , surfactant added (.6 oz for every gal spray solution over 10 gpa).
Plots are 10' X 12' X 6 = .0165 acres
Volume is 24.85 gpa = 1552 ml/plots
Hoe 7113 (Puma) is .63 # ai/gal, One Shot is 2.58 # ai/ A, Tiller is 3.08 # ai/A.

Table 3. Agronomic data from the wild oat and broadleaf herbicide study on spring barley, NWARC, Kalispell, MT. Field R-13.
Planted: April 11, 1988 Date harvested: August 18,1988

	Rate # ai/A	Stage	YIELD Bu/A	TEST WT lb/Bu	% PLUMP
Hoelon	.75	1-3 leaf	67.4a	52.13a	91.55a
Hoelon + Moract	.75 + 1 pt	1-3 leaf	78.0a	52.75a	91.68a
Hoelon	1.0	1-3 leaf	73.9a	52.38a	93.02a
Hoelon + Moract	1.0 + 1 pt	1-3 leaf	81.6a	52.18a	90.82a
One Shot	1.1	1-3 leaf	73.7a	52.80a	93.33a
Hoelon + * Harmy Xtra+ S	1.0 + .012	1-3 leaf	80.5a	52.35a	91.82a
Tiller	.66	3-5 leaf	83.2a	52.88a	94.63a
Tiller + Brom	.66 + .25	3-5 leaf	89.6a	52.77a	94.93a
Tiller + Harmy Xtra +S	.66 + .012	3-5 leaf	84.0a	52.97a	93.47a
Tiller + Banvel	.66 + .063	3-5 leaf	84.7a	53.15a	94.90a
HOE 7113 (PUMA)	.20	3-5 leaf	85.0a	52.40a	91.47a
HOE 7113 + Bromox.	.20 .25	3-5 leaf	72.1a	50.10	88.95a
HOE 7113 + Harmy Xtra + S	.20 + .012	3-5 leaf	93.7a	53.00a	93.75a
Assert + surf	.45	3-5 leaf	81.4a	51.75a	93.55a
Assert + bromox + surf	.45 + .25	3-5 leaf	72.2a	51.78a	93.32a
Assert + Harmy Xtra+ S	.45 + .012	3-5 leaf	64.0a	50.28	89.72a
Check	-----	3-5 leaf	35.0	49.00	83.15
		$\bar{X}$	76.5	52.04	92.00
		LSD	11.0	1.426	3.076
		CV	5.04	.9639	1.176
		P-VALUE	.000	.0000	.0000

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

PROJECT TITLE: Evaluation of bromoxynil in combination with sulfonyl urea herbicides on spring wheat.

YEAR/PROJECT: 1988/754

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

OBJECTIVE:

Efficacy and crop injury evaluation of bromoxynil in combination with sulfonyl urea herbicides on spring wheat.

SUMMARY:

Yield and test weights were not significantly different when comparing treatment combinations of bromoxynil with Harmony Extra or Express. Broadleaf weed control was excellent for all species (except henbit) for all treatments.

RESEARCH METHODS:

Herbicides were applied post emergence using a tractor mounted research type sprayer. Plots were 10 feet by 12 feet with treatments being replicated four times in a randomized complete block design. Plots were seeded with a 12 foot drill, in strips, and spray applications were made perpendicular to the strip. A spray volume of 24.85 gpa was applied using 8002 nozzles at 32 psi.

Planting data:

Crop: Newana spring wheat
Seedbed preparation: Fall plow and disc, spring disc and cultivate, Seedbed completed with brillion packer
Previous crop: Spring barley
Type of planting: Press type drill, 7" spacing
Seeding depth: 1 1/2 inches Seeding rate: 60 lbs/A
Maintenance sprays: Hoelon at .75 lb ai/A on May 20, 1988
Surfactant or additions: R-11 used at .25% v/v where indicated

Application data:

Date: 5/25/88 Air temp: 64 F Soil temp: 60 F Rel. Hum. 30 %
Wind: 0 Cloud cover: clear
Soil moisture: Topsoil - fair subsoil - very good

Crop and weed stages at applications:

Crop: 3-5 leaf, pre-tiller
Lambsquarter (Chenpodium album) 6-8 leaves, 2 1/2 " tall
Henbit (Lamium amplexicauli) 4-6 leaves
Pigweed (Amaranthus retroflexus) 4 leaves
Night flowering catchfly (Silene noctiflora) 4 leaves, 1-2" tall
Fanweed (Thlaspi arvense) 6-10 leaves, 2" tall
Wild buckwheat (Polygonum convolvulus) 2 leaves, 1-2" tall

RESULTS:

Yield and test weights were not significantly different when comparing treatments of bromoxynil alone or in combinations with Harmony Extra or Express. Excluding the check, broadleaf weed control was above 90% for all weeds except henbit. Henbit was not effectively controlled using bromoxynil, bromoxynil + MCPA, 2,4-D, and Harmony Extra + bromoxynil (at the low rate).

Table 1. Agronomic data from a broadleaf weed control study in spring wheat grown on the Northwestern Agricultural Research Center, Kalispell, MT. in 1988.

Planted: April 11, 1988 Date harvested: August 23, 1988

Treatment	Rate lb ai/A	YLD Bu/A	T.W. lb/B	---- Percent Weed Control 1/ ---- LQ	PW	NFC	HB	FW
Express + Surf. (.25% v/v)	.016	88.1	61.1	100.0	98.75	100.0	98.75	100.0
Harmony Extra + Surf.	.016	87.5	61.4	98.75	100.0	100.0	90.00	100.0
Buctril	.375	89.0	60.8	100.0	98.75	100.0	67.50	100.0
Bronate	.375	86.2	61.1	93.75	100.0	92.50	77.50	100.0
Express +Buctril +Surf.	.008+.187	84.1	61.4	98.75	100.0	100.0	98.50	100.0
Express+Buctril+Surf.	.016+.187	91.9	60.9	100.0	100.0	100.0	99.25	100.0
Harmony Extra + Surf. +Buctril	.008+.187	81.4	61.1	100.0	100.0	100.0	79.75	100.0
Harmony Extra + Surf. +Buctril	.016+.187	78.6	61.2	100.0	100.0	100.0	93.50	100.0
2,4-D	.5	87.7	61.1	100.0	100.0	100.0	48.50	100.0
Check	--	77.5	61.1	.0000	.0000	.0000	.0000	.0000
SUMMARY STATISTICS:								
OVERALL MEAN		85.2	61.1	89.13	89.75	89.25	75.32	90.00
CV (SE/MEAN)		6.52	.245	2.339	.6343	2.109	14.96	.0000
LSD(0.05)		16.1	.434	6.049	1.652	5.461	32.71	.0000
P-VALUE		.698	.197	.0000	.0000	.0000	.0000	.0000

Plots 10' x 12'

1. Ocular estimates of weed control, ratings taken 6/24/88
   LQ = Lambsquarter (Chenopodium album)
   PW = Pigweed (Amaranthus retroflexus)
   NFC = Night flowering catchfly (Silene noctiflora)
   HB = Henbit (Lamium amplexicauli)
   FW = Fan weed (Thlaspi arvense)

PROJECT TITLE: Sulfonyl urea herbicide evaluation in winter wheat.

YEAR/PROJECT: 1988/754

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

SUMMARY:

Three sulfonyl urea herbicides were tested in Winridge winter wheat No significant differences in yield, test weights, and height were found. Tansey mustard, henbit, conical catchfly, and fanweed were all effectively controlled with the herbicides evaluated.

RESEARCH METHODS:

Herbicides were applied post emergence using a tractor mounted research type sprayer. Plots were 10 feet by 20 feet with treatments being replicated four times in a randomized complete block. This trial was established in a solid seeded field. A spray volume of 24.85 gpa was applied using 8002 nozzles at 32 psi.

Planting data:

Crop: Winridge
Seedbed preparation: Fall plow and disc, spring disc and cultivated,
Previous crop: Fallow
Type planting: Press type drill
Seeding depth: 1 1/2 inches Seeding rate: 80 lbs/A
Maintenance sprays: none
Surfactant or additions: R-11 at .25% v/v where indicated

Application data:

Date: 3/22/87 Air temp: 48 F Soil temp: 45 F Rel. Hum. 29%
Wind: 0 Cloud cover: prtly cldy
Soil moisture: Topsoil - good subsoil - good

Crop and weed stages at applications:

Wheat: 2-3 leaf, tillering
Fanweed (Thlaspi arvense) 6-10 leaves, 1-2" dia.
Henbit (Lamium amplexicauli 10-15 leaves, 1-2" dia.
Conical catchfly (Silene conoidea) 6-8 leaves 1 1/2" dia.
Tansey mustard (Descurainia pinnata) 8-12 leaves

RESULTS:

Broadleaf weed control was excellent for all sulfonyl urea treatments. The bromoxynil + MCPA tratment was weak on henbit and gave only 88% control of the Silene species. The height, yield and test weight data demonstrates the crop safety of these compounds on winter wheat. Yield, test weight and height differences were not significant.

Table 1. Agronomic data from the sulfonyl urea herbicide study on winter wheat conducted on the John Alton farm, Kalispell, MT. in 1988.

Date planted: September 20, 1987 Date harvested: July 27, 1988

Treatment	Rate AI/A	Percent Broadleaf Control 1/ 5/10/88				6/10/88	
		TM	HB	Silene	FW	TM	Silene
Harmony + Surf	.125 oz	100.0	86.67	100.0	100.0	98.33	98.33
Harmony + Surf	.25 oz	100.0	94.33	100.0	100.0	96.67	98.33
Harmony + Surf	.375 oz	100.0	96.33	100.0	100.0	100.0	100.0
Harmony Extra + Surf	.25 oz	98.33	97.33	100.0	100.0	100.0	100.0
Harmony Extra + Surf	.375 oz	98.33	100.0	100.0	100.0	100.0	100.0
Express + Surf	.125 oz	99.67	99.67	100.0	100.0	100.0	100.0
Express + Surf	.25 oz	100.0	100.0	100.0	100.0	100.0	100.0
Ally + Surf	.06 oz	99.67	100.0	100.0	100.0	100.0	100.0
Bromox +MCPA	.375 lb	100.0	58.33	88.33	100.0	93.00	98.33
Check	----	.0000	.0000	.0000	.0000	.0000	.0000
	$\bar{X}$	89.60	83.27	88.83	90.00	88.80	89.50
	L.S.D.	2.111	10.53	6.826	.0000	7.209	2.859
	C.V.	.7930	4.258	2.586	.0000	2.732	1.075
	P-VALUE	.0000	.0000	.0000	.0000	.0000	.0000

Plots 10' X 20', 3 reps.
Surfactant .25% v/v of R-11

1/ TM = Tansey mustard (Descurainia pinnata)
HB = Henbit (Lamium amplexicauli)
SILENE = Cone catchfly (Silene conoidea)
FW = Fanweed (Thlaspi arvense)

Harmony = DPX-M6316 Express = DPX-L5300 Harmony Extra = DPX-R9674
Ally = DPX-T6376

Table 2. Agronomic data from the sulfonyl urea herbicide study in winter wheat conducted on the John Alton farm, Kalispell, MT. in 1988.

Date planted: September 20, 1987 Date harvested: July 27, 1988

Treatment	Form	Rate AI/A	Amt/ Plots	Height (")	Yield Bu/A	Test Wt lb/Bu
Harmony + Surf	75%	.125 oz	.087	45.16	65.77	61.37
Harmony + Surf	75%	.25 oz	.174	44.88	60.46	60.37
Harmony + Surf	75%	.375 oz	.260	44.61	64.25	61.30
Harmony Extra + Surf	75%	.25 oz	.174	46.47	70.65	61.63
Harmony Extra + Surf	75%	.375 oz	.260	45.39	67.55	61.43
Express + Surf	75%	.125 oz	.087	45.55	67.88	61.40
Express + Surf	75%	.25 oz	.174	43.43	65.27	60.70
Ally + Surf	60%	.06 oz	.052	44.61	68.18	61.50
Bromox +MCPA	4 lb	.375 lb	6.5 ml	46.18	57.19	61.00
Check	----	----	----	41.73	56.79	62.60
			$\bar{X}$	44.80	64.42	61.33
			L.S.D.	2.645	11.85	1.358
			C.V.	1.987	6.195	.7455
			P-VALUE	.0516	.2474	.1590

Plots 10' X 20', 3 reps,
Surfactant .25% v/v of R-11

PROJECT TITLE: Amber rotational study in Newana spring wheat

YEAR/PROJECT: 1988/754

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

OBJECTIVE:

To determine the residual of the sufonyl urea herbicide Amber in comparison to Glean herbicide residue following application to a spring grain crop.

SUMMARY:

Excellent broadleaf weed control was obtained by both fall and spring applications of Amber (.11 to .43 oz ai/A). Yields and height were not affected significantly by the fall or spring applications of Amber.

RESEARCH METHODS:

Herbicides were applied post emergence using a tractor mounted research type sprayer. Plots were 10 feet by 12 feet with treatments being replicated four times in a randomized complete block. A spray volume of 24.85 gpa was applied using 8002 nozzles at 32 psi.

Fall applications were made to bare ground where test site was to be located the next spring. Light harrowing was done to prepare the seedbed in the spring. Newana spring wheat was seeded April 12, 1988 using a research seeder. Post applications were made after emergence on May 11, 1988.

Planting data:

Crop: Newana spring wheat
Seedbed preparation: Fall plow and disc, spring disc and cultivated, seedbed preparation with brillion packer
Previous crop: Spring barley
Planter: Research seeder, double disc openers, 6" spacing
Seeding depth: 1 1/2 inches Seeding rate: 60 lbs/A
Maintenance sprays: Hoelon 1.25 lb ai/A 5/16/88
Surfactant or additions: X-77 included in all treatments, .25% v/v

Application data:

Application #1. Pre-emergence
Date: 10/15/87 Air temp: 47 F Soil temp: 51 F Rel. Hum. 40 %
Wind: 0 Cloud cover: cloudy
Soil moisture: Topsoil - fair subsoil - fair-moderate

Application #2. Post emergence
Date: 5/11/88 Air temp: 64 F Soil temp: 59 F Rel. Hum. 36%
Wind: 0 Cloud cover: clear
Soil moisture: Topsoil - good Subsoil - very good
Crop and weed stages: wheat 3-4 leaf
Wild oat (Avena fatua) 1 leaf
Broadleaf weeds - cotyledon stage of:
Night flowering catchfly (Silene noctiflora)
Wild buckwheat (Polygonum convulvulus)
Henbit (Lamium amplexicauli) Chickweed (Stellaria media)

RESULTS:

In the treatment year there were no adverse effects of the applications of Amber in the fall (pre plant to spring wheat) or post emmergence in Newana spring wheat. Yield and height were equal throughout the trial with no significant differences between treatments. Test weights were significantly higher in two treatments when compared to the check (.43 oz per acre Amber pre emergence and .14 oz ai/A Amber post emergence). Weed control was very good for all treatments.

Table 1. Agronomic data from the Amber Rotational Study conducted in Newana spring wheat on the Northwestern Agricultural Research Center, Kalispell, MT. in 1988.

Date planted: April 12, 1988 Date harvested: August 15, 1988

Treatment	Appln	Rate oz ai/A	Yield Bu/A	Test Wt lb/Bu	Height (")	% Broadleaf Control 1/ NFC	WB	HB	CW
Amber	Fall	.11	43.22	61.15	29.30	100.0	95.00	100.0	100.0
Amber	Fall	.14	45.36	61.12	29.15	86.25	82.50	96.25	90.00
Amber	Fall	.29	47.72	61.58	28.67	100.0	98.75	100.0	100.0
Amber	Fall	.43	47.74	61.80	28.73	100.0	96.25	100.0	100.0
Glean	Fall	.29	50.62	61.38	29.60	100.0	100.0	100.0	95.00
Amber	Spring	.11	50.51	61.38	30.10	98.75	90.00	95.00	97.50
Amber	Spring	.14	44.73	61.97	29.02	100.0	98.75	100.0	100.0
Amber	Spring	.29	50.98	61.13	30.30	100.0	100.0	100.0	100.0
Amber	Spring	.43	43.38	61.38	29.42	100.0	100.0	100.0	100.0
Glean	Spring	.29	44.74	60.45	28.35	100.0	98.75	100.0	100.0
Check	------	----	46.02	61.13	30.00	.0000	.0000	.0000	.0000
	$\bar{X}$		46.82	61.22	29.33	89.55	87.27	90.11	89.32
	L.S.D		11.39	.5300	1.703	7.794	11.06	5.529	5.975
	C.V.		8.420	.2997	2.011	3.014	4.387	2.124	5.975
	P-VALUE		.8600	.0025	.3707	.0000	.0000	.0000	.0000

* X-77 included in all treatments at .25% V/V Plots are 10' X 12'

1/ Broadleaf weed scores made 6/7/88, Height notes 8/9/88
NFC = Nightflowering catchfly (Silene noctiflora)
WB = Wild buckwheat (Polygonum convulvalus)
HB = Henbit (Lamium amplexicauli) CW = Chickweed (Stellaria media)

PROJECT TITLE: Re-application of metasulfuron to plots treated the year before with varying rates of chlorsulfuron or metasulfuron in combination with AC 222,293.

YEAR/PROJECT: 1988/754

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

OBJECTIVE:

Evaluation of re-applications of metasulfuron in spring barley for crop tolerance.

SUMMARY:

Metasulfuron re-applied to areas previously treated with chlorsulfuron or metasulfuron plus AC 222,293 caused lower yields where chlorsulfuron had been used, higher yields where metasulfuron had been used. There was signifiicant yield reduction where these chemicals had been applied alone.

RESEARCH METHODS:

Gallatin spring barley was seeded to an area that the previous year had been treated with varying rates of chlorsulfuron, metasulfuron, and AC 222,293. Plots were staked to assure proper re-application of metasulfuron.

Herbicides were applied post emergence using a tractor mounted research type sprayer. Plots were 10 feet by 12 feet with treatments being replicated four times in a randomized complete block design. A spray volume of 24.85 gpa was applied using 8002 nozzles at 32 psi.

Metasulfuron was applied at .125 oz. ai/A to replications one and three. Bromoxynil at .375 lb. ai/A was applied to replications two and four the same day. Diclfop-methyl was applied on the whole study (.75 lb ai/A) on May 10. Difenzoquat at 1.0 lb ai/A was applied on May 25 in attempts to control a severe population of wild oats.

Planting data:

Crop: Gallatin spring barley
Seedbed preparation: Fall plow and disc, spring disc and cultivate, Final seedbed prepared with brillion packer
Previous crop: Spring barley
Planter: Research type, double disc openers, 6" spacing
Seeding depth: 1 1/2 inches Seeding rate: 60 lbs/A
Maintenance sprays: Hoelon and Avenge for wild oats (see above)
Surfactant or additions: none

Application data:

Date: 5/9/88 Air temp: 62 F Soil temp: 65 F Rel. Hum. 26 %
Wind: 0-2mph Cloud cover: clear
Soil moisture: Topsoil - good subsoil - very good

Crop and weed growth stages at applications:

Crop: 3-4 leaf Wild oats (Avena fatua) 2-3 leaf
Broadleaves cotyledon - 1" diameter

RESULTS:

Table 1 gives the results of this study not separating the reapplication of ally fron the no-ally treatments but only evaluating the barley performance in relation to last year's treatments. There were no significant differences in any of the agronomic measurements.

Tables 2 and 3 give the agronomic data according to Ally (= metasulfuron) or No Ally. The treatments listed are ordered by last year's treatment plan (1987). The Ally or No Ally columns refer to the 1988 applications.

Plant counts were lower in all but three plot areas where metasulfuron was reapplied this year. Height was in most cases lower this year where metasulfuron was reapplied except in areas where there had been 1987 metasulfuron applications.

Metasulfuron re-applied to areas previously treated with chlorsulfuron or metasulfuron plus AC 222,293 resulted in lower yields where chlorsulfuron was used, higher yields where metasulfuron had been used, and significant yield reduction where these chemicals had been applied alone in 1987.

Test weights were reduced in the majority of cases where metasulfuron was reapplied. No significant changes were detected in the percent plump measurements.

Table 1. Agronomic data from the re-application of metasulfuron (Ally)to plots treated the previous year with varying rates of chlorsulfuron (Glean) or metasulfuron (Ally) in combination with AC 222,293 (Assert). Northwestern Agricultural Research Center, Kalispell, MT.

Date planted: April 11, 1988 Harvested: August 11, 1988

Treatment	Rate lb or ai/A	Yield Bu/A	T.W. lb/bu	% Plump	Plts/ Ft2	Ht. (")
Assert + Glean + Surf. 1/	.38#+.125oz	70.2	52.0	89.5	59.00	28.88
Assert + Glean + Surf.	.45#+.125oz	70.0	52.4	91.5	52.25	29.75
Assert + Glean + Surf.	.38#+.187oz	78.2	52.5	89.6	54.25	32.13
Assert + Glean + Surf.	.45#+.187oz	62.4	52.2	91.0	47.00	29.00
Assert + Ally + Surf.	.38#+.06oz	67.1	51.7	90.7	47.25	30.25
Assert + Ally + Surf.	.45#+.06oz	72.6	51.8	89.5	50.75	29.38
Assert + C.O.C 2/	.38#	65.9	52.6	92.4	47.50	29.75
Assert + C.O.C	.45#	67.0	52.1	91.2	46.00	30.63
Glean + Surf.	.125oz	67.3	52.4	91.6	59.75	31.50
Glean + Surf.	.187oz	73.2	52.8	92.7	48.75	30.63
Ally + Surf.	.06oz	51.8	51.5	89.4	50.75	26.50
Check	---	58.8	52.4	90.7	50.50	28.38
	$\bar{X}$	67.1	52.2	90.8	51.15	29.7
	L.S.D.	19.7	.745	2.60	15.59	3.835
	C.V.	10.2	.496	.997	10.60	4.484
	P-VALUE	.438	.029	.143	.7430	.2941

1/ Surfactant used, R-11 at .25% v/v
2/ C.O.C. (crop oil concentrate) Atplus 411F

Table 2. Agronomic data from the re-application of metasulfuron (Ally)to plots treated the previous year with varying rates of chlorsulfuron (Glean) or metasulfuron (Ally) in combination with AC 222,293. Northwestern Agricultural Research Center, Kalispell, MT.

Date planted: April 11, 1988 Harvested: August 11, 1988

Treatment	Rate lb or ai/A	Plts/FT2 3/ Ally	Plts/FT2 3/ No Ally	HEIGHT (") Ally	HEIGHT (") No Ally
Assert + Glean + Surf. 1/	.38#+.125oz	55.00	63.00	29.25	28.50
Assert + Glean + Surf.	.45#+.125oz	44.50	60.00	26.75	32.75
Assert + Glean + Surf.	.38#+.187oz	53.00	55.50	30.75	33.50
Assert + Glean + Surf.	.45#+.187oz	34.50	59.50	27.75	30.25
Assert + Ally + Surf.	.38#+.06oz	43.00	51.50	31.00	29.50
Assert + Ally + Surf.	.45#+.06oz	54.00	47.50	31.25	27.50
Assert + C.O.C 2/	.38#	52.00	43.00	29.50	30.00
Assert + C.O.C	.45#	42.50	49.50	28.50	32.75
Glean + Surf.	.125oz	54.50	65.00	29.25	33.75
Glean + Surf.	.187oz	37.00	60.50	27.75	33.50
Ally + Surf.	.06oz	48.00	53.50	25.00	28.00
Check	---	55.50	45.50	27.00	29.75
$\bar{X}$		51.15		29.73	
L.S.D.		22.31		5.061	
C.V.		14.91		5.819	
P-VALUE		.4329		.0753	

1/ Surfactant used, R-11 at .25% v/v
2/ C.O.C. (crop oil concentrate) Atplus 411F
3/ Bromoxynil applied as cover spray for broadleaf weeds

Table 3. Agronomic data from the re-application of metasulfuron (Ally)to plots treated the previous year with varying rates of chlorsulfuron (Glean) or metasulfuron (Ally)in combination with AC 222,293 (Assert). Northwestern Agricultural Research Center, Kalispell, MT.

Date planted: April 11, 1988 Harvested: August 11, 1988

Treatment	Rate lb or ai/A	YIELD BU/A 3/ Ally	YIELD BU/A 3/ No Ally	TEST WT LB/BU Ally	TEST WT LB/BU No Ally	% Plump Ally	% Plump No Ally
Assert + Glean + Surf 1/	.38#+.125oz	65.9	74.4	51.60	52.40	89.25	89.70
Assert + Glean + Surf	.45#+.125oz	53.9	86.1	51.75	53.00	90.15	92.80
Assert + Glean + Surf	.38#+.187oz	74.4	82.1	52.00	53.05	87.65	91.45
Assert + Glean + Surf	.45#+.187oz	45.3	79.5	51.70	52.70	92.15	89.75
Assert + Ally + Surf	.38#+.06oz	69.6	64.6	51.30	52.15	90.20	91.10
Assert + Ally + Surf 2/	.45#+.06oz	74.4	70.9	51.45	52.10	89.85	89.15
Assert + C.O.C	.38#	53.9	78.0	52.50	52.70	93.25	91.60
Assert + C.O.C	.45#	53.2	80.9	51.25	52.95	90.30	92.00
Glean + Surf.	.125oz	54.6	80.1	51.80	52.95	90.80	92.40
Glean + Surf.	.187oz	58.4	88.0	52.70	52.90	93.35	92.00
Ally + Surf.	.06oz	38.4	65.3	51.50	51.45	90.00	88.85
Check	---	36.6	81.0	52.05	52.70	90.65	90.75
$\bar{X}$		67.05		52.19		90.80	
L.S.D.		30.17		1.180		3.641	
C.V.		15.38		.7726		1.371	
P-VALUE		.0439		.0269		.2288	

1/ Surfactant used, R-11 at .25% v/v
2/ C.O.C. (crop oil concentrate) Atplus 411F
3/ Bromoxynil applied as cover spray for broadleaf weeds

PROJECT TITLE: Evaluation of Harmony Extra and Express for crop tolerance in two varieties of spring barley.

YEAR/PROJECT 1988/754

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

OBJECTIVE:

To evaluate the tolerance of two spring barley varieties to various rates of Harmony Extra and Express.

SUMMARY:

No injury was observed on the two spring barley varieties tested for tolerance to Harmony Extra or Express. There were no agronomic differences measured due to treatments in barley varieties evaluated.

RESEARCH METHODS:

Herbicides were applied post-emergence to two varieties of spring barley using a tractor mounted research-type sprayer. Plots were 8.5 feet by 15 feet with treatments across varieties being replicated four times in a complete randomized block design. A spray volume of 24.85 gpa was applied using 8002 nozzles at 32 psi.

Planting date:

Crop: Hector and Gallatin spring barley
Seedbed preparation: Fall plow and disc, spring disc and cultivate
Seedbed prepared with a brillion packer
Previous crop: Spring barley Soil type: Creston silt loam
Type planting: Research plot seeder, double disc openers, 6" spacing
Seeding depth: 1 1/2 inches, Seeding rate: 60 lbs/A
Maintenance sprays: none
R-11 surfactant used where indicated, .25 % v/v

Application data:

Date: 5/25/88 Air temp: 44 F Soil temp: 50 F R.H. 42%
Cloud cover: cloudy, foggy (plants wet at application), Wind: 0-2
Soil: topsoil moist, sub soil, very good moisture

Crop and weed stages at application:

Barley: 5-7 leaf, pre-tiller
Fanweed (Thlaspi arvense) 4-8 leaves
Tansey mustard (Descurainia pinnata) 4 leaves
Henbit (Lamium amplexicauli) 4 leaves
Pigweed (Amaranthus retroflexus) 2-4 leaves

RESULTS:

Injury ratings taken on a 0-10 scale were not above .25 indicating good crop tolerance of all rates tested on both spring barley varieties. Weed control taken prior to weeding was excellant for all treatments tested (weed free area desired for crop tolerance testing) Table 1. Yields varied from 73.3 to 94.1 bu/A with no significance found between any of the treatments. Test weights averaged 52.3 and 51.0 lbs/bu respectively for Gallatin and Hector. The percent plump mean was 90.3% for Gallatin and 78.4% for Hector. Height

measurements are given in table 2. No significant differences were reported in yield, test weight, % plump, and height.

Table 1. Agronomic data from evaluations of Harmony Extra and Express on two varieties of spring barley grown on the Northwestern Agricultural Research Center, Kalispell, Mt. in 1988.
Planted: May 2, 1988 Harvested: August 12, 1988 Field F-3

Treatment	Rate oz ai/A	Injury 1/ Klages	Injury 1/ Gallatin	% Weed Control 2/ Fanweed	% Weed Control 2/ Pigweed
Harmony Extra + Surf (.25% v/v)	.375	.0000	.0000	100.0	100.0
Harmony Extra + Surf (.25% v/v)	.75	.2500	.1250	100.0	100.0
Harmony Extra + 2,4-D	.375 +4	.0000	.0000	100.0	100.0
Harmony Extra + 2,4-D	.375 +8	.0000	.0000	100.0	100.0
Harmony Extra + 2,4-D	.75 + 4	.0000	.0000	100.0	100.0
Harmony Extra + 2,4-D	.75 + 8	.1250	.0000	100.0	100.0
Express + Surf.(.25%)	.125	.0000	.2500	100.0	100.0
Express + Surf.(.25%	.25	.0000	.0000	100.0	100.0
Express + 2,4-D	.125 +4	.1250	.0000	100.0	100.0
Express + 2,4-D	.125 +8	.2500	.2500	100.0	100.0
Express + 2,4-D	.25 + 4	.1250	.0000	100.0	100.0
Express + 2,4-D	.25 + 8	.0000	.1250	100.0	100.0
2,4-D	4	.0000	.0000	100.0	100.0
2,4-D	8	.2500	.1250	100.0	100.0
Check	----	.0000	.0000	.0000	.0000
	$\bar{X}$	.0583	.0750	93.33	93.33
	L.S.D.	.2941	.3458	.0000	.0000
	C.V.	176.6	161.6	.0000	.0000

1/ Injury Rating on 0-10 scale, 0=no injury 10=dead plants due to chemical injury
2/ Weed Control
Fanweed (Thlaspi arvense)
Pigweed (Amarathus rectroflexus)

Table 2. Agronomic data from the Harmony Extra / Express Crop Tolerance Study grown on the Northwestern Agricultural Research Center, Kalispell, MT., in 1988. Barley varieties tested: Gallatin (Gal) and Klages (Klg). Field F-3

Treatment	Rate oz ai/A	YIELD Gal	YIELD Klg	TEST WT. Gal	TEST WT. Klg	% PLUMP Gal	% PLUMP Klg	HEIGHT (IN) Gal	HEIGHT (IN) Klg
Harmony Extra + Surf (.25% v/v)	.375	78.7	70.7	52.1	50.8	88.8	75.9	24.9	25.5
Harmony Extra + Surf (.25% v/v)	.75	80.1	75.6	51.9	51.0	87.5	75.1	25.8	25.3
Harmony Extra + 2,4-D	.375 +4	87.1	74.4	52.2	51.2	91.8	80.3	25.3	25.0
Harmony Extra + 2,4-D	.375 +8	86.2	76.2	52.2	53.0	92.1	76.6	25.6	25.1
Harmony Extra + 2,4-D	.75 + 4	86.8	77.6	52.4	51.1	91.0	77.2	24.5	25.9
Harmony Extra + 2,4-D	.75 + 8	79.1	76.8	52.0	51.0	88.5	77.6	24.2	25.0
Express + Surf.(.25%)	.125	94.1	80.4	52.6	51.5	91.8	79.9	25.3	25.4
Express + Surf.(.25%)	.25	83.3	74.8	52.2	51.0	89.1	77.5	24.9	25.2
Express + 2,4-D	.125 +4	93.8	87.6	53.0	51.5	92.1	82.0	25.7	26.5
Express + 2,4-D	.125 +8	82.5	73.2	52.2	51.3	90.3	80.7	24.3	24.8
Express + 2,4-D	.25 + 4	85.0	81.1	52.5	50.7	90.3	78.9	26.0	26.3
Express + 2,4-D	.25 + 8	73.3	68.9	51.8	50.8	89.1	75.0	24.2	25.1
2,4-D	4	78.6	77.8	51.9	50.9	90.7	81.2	24.2	24.8
2,4-D	8	89.6	80.7	52.4	51.2	90.0	78.6	25.6	26.5
Check	----	92.8	74.9	52.4	50.9	90.9	79.9	24.2	25.7
	$\bar{X}$	84.4	76.8	52.3	51.0	90.3	78.4	25.0	25.5
	C.V.	6.60	6.92	.553	.488	1.23	2.67	2.90	2.96
	P-Value	.287	.730	.306	.560	.105	.356	.632	.873
	L.S.D.	15.9	15.2	.824	.712	3.17	5.96	5.25	5.47

PROJECT TITLE: Evaluation of glyphosate plus ammonium sulfate and bisulfate additives for quackgrass control.

YEAR/PROJECT: 1988/754

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

SUMMARY:

The most effective quackgrass control was achieved with the addition of ammonium sulfate to tank mixes of glyphosate. Ammonium bisulfate was not quite as effective, and even less than glyphosate alone.

RESEARCH METHODS:

Herbicides were applied post emergence to quackgrass (Agropyron repens) in an established stand of sainfoin using a tractor mounted research type sprayer. Plots were 10 feet by 20 feet with treatments being replicated three times in a randomized complete block. A spray volume of 9.76 gpa was applied using 8001 nozzles at 32 psi.

Planting data:

Crop: Eski sainfoin
Seedbed preparation: Established stand (seven years old)
Previous crop: Sainfoin
Maintenance sprays: none
Surfactant or additions: See spray plan for details, .5% v/v R-11

Application data:

Date: 5/16/88 Air temp: 65 F Soil temp: 60 F Rel. Hum. 32 %
Wind: 0-3mph Cloud cover: clear
Soil moisture: Topsoil - fair subsoil - good
Nozzles: 8001, 9.76 gpa

Crop and weed stages at applications:

Weed or crop	Height	% composition of stand
Quackgrass	6-8"	65%
Sainfoin	7-10"	25%
Orchardgrass	9-11"	10%
Dandelion	5-7"	<1%

RESULTS:

Burndown ratings were made early, mid, and late season (6/7/88, 6/30/88/ and 10/5/88). All ratings were fairly consistant indicating that ammonium sulfate tank mixed with glyphosate demonstrated better quackgrass control than the bisulfate tank mix or glyphosate alone. All treatments gave poor quackgrass control at the low rate (.38 lb ae/A) but at .75 lb ae/A there was at least 65% control. Glyphosate plus ammonium sulfate at 75 lb ae/A of glyphosate gave the best quackgrass control.

Table 1. Agronomic data from the Glyphosate-plus-Additives Herbicide Study conducted in an established sainfoin for quackgrass control on the Northwestern Agricultutral Research Center in Kalispell, MT. in 1988.

Treatment	Rate # ai/A	Burndown 3/ Score	Burndown 3/ (%)	% Height Regrowth	Burn 4/ Down %	Burn 5/ Down %
Glyphosate + Surf (.5% v/v)	.38	4.000	38.33	53.33	41.67	20.0
" + "	.75	6.333	65.00	20.00	90.00	70.0
" + "	1.13	9.667	96.33	16.67	98.33	91.7
" + "	1.50	9.333	93.33	.0000	99.67	98.3
Glyphosate + Ammonium Sulfate (2% wt/vol) + surf. 1/	.38	4.667	46.67	26.67	50.00	40.0
" + "	.75	9.333	95.00	.0000	86.67	86.3
" + "	1.13	9.333	96.67	.0000	95.00	98.3
" + "	1.50	8.344	85.90	.0000	87.06	94.1
Glyphosate + Ammonium bisulfate(.48%wt/vol)+ Surf 2/	.38	3.667	33.33	53.33	33.33	40.0
" + "	.75	7.000	78.33	.0000	63.33	63.3
" + "	1.13	7.667	78.33	.0000	80.00	86.7
" + "	1.50	9.667	96.67	.0000	90.00	94.3
CHECK	----	.0000	.0000	.0000	.0000	.0000
$\bar{X}$		6.816	69.18	13.68	69.95	67.39
L.S.D.		2.212	19.55	27.79	20.16	24.93
C.V.		11.04	9.612	65.36	9.788	12.54
P-VALUE		.0000	.0000	.0013	.0000	.0000

Plots 10' x 20' x 5 = .023A 850 ml/plots 10' boom, 8001 nozzles, 9.76 gpa

1/ Ammonioum sulfate 2% wt/vol = 17 lbs/100 gals spray solution (1.66#/A)
2/ Ammonium bisulfate .48% wt/vol = 4 lbs/100 gals spray solution (.39#/A)
3/ Burndown Ratings 6/7/88
% Height Reductions are height regrowth ratings in comparison to check
4/ Burndown Ratings 6/30/88
5/ Burndown Ratings 10/5/88
Plant species rated (3,4, & 5) was Quackgrass (Agropyron repens)
Score: 0-10 rating, 0 = no burndown 10 = complete burndown, no growth
% = Percent burndown as compared to check

PROJECT TITLE: Evaluation of sethoxydim sequential applications to alfalfa.

YEAR/PROJECT: 1988/756

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

SUMMARY:

Sethoxydim applied post-emergemce to quackgrass in alfalfa effectively controlled quackgrass. The additon of adjuvant, Dash, was more effective than the crop oil concentrate as a spray additive.

RESEARCH METHODS:

Herbicides were applied post emergence using a tractor mounted research type sprayer. Plots were 10 feet by 20 feet with treatments being replicated three times in a randomized complete block. A spray volume of 24.85 gpa was applied using 8002 nozzles at 32 psi. The test was located in an established stand of alfalfa (Maxim) with a moderate infestation of quackgrass (Agropyron repens). Harvested area was a 2' X 16' area using a Rhem forage plot harvester at approximately 10% bloom for each cutting. Three harvest were made. Quackgrass control was rated June 7, 1988 and July 26, 1988. The percent composition of alfalfa, quackgrass, and broadleaf weeds was determined at each harvest by taking a subsample and hand separating each sample.

Planting data:
Established stand of Maxim alfalfa
Surfactant or additions: Crop oil concentrate or Dash, Table 1.

1) Application data: First application
Date: 5/12/88 Air temp: 66 F Soil temp: 63 F Rel. Hum. 30 %
Wind: 0 Cloud cover: clear
Soil moisture: Topsoil - good subsoil - very good

Crop and weed stages at applications:
Quackgrass (Agropyron repens) 10-12"
Garrison creeping foxtail 12-14"
Broadleaf weeds (dandelions, plantains) 1-3"

2) Application data: Sequential application
Date: 7/7/88 Air temp: 56 F Soil temp: 59 F Rel. Hum. 36 %
Wind: 0 Cloud cover: clear
Soil moisture : Topsoil - good subsoil - very good

Crop and weed stages at applications:

Quackgrass (Agropyron repens) 6 - 8"

RESULTS:

Ratings of quackgrass control (6/7 and 7/26) show that sethoxydim gave excellent control. The weed data indicate no obvious differences between any one rate or spray adjuvant used. First harvest results show the higher rate of sethoxydim gave slightly better control than the lower rate and the addition of Dash increased the effectiveness of sethoxydim. The second cutting results were similar to the first cutting with plots treated with sethoxydim and crop oil showing a lower percentage of alfalfa, due to the increase of broadleaf weeds. The third cutting showed grass percentages and broadleaf composition increasing in the treatments with lower rates of sethoxydim applied with crop oil. The total yield figures (Table 5) showed the high rate of sethoxydim plus Dash had about equal yields of hay as the check, and was a half ton greater than any other treatment. The total yield of alfalfa was greatest in the sethoxydim + Dash treatment which was a ton above the other treatments and one-half ton above the check.

Table 1. Agronomic data from the Sethoxydim Application Study to established alfalfa conducted on the Northwestern Agricultural Research Center in Kalispell, MT., 1988.

Treatment	Rate lb ai/A	Percent Quackgrass Control 1/ June 7, 1988	July 26, 1988
Sethoxydim + oil conc	.5 + 1 qt	100	96.7
Sequential 2/	.3 + 1 qt		
Sethoxydim + Dash 3/	.4 + 1 qt	100	96.7
Sequential	.2 + 1 qt		
Sethoxydim + Dash	.5 + 1 qt	100	95.0
Sequential	.3 + 1 qt		
CHECK	----	0	0
	$\bar{X}$	75.00	72.08
	P-value	.0000	.0000
	C.V.	.0000	2.407
	L.S.D.	.0000	6.003

1/ Percent Quackgrass (Agropyron repens) Control: Ocular reading
2/ Sequential applications after 6-8" regrowth of quackgrass
3/ Dash (BCH0815085 Adjuvant SD7010CCN 348) batch 3/16/88
Oil concentrate used: Concentrated soybean oil

Table 2. Agronomic data from the Sethoxydim Application Study to established alfalfa conducted on the Northwestern Agricultural Research Center in Kalispell, MT., 1988.

First Harvest: June 14, 1988

Treatment	Rate lb ai/A	Yield (Ton/Acre) Hay	Alfalfa	Percent Composition Alf	Grass	Brdlv
Sethoxydim + oil conc	.5 + 1 qt	2.88	2.66	93.1	1.7	5.2
Sequential 1/	.3 + 1 qt					
Sethoxydim + Dash 2/	.4 + 1 qt	2.99	2.94	98.5	1.0	.5
Sequential	.2 + 1 qt					
Sethoxydim + Dash	.5 + 1 qt	3.11	3.10	99.5	.3	.2
Sequential	.3 + 1 qt					
CHECK	----	3.27	2.85	88.2	11.5	.3
	$\bar{X}$	3.06	2.89	94.85	3.61	1.54
	P-value	.952	.905	.1401	.1147	.007
	C.V.	13.6	12.7	3.401	85.10	87.5
	L.S.D.	1.44	1.29	11.18	10.63	4.66

1/ Sequential applications after 6-8" regrowth of quackgrass
2/ Dash (BCH0815085 Adjuvant SD7010CCN 348) batch 3/16/88
Oil concentrate used: Concentrated soybean oil

Table 3. Agronomic data from the Sethoxydim Application Study to established alfalfa conducted on the Northwestern Agricultural Research Center in Kalispell, MT., 1988.

Second Harvest: July 28, 1988

Treatment	Rate lb ai/A	Yield (Ton/Acre) Hay	Alfalfa	Percent Composition Alf	Grass	Brdlv
Sethoxydim + oil conc	.5 + 1 qt	1.47	1.22	81.8	5.6	12.6
Sequential 1/	.3 + 1 qt					
Sethoxydim + Dash 2/	.4 + 1 qt	1.18	1.08	92.4	.5	7.0
Sequential	.2 + 1 qt					
Sethoxydim + Dash	.5 + 1 qt	1.54	1.53	99.1	.6	.3
Sequential	.3 + 1 qt					
CHECK	----	1.67	1.51	90.9	6.3	2.7
	$\bar{X}$	1.47	1.34	91.05	3.27	5.68
	P-value	.534	.4806	.2721	.5301	.4565
	C.V.	15.2	16.8	6.051	102.7	92.84
	L.S.D.	.770	.771	19.06	11.62	18.25

1/ Sequential applications after 6-8" regrowth of quackgrass
2/ Dash (BCH0815085 Adjuvant SD7010CCN 348) batch 3/16/88
Oil concentrate used: Concentrated soybean oil

Table 4. Agronomic data from the Sethoxydim Application Study to established alfalfa conducted on the Northwestern Agricultural Research Center in Kalispell, MT., 1988.

Third Harvest: September 29, 1988

Treatment	Rate lb ai/A	Yield (Ton/Acre) Hay	Alfalfa	Percent Composition Alf	Grass	Brdlv
Sethoxydim + oil conc	.5 + 1 qt	1.04	.82	77.1	8.2	14.7
Sequential 1/	.3 + 1 qt					
Sethoxydim + Dash 2/	.4 + 1 qt	1.12	.94	83.1	7.1	9.8
Sequential	.2 + 1 qt					
Sethoxydim + Dash	.5 + 1 qt	1.23	1.20	98.5	1.2	.3
Sequential	.3 + 1 qt					
CHECK	----	1.01	.86	84.7	5.2	10.1
	$\bar{X}$	1.10	.95	85.86	5.41	8.73
	P-value	.664	.213	.0333	.306	.1867
	C.V.	10.9	12.9	4.491	46.1	46.66
	L.S.D.	.418	.425	13.35	8.63	14.99

1/ Sequential applications after 6-8" regrowth of quackgrass
2/ Dash (BCH0815085 Adjuvant SD7010CCN 348) batch 3/16/88
Oil concentrate used: Concentrated soybean oil

Table 5. Agronomic data from the Sethoxydim Application Study to established alfalfa conducted on the Northwestern Agricultural Research Center in Kalispell, MT., 1988.

Combined Harvest Data (three cuts)

Treatment	Rate lb ai/A	Total Yield (Ton/Acre) Hay	Alfalfa
Sethoxydim + oil conc	.5 + 1 qt	5.39	4.70
Sequential 1/	.3 + 1 qt		
Sethoxydim + Dash 2/	.4 + 1 qt	5.29	4.96
Sequential	.2 + 1 qt		
Sethoxydim + Dash	.5 + 1 qt	5.88	5.83
Sequential	.3 + 1 qt		
CHECK	----	5.95	5.22
	$\bar{X}$	5.63	5.18

1/ Sequential applications after 6-8" regrowth of quackgrass
2/ Dash (BCH0815085 Adjuvant SD7010CCN 348) batch 3/16/88
Oil concentrate used: Concentrated soybean oil

PROJECT TITLE: Spring Barley Variety Evaluations

YEAR/PROJECT: 1988/756

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

SUMMARY:

Excellent yields and test weights were obtained from the 1988 Intrastate and Early Yield spring barley nurseries. The majority of yields were above 100 bushel/A and test weights averaged above 52 lbs/bu for the Intrastate or 49.68 lbs/bu for the Early Yield.

Despite hot, dry weather conditions this season good yields were obtained from the Lake and Ravalli County Offstation Nurseries. Mean yields in both counties were above 90 bu/A.

RESULTS:

1988 Intrastate Spring Barley Nursery -

The mean yield in 1988 was 106. 85 bu/A while in 1987 it was 95.37 bu/A. Ample and timely spring moisture resulted in good yields in spite of the hot and dry summer. Of the sixty-four entries there were only eleven that did not yield above 100 bu/A. Clark, the check variety had a yield of 107.42 bu/A. Test weights were excellent and had a mean of 51.99 lbs/bu. Percent plump averages were lower than normal, height averages were greater, and heading dates were about three days later on the average. Table 1.

1988 Early Yield Nursery -

Excellent yields were obtained from this nursery. The highest yielding entry was MT 870070 at 146.67 bu/A. The mean yield for the nursery was 108.78 bu/A. Of the sixty four entries only fifteen did not have yields of 100 bu/A or greater. Test weight average was 49.68 lbs/bu and is lower than the Intrastate nursery. Eleven entries had test weights that exceeded 52 lbs/bu and Clark, the check had the highest with 53.60 lbs/bu. Percent plumps for this nursery were generally low (mean 83.68%) due in part to the high incidence of lodging. There was lodging in all but five varieties and average prevalence was 45.64 percent with a mean severity of 4.5 on a scale of 0-9. Table 2.

Lake County Nursery -

Gallatin spring barley plot yields were the highest at 106.98 bu/A. The mean yield for the twenty entry nursery was 93.89 bu/A with all but six entries yielding above 90 bu/A. Test weights averaged 52.08 lbs./Bu. Percent plump measurements were slighlty lower than normal and varied from 88.97 to 98.27%.

Corvallis Research Center, Ravalli County -

Light shattering and lodging observed in this nursery may have attributed to lower than expected yields (mean yield 55.03 bu/A). Lewis had the high yield at 71.94 bu/A. Test weight and percent plump pertage means were 51.59 lbs/bu and 86.27 % respectively. Lodging varied from 93% to none (in three entries there was no lodging).

Ravalli County, Bill Strange farm -

Very good yields were obtained from the Ravalli County site with the mean yield being 92.51 bu/A. Eight entries exceeded 100 bu/A in yield, Triumph was the highest at 116.25 bu/A. Test weights were normal and averaged 51.54 lbs/bu. Percent plumps ranged from 81.1 to 96.9%.

Table 1. Agronomic data from the 1988 Interstate Spring Barley Nursery grown on the Northwest Agricultural Research Center in Kalispell, MT.
Date Seeded: April 1, 1988 Date Harvested: August 4, 1988

	VARIETY	YIELD BU/A	TEST WT LBS/BU	PERCENT PLUMP	HEIGHT INCHES	HEADING DATE
MT860224	LEWIS/APEX	119.79a	54.00	93.90	31.10	168.00
MT861626	GALLATIN/HARRINGTON	118.02	51.00	87.10	32.68	170.00
CO 3	MORAVIAN 3	117.23	52.10	94.00	30.71	167.67
MT860756	GALLATIN/BELLONA	116.81	52.60	89.50	31.10	166.67
MT 83424	CLARK/TR450	116.48	52.13	90.67	33.46	169.00
MT140523	HECTOR/KLAGES	116.31	52.00	88.40	32.68	168.67
MT 83435	CLARK/TR450	115.50	53.60	90.30	32.15	167.33
MT851051	HARRINGTON/MT 41921	114.85	50.90	92.50	31.89	168.33
MT860449	HARRINGTON/APEX	114.81	50.90	85.60	30.58	169.00
CI 15856	LEWIS	114.29	53.40	91.10	33.33	167.00
MT 83533	CLARK/LAMONT	114.02	52.50	92.40	33.07	168.33
MT851221	ID810264/MT 41918	113.92	53.00	90.60	34.38a	168.33
MT 83518	CLARK/LAMONT	113.90	52.50	89.50	32.81	167.67
MT 83422	CLARK/TR450	113.77	52.30	88.60	32.28	167.33
MT 81502	Clark//Kgs/Zy	113.56	52.60	86.70	31.50	167.67
MT861183	WA 890878/MENUET	113.54	52.80	91.30	31.89	169.33
BA 8529	BUSCH AGR 8529	112.46	52.10	95.30	32.68	168.00
AC117-11	AC117-11	112.31	49.50	73.00	25.46b	170.33
CI 15478	KLAGES	112.27	52.30	82.10	31.63	170.33
MT860186	LEWIS/APEX	112.10	50.00	84.00	30.45	168.67
MT860373	LEWIS/BIRKA	111.96	53.83	80.07	32.55	167.33
MT860189	LEWIS/APEX	111.79	51.50	80.20	29.40	168.00
MT 81143	Hcr/Kgs//Kgs/Smt	111.25	54.20	93.80	32.28	167.67
MT861554	CLARK/TR 533	110.79	53.00	94.20	35.43a	167.00
MT851161	MT 41918/MT 41279	110.27	51.40	79.80	30.71	166.67
MT851031	HARRINGTON/CLARK	110.00	52.60	94.00	33.07	168.67
MT861426	MT861426	109.92	53.10	86.90	32.55	167.00
MT851195	MT 41918/TR 450	109.65	52.20	88.10	33.73	167.00
MT860463	HARRINGTON/APEX	109.31	50.90	84.90	31.10	168.33
MT851032	HARRINGTON/CLARK	108.65	52.20	89.40	31.36	170.00
MT 83491	CLARK/MT 41279	108.46	52.10	86.30	32.55	169.00
MT860737	GALLATIN/APEX	108.44	53.10	84.30	31.10	168.33
BA 4039	BUSCH AGR 4039	108.35	50.80	85.90	29.53	169.00
MT860121	CLARK/MENUET	108.02	52.70	91.80	35.70a	168.33
PI483237	BOWMAN	107.96	53.00	95.20	32.28	166.67
MT860839	SUNBAR 560/MT 41549	107.85	51.50	83.30	29.40	168.33
CI 15857	CLARK 1/	107.42	51.00	85.60	31.23	169.00
MT851224	ID810264/MT41918	107.17	52.10	90.10	30.71	166.33
CI 15229	STEPTOE	107.10	47.20	92.00	31.10	164.00b
MT860219	LEWIS/APEX	107.06	51.60	88.10	30.58	169.67
PI483127	RUSSELL	107.02	50.00	85.90	31.89	167.33
PI491534	GALLATIN	105.75	52.80	88.40	33.86	166.33
MT861572	LEWIS/MT 41549	105.06	54.50	90.00	33.33	167.33
MT851088	MT354585/MT 4126	104.04	51.00	91.27	32.15	167.33
MT860326	LEWIS/TR 533	103.58	53.50	86.40	32.28	167.00

Table 1 (Cont'd). Agronomic data from the 1988 Interstate Spring Barley Nursery grown on the Northwest Agricultural Research Center in Kalispell, MT.
Seeded: April 1, 1988 Harvested: August 4, 1988

VARIETY	YIELD BU/A	TEST WT LBS/BU	PERCENT PLUMP	HEIGHT INCHES	HEADING DATE
CI 15514 HECTOR	103.58	53.00	91.30	35.96a	167.00
MT861330 MT 41238/ND 5698	103.38	53.30	94.80	34.25a	167.00
FM 1 TRIUMPH	103.35	50.00	81.40	27.95b	167.33
SK 76333 HARRINGTON	102.79	50.40	85.10	31.50	168.00
MT851177 MT 41918/BRIDGER 82	102.48	50.30	79.20	30.84	167.33
MT861596 LEWIS/MT 41549	102.29	53.17	84.10	32.94	168.33
MT 81161 Lewis//Kgs/Smt	101.85	50.50	89.20	30.58	168.33
MT851012 CLARK/WA877178	101.02	51.50	89.20	33.07	167.00
MT851011 CLARK/WA877178	99.92	51.60	87.20	33.60	168.00
MT851005 CLARK/ID 810264	99.63	51.00	87.07	34.91a	167.00
MT851216 ID810264/MT 4126	98.92	51.40	89.40	32.15	167.00
MT 81616 TR440/CLARK	98.23	49.40	84.70	32.02	170.67
MT851013 CLARK/WA877178	94.65b	51.67	90.63	32.68	168.00
CI 15773 MOREX	93.63b	50.70	87.80	37.40a	165.00b
CI 9558 PIROLINE	91.87b	50.80	76.70	33.99a	168.33
MN 36 ROBUST	91.44b	50.90	82.40	35.43a	168.33
MT851039 HARRINGTON/MT 41279	90.35b	51.20	85.20	32.15	168.00
BE 14 NUBET	79.17b	56.40	23.40	32.55	171.00
BE 15 WANUBET	76.46b	56.10	11.00	33.86	169.33
$\bar{X}$	106.85	51.99	85.75	32.24	167.97
C.V.	4.06	0.0	0.0	2.98	.69
L.S.D.	12.15	0.0	0.0	2.68	3.26

1/ Check value
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 1988 Early Yield Trial grown on the Northwestern Agricultural Research Center, Kalispell, MT.
Date Seeded: April 1, 1988 Date Harvested: August 10, 1988

	VARIETY	YIELD BU/A	TEST WT LBS/BU	PERCENT PLUMP	HEIGHT INCHES	HEADING DATE	-- LODGING -- PREV.	SEVER.
MT870070	COLUMBIA/LINDY	146.67a	51.50	94.00	34.78b	166.00	15.00	3.33
MT870120	LINDY/MARTIN	138.06a	51.20	89.70	37.66	165.00b	36.67	5.00
CI 15229	STEPTOE	131.17a	47.10	94.60	36.75	166.33	50.00	5.67
MT870248	WESTBRED 501/EARLY TITAN	124.52	49.60	80.40	35.70b	164.67b	5.00	1.00
MT870062	COLUMBIA/GALLATIN	122.79	50.20	74.50	36.75	165.67b	6.67	2.00
MT870249	WESTBRED 501/EARLY TITAN	122.50	48.40	75.30	38.19	165.33b	15.00	3.67
MT870170	MT 3712/ERBET	122.25	52.00	93.30	35.83	171.00a	31.67	4.67
MT870246	TETON/WESTBRED 501	122.19	49.20	96.10	38.98	166.67	30.00	2.67
MT870113	KLAGES/UT 1423	121.90	47.10	69.60	36.75	166.00	56.67	4.33
MT870027	BA 26/UT 1423	119.54	47.40	65.60	36.22	167.00	73.33a	6.67
MT870056	COLUMBIA/BA 26	119.35	48.60	79.50	34.51b	168.67	88.33a	8.00a
MT870216	ROBUST/BRIGGS	118.58	48.90	94.20	40.68	165.33b	26.67	2.33
MT870243	TETON/ROBUST	118.42	50.00	96.30	41.60a	168.00	3.33	1.00
MT870055	COLUMBIA/AZURE	117.67	49.20	92.00	40.29	168.00	.00	.00b
MT870014	APEX/PREMIER	117.48	52.30	93.80	35.30b	169.67a	.00	.00b
MT870214	ROBUST/ATSEL	117.35	50.40	89.20	37.80	164.33b	13.33	2.00
MT870083	FLEET/GALLATIN	117.04	51.40	75.10	27.82b	167.67	30.00	.67a
MT870012	APEX/LEWIS	116.50	52.00	82.10	35.83	169.67a	76.67a	5.33
MT870250	WESTBRED 501/MOREX	115.48	49.60	83.70	33.86b	166.67	10.00	1.00
MT870063	COLUMBIA/GALLATIN	115.10	50.40	83.30	33.60b	166.00	.00	.00b
MT870112	KLAGES/UT 1423	114.90	47.80	61.00	37.53	167.33	53.33	5.00
MT870148	MINERVA MUTANT/ROBUST	114.54	47.00	55.07	35.30b	165.67b	26.67	6.00
MT870137	MINERVA MUTANT/CLARK	113.69	47.80	78.30	34.25b	168.33	94.67a	8.33a
CI 15856	LEWIS 1/	113.25	53.60	95.40	38.58	167.33	33.33	4.33
MT870065	COLUMBIA/HAZEN	113.06	51.00	96.20	41.47a	167.33	8.33	2.00
MT870149	MINERVA MUTANT/UT 1423	112.60	46.60	66.20	36.22	166.00	43.33	4.67
MT870054	COLUMBIA/AZURE	111.87	47.77	89.90	37.14	165.67b	20.00	2.33
MT870222	ROBUST/LEWIS	111.62	49.10	48.80	36.35	166.00	35.00	3.67
MT870140	MINERVA MUTANT/GLENN	111.04	44.10	46.20	35.30b	165.00b	80.00a	5.33
MT870236	SEL 62/RADSKORN	110.44	51.20	83.50	34.12b	165.00b	13.33	3.67
CI 15514	HECTOR	110.06	51.00	87.90	38.58	167.67	91.67a	7.67
MT870126	MARTIA/STEPTOE/KLAGES	109.96	49.80	95.60	40.29	166.33	20.00	2.00
MT870174	MT 3712/HECTOR	108.98	52.50	95.40	37.27	168.00	41.67	4.33
MT870200	MT312613/ERBET	108.25	50.30	87.00	36.35	166.33	86.67a	5.67
MT870150	MINERVA MUTANT/UT 1423	107.46	46.40	61.60	36.88	168.67	43.33	5.00
MT870092	GALLATIN/UT 1423	107.21	50.40	73.00	35.04b	165.33b	28.33	5.00
MT870066	COLUMBIA/HAZEN	106.37	49.00	96.90	37.27	167.67	11.67	3.67
MT870060	COLUMBIA/FLEET	105.21	48.00	69.90	35.56b	167.67	10.00	4.33
MT870157	MOREX/EARLY TITAN	104.42	49.50	77.00	41.99a	165.00b	75.00	5.67
MT870084	FLEET/LEWIS	104.17	44.40	87.00	36.35	168.33	66.67	6.33
MT870203	MT312613/HCR/KLGS//WA9037	104.08	48.00	76.00	37.66	167.67	75.00a	7.00
SK 76333	HARRINGTON	104.00	51.20	91.60	37.01	170.33a	63.33	5.67
MT870075	COLUMBIA/ROBUST	103.56	49.60	94.00	40.03	166.33	31.67	2.33
MT870237	SEL 62/RADSKORN	103.50	47.10	87.13	36.22	165.67b	.00	.00

Table 2 (Cont,d). Agronomic data from the 1988 Early Yield Trial grown on the Northwestern Agricultural Research Center, Kalispell, MT.
Date Seeded: April 1, 1988 Date Harvested: August 10, 1988

	VARIETY	YIELD BU/A	TEST WT LBS/BU	PERCENT PLUMP	HEIGHT INCHES	HEADING DATE	-- LODGING -- PREV.	SEVER.
MT870212	MT312613/SPARTAN	103.02	49.00	85.00	33.99b	165.00b	93.33	5.67
MT870136	MINERVA MUTANT/CLARK	102.40	52.50	94.20	36.35	167.33	81.33a	6.67
MT870031	BA79533/LEWIS	102.23	52.80	81.60	34.91b	168.00	73.33	7.67
MT870049	CLARK/HECTOR	102.17	53.40	95.20	39.76	167.67	90.00a	5.33
MT870122	MARTIA/EARLY TITAN	101.65	46.90	89.40	37.27	167.00	61.67	7.00
CI 15478	KLAGES	99.83	49.40	73.50	36.09	172.33a	58.33	6.67
MT870183	MT 3712/TOKAK	98.92	52.50	92.80	38.32	167.33	38.33	4.67
MT870100	HAZEN/CHALKY GLENN	97.52	50.40	94.10	42.78a	166.00	0.00	0.00b
MT870169	MT 3712/COMPANA	95.00b	50.40	87.20	34.25b	165.00b	99.00a	7.67
MT870109	ID 76871/GALLATIN	94.92b	52.50	86.90	38.32	168.00	78.33a	6.67
MT870028	BA79533/COMPANA	94.27b	47.53	84.50	35.70b	166.33	97.67a	8.33a
MT870168	MT 3712/BA 79533	94.08b	48.00	80.40	37.80	168.67	81.67a	7.00
MT870127	MARTIA/STEPTOE/KLAGES	93.48b	52.10	90.00	37.01	165.67b	68.33	6.67
MT870098	HAZEN/AZURE	93.38b	52.30	95.40	40.94	165.67b	26.67	2.67
MT870043	CLARK/COMPANA	92.71b	48.40	94.30	39.11	167.67	93.33	6.33
MT870204	MT312613/HCR/KLGS//WA9037	90.04b	52.20	84.60	35.30b	167.67	61.67	5.00
MT870162	MOREX/ROBUST	89.73b	48.60	74.00	41.08	166.33	56.67	7.67
MT870184	MT 3712/TOKAK	88.27b	49.00	84.10	37.14	167.67	75.00a	6.00
MT870160	MOREX/ROBUST	85.54b	51.20	91.80	44.09a	166.33	35.00	6.6
MT870105	HAZEN/UT1423	84.23b	50.93	93.50	41.99a	167.33	30.00	3.67
	$\bar{X}$	108.78	49.68	83.68	37.26	166.96	45.64	4.49
	C.V.	5.58	0.0	0.0	2.73	.31	29.32	5.58
	L.S.D.	16.98	0.0	0.0	2.85	1.43	37.45	3.43

1/ Check variety
a/ Indicates values significantly greater than the check at the .05 level
b/ Indicates values significantly less than the check at the .05 level

Table 3. Agronomic data from the off station spring barley nursery grown on the Jim Nethercott farm, Valley View, MT. Lake Co.
Date Seeded: April 13, 1988 Date Harvested: August 17, 1988

	VARIETY		YIELD BU/A	TEST WT LB/BU	% PLUMP	HEIGHT INCHES
PI491534	Gallatin		106.98	54.00	95.80	29.27
FM 1	TRIUMPH		106.31	52.67	96.70	25.07
CI 15687	KIMBERLY		104.71	52.93	95.53	32.68
CI 15773	MOREX		102.90	50.23b	94.13	28.22
CI 15856	LEWIS		101.94	53.83	96.37	27.56
VD 3	MENUET		97.85	53.43	97.87	24.54
SK 76333	HARRINGTON		97.67	51.80b	94.60	27.43
MN 36	ROBUST		95.54	51.43b	95.67	30.97
CI 15514	HECTOR		95.52	53.27	96.03	28.22
CI 10083	INGRID	1/	94.46	53.37	97.27	30.31
BA 1202	Busch Agr 1202		93.04	51.67b	96.40	25.85
78AB6871	Crystal		91.79	53.30	97.50	27.03
CI 15478	KLAGES		91.04	52.33	91.47	29.27
MT 81161	MT 81161		90.92	52.70	93.90	27.03
CB 2	BELLONA		89.60	53.17	97.93	24.54
MT 81616	MT 81616		89.29	50.80b	88.97b	27.43
CI 15857	CLARK		89.27	51.87b	90.83b	29.79
CO 3	MORAVIAN 3		81.60	53.03	98.27	29.27
PI483127	Russell		81.08	49.20b	90.13b	27.43
CI 15229	STEPTOE		76.25	46.50b	94.77	21.92
	$\bar{X}$		93.89	52.08	95.01	27.69
	C.V.		7.43	.72	1.93	7.20
	L.S.D		19.98	1.07	5.26	5.70

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

Table 4. Agronomic data from the off station spring barley nursery grown on the Western Agricultural Research Center, Corvallis MT.
Date Seeded: April 13, 1988 Date Harvested: August 16, 1988

	VARIETY	YIELD BU/A	TEST WT LBS/BU	PERCENT PLUMP	HEIGHT INCHES	-- LODGING -- %	SEVER
PI491534	Gallatin	70.19a	54.00	81.90	27.17a	31.67	1.0
CI 15857	CLARK	64.21a	52.60	89.70	27.03a	93.33	4.0
FM 1	TRIUMPH	28.21	52.20	89.00	19.82	0.0	0.0
BA 1202	Busch Agr 1202	48.29	50.50	78.80	24.28	53.33	4.0
CI 15514	HECTOR	63.02a	52.60	91.60	27.56a	63.33	4.3
CB 2	BELLONA	42.79	51.90	86.20	22.83	0.0	0.0
CI 15478	KLAGES	55.58a	52.00	88.90	24.80	51.67	2.0
CI 15229	STEPTOE	62.90a	45.60	80.20	28.87	50.00	3.7
CI 15856	LEWIS	71.94a	53.50	91.80	27.56a	6.67	1.0
CI 15687	KIMBERLY	51.83	53.37	93.70	28.61a	46.67	4.0
MT 81616	MT 81616	58.42a	51.80	92.40	25.33	63.13	3.0
MT 81161	MT 81161	59.69a	51.20	81.30	28.08a	16.67	1.7
78AB6871	Crystal	48.31	52.30	90.50	23.23	41.67	2.7
PI483127	Russell	56.29a	48.37	78.30	26.77a	31.67	2.3
VD 3	MENUET	51.56	51.90	82.40	22.18	25.00	1.7
CO 3	MORAVIAN 3	62.48a	53.50	93.60	27.43a	58.33	4.3
MN 36	ROBUST	58.94a	51.10	82.10	32.02a	0.0	0.0
CI 10083	INGRID	38.60	53.90	93.10	22.83	88.33	3.7
CI 15773	MOREX	60.98a	48.50	69.30	30.97a	50.00	3.7
SK 76333	HARRINGTON	46.33	51.00	90.60	25.72	31.67	1.0
	$\bar{X}$	55.03	51.59	86.27	26.15	40.17	2.4
	C.V.	9.16	0	0	5.08	58.69	62.96
	L.S.D.	14.44	0	0	3.80	67.49	4.33

1/ Check variety
2/ Lodging notes: Lodging % = % of plot lodged, Lodging sever = severity, or degree of lodging 0 = no lodging, 9 = lodged to ground
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 off station spring barley nursery grown on the Bill Strange farm, Stephensville, MT. Ravalli Co.
Date Seeded: April 13, 19 Harvested: August 16,1988

	Variety		YIELD BU/A	TEST WT LBS/BU	% PLUMP	HEIGHT INCHES
FM 1	TRIUMPH		116.25	50.70	91.80	33.00b
CI 10083	INGRID	1/	103.29	50.80	80.10	37.40
MT 81616	MT 81616		101.48	52.10	94.60	39.11
78AB6871	Crystal		101.17	52.60	96.90	38.98
BA 1202	Busch Agr 1202		101.00	49.70	92.53	35.56
CI 15856	LEWIS		100.98	53.00	94.40	37.80
SK 76333	HARRINGTON		100.29	52.10	95.20	35.70
PI491534	Gallatin		100.06	52.40	93.20	35.17
PI483127	Russell		96.65	48.40	85.03	37.01
CI 15857	CLARK		94.52	51.80	87.90	39.24
CB 2	BELLONA		93.38	52.40	94.60	34.65
CI 15514	HECTOR		90.94	50.40	81.10	38.32
CI 15687	KIMBERLY		89.79	50.10	80.90	38.85
VD 3	MENUET		89.71	52.00	92.20	35.70
CI 15478	KLAGES		88.75	51.60	90.60	39.24
CI 15229	STEPTOE		82.62b	49.50	91.60	36.35
MT 81161	MT 81161		82.62b	50.60	92.20	36.09
CI 15773	MOREX		80.56b	48.30	84.90	43.18a
CO 3	MORAVIAN 3		73.06b	51.70	92.20	35.83
MN 36	ROBUST		63.02b	50.60	90.20	42.65a
		$\bar{X}$	92.51	51.54	90.11	37.49
		C.V.	6.22	0.0	0.0	3.24
		L.S.D.	16.48	0.0	0.0	3.47

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

PROJECT TITLE: 1988 Uniform Northwestern Oat Nursery

YEAR/PROJECT: 1988/756

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

SUMMARY:

To determine the adaptablilty of new and introduced oat varieties to Montana the Northwestern Uniform Oat nursery is grown in Kalispell, and throughout the state in dryland and irrigated conditions. This nursery was grown under high moisture conditions.

RESULTS:

The check variety, Otana ,yielded 187.39 bushel/acre. Monida (216.35 bu/Acre) and ID 82248 (212.84 bu/A) had significantly higher yields than Otana. There were seven varieties that yielded above 200 bu/A.

Test weights were very good considering the drier season. The average was 38.28 lbs/bu. The highest test weight was 41.83 lb/bu for the variety Trucker. Height and heading date are included in Table 1.

Table 1. Agronomic data from the 1988 N. W. Uniform Oat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT. Field Y2

Seeded April 1, 1988 Harvested: August 12, 1988

	VARIETY	YIELD BU/A	TEST WT LB/BU	HT INCHES	HEAD DATE
CI483126	Monida (ID 751170	216.35a	39.53	45.54	171.00
ID 82248	CAYUSE/MONIDA	212.84a	38.80b	37.27b	173.00a
ID742608	CAYUSE/OTANA	207.74	38.87b	41.60b	174.00a
ID821142	74ab1952/74ab2608	202.70	37.27b	31.10b	171.33
ID804725	CAYUSE/74/AB1956	201.85	38.40b	33.60b	171.33
W 80474	RIEL	201.38	38.50b	45.54	170.00b
ID 75861	CAYUSE/OTANA	201.20	39.30	39.63b	173.00a
ID805322	BORDER/74AB1956	199.57	39.23	34.65b	172.67a
CI467882	BORDER	198.07	37.80b	40.03b	172.67a
OT 308	CALIBRE	197.94	40.97	50.39a	171.33
ID815792	74AB2608/CAYUSE6	197.47	37.67b	35.70b	169.67b
W 78286	DUMONT	195.28	39.13	49.47	171.33
ID805807	74AB2608/CAYUSE	195.28	37.67b	37.40b	172.00
ID 80988	74AB1952/74AB2608	194.34	37.00b	32.55b	171.33
ID766843	K71299/3/OTANA/2/CO	194.15	37.67b	35.30b	170.00b
CI 9297	APPALOOSA	189.08	35.73b	39.11b	172.33
NPB86803	OGLE/OTTAWA 32015	189.08	34.93b	29.00b	168.33b
CI 9252	OTANA 1/	187.39	40.30	46.72	171.33
OT 726	CASCADE	187.24	39.17	48.69	171.67
ID783965	AURORA NYCRR COMPOS	185.14	37.67b	39.24b	170.33
CI 8263	CAYUSE	182.76	37.97b	41.08b	170.00b
ND820603	FROKER/RL 3038/2/HU	178.50	39.73	36.61b	170.00b
ID821178	74AB1952/75AB1576	175.56	38.77b	31.23b	170.33
W 82056	OT 212/RL 3064	175.22	37.10b	46.06	172.67a
CI 6611	PARK	173.62	38.90b	46.85	172.67a
NPB86830	OGLE/PA 7733-551	171.24	35.40b	34.65b	166.33b
CI 9412	PORTER	170.99	39.27	40.03b	170.67
CI 9401	OGLE	168.96	35.63b	37.40b	167.00b
SD810109	TRUCKER (MOORE//DA	149.55b	41.83a	44.49	170.00
	EXPERIMENTAL MEANS	189.67	38.28	39.69	170.98
	F TEST FOR VAR.	3.99**	13.43**	32.57**	21.49**
	C.V. 2: (S OF MEAN/MEAN)*100	3.91	1.14	2.63	.22
	LSD (0.05)	21.04	1.24	2.95	1.06

1/ Check variety
2/ F value determining significant differences among varieties
** Indicates statistical significance at the .01 level

PROJECT TITLE: Spring Wheat Variety Trials

YEAR/PROJECT: 1988/756 Small Grain Production

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

SUMMARY:

Dispite the hot dry summer during the season the spring wheat nurseries performed better in yield and test weight than last year. Several varieties had yields in excess of 100 bu/A and test weights were as high as 63 lbs/bushel.

Yields, test weights and height were reduced this season at both Lake and Ravalli County sites due to severe weather conditions. Severe weed pressure in the Lake County nursery also effected yields.

RESULTS:

Western Regional Spring Wheat -

Owens had a yield of 105.6 bu/A which was 4 bushels higher than last last year. There were 14 entries that yielded more than 100 bushel/A. The mean yield was 95.9 bu/A, ten bushels less than last year's mean. The test weight mean for this nursery was 59.8 lbs/bu with Owens having a weight of 60.73 lbs/bu. Test weights actually were higher this year than 1987. Heading dates were four days later than the 1987 (164.87). Table 1. No diseases were noted.

Advanced Yield Spring Wheat -

The check variety Newana yielded 113.85 bu/A with only two varieties, Treasure at 139. 08 bu/A, and Owens at 129.08 bu/A, having significantly higher yields. The mean yield for the nursery was 104.08 bu/A, eight bushels higher than last year. Twenty eight entries yielded above 100 bushels/A. Test weights were excellent and averaged 62.19 lbs/bu. Five entries had test weights of 63 lbs/bu or above. Heading dates averaged 168, which was five days later than the 1987 nursery. Table 2.

Lake County Nursery -

Of the twenty varieties tested Owens had the highest yield of 55.1 bu/A. The only other entry yielding above 50 bu/A was Newana (50.75 bu/A). The average yield was 43.3 bu/A. The test weight mean was 60.2 lb/bu.

Ravalli County Nursery -

Light shattering through out this nursery caused reduction in yields. Pondera had the highest yield at 44.94 bu/A. Glenman, Owens, Rambo, and Copper were equal in yield with each producing above 40 bu/A. Test weights averaged 59.4 lb/bu.

Triticale Nursery - The data from a cooperative triticale nursery grown this year is found in Table 5.

Table 1. Agronomic data from the Western Regional Spring Wheat Nursery grown on the Northwestern Reasearch Center , Kalispell , MT.
Date seeded: April 1, 1988 Date harvested: August 19,1988

CI or State #	Variety	Yield Bu/A	Test wt lb/Bu	Heading Date	Height (")
OR487570	EKU SIB/1JB84/1	106.5	59.60	171.0	33.46
WA 7183	K78504/K779129-3	97.45	59.50	171.0	32.02
ID 366	BBH/3/II-60-101	92.80b	60.73	169.3	34.65
ID 75021	ID204/ID134	88.05b	61.00	169.0	31.76b
WA 6920	PENAWANA	99.35	60.03	170.3	30.97b
UT 884	WYNNE/CA353	100.6	59.67	168.7	31.50b
UT 1437	UT74525-910/CA3	100.9	60.27	169.7	35.04
WA 7176	K78504/K74129-3	101.1	59.50	170.7	34.65
WA 7075	K73579/BORAH	101.5	59.03	169.7	32.68
WA 7493	KDM0004/NK751	102.4	60.17	167.7b	32.55
UT 526	FREMONT/ID1165	110.8	61.67	170.0	34.78
ID 312	COWBIRD S./2*ST	105.0	60.80	167.0b	32.94
ID 367	A76102S-1-2/ID1	100.7	59.37	170.0	32.15b
ID 379	ID190/ID138B	106.7	60.37	169.3	33.20
WA 7326	K720508/CI1419	97.35	59.20	170.3	33.59
CI 4734	FEDERATION	66.65b	57.53b	171.0	39.49a
CI 17903	MCKAY	96.85	59.57	171.0	32.15b
ID 372	OWENS/FIELDWIN	104.3	60.93	169.3	36.35a
CI 17904	OWENS 1/	105.6	60.73	170.0	34.25
ORS 8509	VEERY.S,CM33027	94.90	60.60	170.0	29.00b
OR 8508	TANAGER'S',CM30	93.10	61.77	166.0b	30.97b
UT 743	WYNNE/CA353	97.95	60.83	171.0	32.55
ID 341	COWBIRD"S"/5/MC	77.10b	58.97	170.7	29.26a
ID 348	2*SLG//COWBIRD"	101.5	60.80	170.0	33.07
WA 7492	K78504/K74129-3	95.15	58.57	170.7	36.09a
ID 372	ID172/FIELDWIN	105.0	60.90	170.0	33.33
OR 487316	SAP SIB/MON SIB	94.55	59.33	169.7	28.74b
OR 487503	CORVALLIS DUAL	93.10	59.47	171.0	31.89b
UT 1309	UT74525-910/CA3	89.35b	59.63	171.0	35.43
ORS 8510	KINIVET.S,CM377	91.20b	60.80	170.7	31.89b
ID 368	A76102S-1-2/ID1	94.50	59.53	169.0	33.86
WA 7328	NHS07664/NDM000	80.10b	57.47	171.0	33.73
UT 817	WYNNE/CA353	96.05	60.50	170.3	31.23b
OR 487006	BUCK/MATUCHE	87.25b	60.47	162.3b	30.71b
ID 365	COWBIRD"S"/STER	90.75b	59.70	167.0b	31.76b
ORS 8511	KVZ/3/TOB/CFN//	87.45b	60.80	168.7	30.05b
ORS 8512	BOW.S,CM33023-F	92.20b	62.57	168.7	28.61b
WA 7496	K7400315/PTM70S	90.50b	55.97b	169.0	29.40b
ORS8422	TITKOUSE.S,CM30	97.70	54.00b	167.0	29.79b
	$\bar{X}$	95.90	59.80	169.5	32.85
	C.V.	4.715	1.820	.3916	1.892
	L.S.D.	12.74	3.066	1.869	1.729

1/ Check Variety
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 Advanced Yield Spring Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1988.

Date planted: April 1, 1988 Date harvested: August 19, 1988

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGHT INCHES
ID 248	TREASURE	139.08a	59.77	171.00	34.91
CI 17904	OWENS 1/	129.08a	62.10	169.67	36.75a
STOCK000	STOCKHOLM	122.62	63.17	171.00	32.28
C982-324	RAMBO	115.03	62.47	169.00	35.04
MT 8182	YDING "S"/PCI "S"-287	114.27	60.57	168.00	33.99b
ID 238	COPPER	114.03	61.47	167.33b	33.99b
CI 17430	NEWANA	113.85	61.40	171.00	34.12b
CI 17828	PONDERA	113.67	62.70	167.67b	36.09a
MT 8612	CI15838/MT7418//PONDERA	113.65	63.23	167.67b	35.56
MT 8651	CI15838/MT7418//PONDERA	112.35	62.17	168.67b	35.96
PI483235	GLENMAN	112.13	61.80	169.67	35.43
MT 8631	CI15838/MT7418//PONDERA	111.33	62.83	167.67b	35.30
MT 8603	MT7635/NACOZARI S	111.27	62.37	166.67b	34.12b
MT 8627	NEWANA/MT7746	110.88	61.77	167.33b	35.04
MT 8658	MT7635/NACOZARI S	110.30	61.83	166.33b	34.25b
MT 8615	CI15838/MT7418//PONDERA	109.97	62.90	167.67b	33.99b
MT 8645	CI15838/MT7418//PONDERA	108.43	61.87	167.00b	33.99b
MT 8602	CI15838/MT7418//PONDERA	106.67	62.40	167.33b	37.14a
MT 8608	NEWANA/MT7746	106.57	62.33	168.67b	34.78b
MT 8626	CI15838/MT7418//PONDERA	106.48	62.83	167.33b	35.30
MT 8424	MT7336/NORANA	106.35	62.03	167.67b	36.35a
MT 8632	NEWANA/MT7746	105.05	61.13	167.33b	33.60b
ND 606	AMIDON	103.72	61.50	169.33	43.04a
CI 17282	CROSBY	103.57	62.87	170.33	45.28a
MT 8657	LEN/MT7632	102.53	61.63	165.67b	33.99b
MT 8652	CI15838/MT7418//PONDERA	101.60	62.30	168.33b	34.65b
MT 8537	RS6880/MT7746	100.80b	62.10	167.33b	37.80a
MT 8625	NEWANA/MT7746	100.48b	60.73	168.00b	35.56
ND 597	BUTTE86	99.97b	62.13	167.00b	39.89a
MT 8429	MT7421/MT7031	99.67b	60.83	169.67	39.50a
MT 8641	NEWANA/MT7746	99.37b	60.80	167.00b	35.17
MT 8648	CI15838/MT7418//PONDERA	99.33b	61.70	165.33b	34.91
MT 8624	NEWANA/ANTIZANA	98.67b	61.93	167.33b	39.24a
MT 8609	NEWANA/MT7746	98.62b	60.83	168.00b	33.73b
MT 8653	MT7746/LEW	98.42b	62.83	167.00b	43.04a
MT 8402	MT7336/SHORTANA	98.03b	62.23	167.00b	32.41b
MT 8619	NEWANA/MT7746	97.95b	61.47	168.00b	38.45a
MT 8515	MT7421/NEWANA	97.93b	62.67	167.00b	37.14a
CI 17429	LEW	96.82b	63.20	171.33	45.14a
MT 8447	SU73/MT7336	95.70b	61.60	167.33b	40.29a
PI 15892	WARD	95.15b	62.83	168.67b	45.41a
MT 8407	SU73/MT7336	94.93b	61.23	167.33b	41.86a
MT 8661	SU73/MT7336	93.95b	61.93	167.00b	40.68a

Table 2 (Cont'd). Agronomic data from the Advanced Yield Spring Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1988.

VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGHT INCHES
CI 10003 THATCHER	92.48b	61.00	169.33	48.56a
CI 13596 FORTUNA	91.57b	63.40	168.00b	43.96a
NDCUT CUTLESS	90.98b	62.27	168.67b	40.94a
MT 7926 ND 681/MT 6830	88.63b	63.03	170.00	43.04a
MT 8621 NEWANA/MT7746	88.58b	61.63	163.33b	33.60b
CANLANC LANCER	77.50b	61.40	169.00	45.01a
EXPERIMENTAL MEANS	104.08	62.19	168.04	37.56
F TEST FOR VAR. 2/	5.57**	1.18	3.89**	35.85**
C.V. 2: (S OF MEAN/MEAN)*100	4.38	2.26	.46	1.84
LSD (0.05)	12.79	3.94	2.19	1.94

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 offstation spring wheat nursery grown on the Jim Nethercott farm in Valley View , MT. in 1988.
Date seeded: April 13, 1988 Harvested: August 17, 1988

CI or State #	Variety		Yield Bu/A	Test Wt lbs/Bu	Height (")
CI 17430	Newana	1/	50.75	60.7	27.17
CI 17838	Pondera		47.60	60.6	28.35
CI 13596	Fortuna		42.77	61.0	35.17
CI 17429	Lew		40.97	60.7	33.33
PI483235	Glenman		49.00	59.1	29.92
ID 238	Copper		48.19	60.2	26.38
ND 582	Stoa		39.49	59.7	31.37
CI 17920	Marshall		40.09	59.8	26.25
CI 17790	Len		48.40	59.8	26.77
CI 17910	Alex		40.90	60.0	33.20
CI 15930	Olaf		45.17	59.3	29.13
CI 17904	Owens		55.10	61.3	29.00
ID 248	Treasure		44.84	58.1	27.43
WPB 906R	Westbred 906R		38.49	59.4	24.28
C982-324	Rambo		42.57	60.6	27.69
ND CUT	Cutless		36.15	60.3	27.95
CANLANC	Lancer		30.27	60.0	36.48
ND 597	Butte86		35.72	61.3	28.22
MT 7926	ND 681/MT 6830		49.34	61.1	34.65
MT 8402	MT7336/Shortana		40.24	61.4	26.11
	X		43.30	60.2	29.44
	C.V.		11.10	0.0	4.065
	L.S.D.		13.80	0.0	3.426

1/ Check Variety
Fertilized: April 13, 1988 with 120 lbs 29/14/0

Table 4. Agronomic data from the offstation spring wheat nursery grown on the Western Research Center in Corvallis, MT. in 1988.
Date seeded: April 13, 1988 Date harvested: August 16, 1988

CI or State #	Variety		Yield Bu/A	Test Wt lbs/Bu	Height (")
CI 17430	Newana	1/	35.27	60.1	26.64
CI 17838	Pondera		44.94	59.7	31.23
CI 13596	Fortuna		15.60b	57.6	36.48a
CI 17429	Lew		22.15	61.0	36.61a
PI483235	Glenman		44.82	59.1	27.95
ID 238	Copper		41.72	57.7	27.69
ND 582	Stoa		36.59	60.0	33.07a
CI 17920	Marshall		29.59	59.1	24.15
CI 17790	Len		37.32	59.1	28.35
CI 17910	Alex		22.95	59.6	32.68a
CI 15930	Olaf		32.32	59.3	26.64
CI 17904	Owens		44.04	60.1	29.79
ID 248	Treasure		24.75	56.4	22.31
WPB 906R	Westbred 906R		19.25	58.1	27.17
C982-324	Rambo		43.12	60.6	26.64
ND CUT	Cutless		34.97	61.0	30.18
CANLANC	Lancer		18.29b	59.0	34.91a
ND 597	Butte86		34.24	60.4	31.76a
MT 7926	ND 681/MT 6830		18.29b	60.7	34.38a
MT 8402	MT7336/Shortana		31.15	60.0	26.90
	$\bar{X}$		31.76	59.4	29.78
	C.V.		17.90	0.0	5.791
	L.S.D.		16.27	0.0	4.937

1/ Check Variety

Fertilized: April 13, 1988 with 120 lbs 29/14/0
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 Triticale nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT in 1988.

Date seeded: April 4, 1988 Date harvested: August 23, 1988

CI or State No.	Variety	Yield Bu/ A	Test Wt. lb/Bu	Heading Date	Height Inches
CI 17430	NEWANA	69.6	60.3	169.7	29.13
TRITWELS	WELSH	78.4	50.5	165.7	39.37
TRIRCARM	CARMEN	65.4	48.7	165.3	36.61
TRITKARL	KARL	73.4	52.3	164.7	29.53
TRITKRAM	KRAMER	73.7	49.5	165.7	33.73
TRITMARV	MARVAL	71.6	49.0	165.7	42.24
TRIRJUAN	JUAN	78.6	53.0	167.0	36.35
TRIRWHIT	WHITMAN	72.2	47.8	180.3	40.55
VT082464	VT082464	85.5	51.4	172.0	37.01
VT082478	VT082478	75.7	50.3	173.3	35.56
VT086085	VT086085	39.7	42.7	183.3	30.05
VT086497	VT086497	55.8	43.7	182.0	29.13
	$\bar{X}$	69.95	49.93	171.2	34.90
	C.V.	5.227	.3551	.3554	3.399
	L.S.D.	10.73	.5200	1.785	3.483
	P-VALUE	.0000	.0000	.0000	.0000

PROJECT TITLE: Winter Wheat Variety Evaluations

YEAR/PROJECT: 1988/756 Small Grain Production

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

OBJECTIVES:

To determine the adaptability of new and introduced winter wheat varieties for western Montana.

SUMMARY:

The Western Regional Winter Wheat nurseries are grown at the Kalispell and Stillwater locations. The outstanding varieties from these nurseries are tested in western Montana in off-station nursery evaluations. These data are used in making recommendations to the Montana producer.

Continuous snow cover began on December 15, 1987 and continued until February 13, 1988 (60 days) which was 34 days less than last year and 45 days shorter than the 1985/86 season. Dwarf smut infection levels were low at the Stillwater and Kalispell locations sites this year. Although disease occurance was light in most experiments there was a severe incidence of stripe rust in susceptible varieties in the Intrastate winter wheat nursery. Although fall, winter and early spring precipitation amounts were 60-70% of normal the rainfall recieved in April and May greatly aided the sustaining of winter wheat through to harvest. Yields were very good considering the lack of moisture experienced Statewide.

RESULTS:

Western Regional Hard Red Winter Wheat - Kalispell

The Kalispell site had a mean yield of 81.57 bu/A. The highest yielding entry was UT 157140 at 97.75 bu/A. UT 156751, UT 156516, ID 326, and ORCR 8608 all had yields greater than 90 bu/A. No variety had a test weight of 60 lbs/bu and only five entries had test weights of 59.0 lbs/bu. Winter survival of all varieties were good, averaging 95.82%. TCK smut was generally light with seven lines being smut free. Table 1.

Western Regional Hard Red Winter Wheat - Stillwater

The Stillwater trial had a mean yield of 85.97 bu/A. Nine lines had yields in excess of 90/bu/A. All lines but two had test weights above the 60 lb/bu. Winter survival for all entries averaged 97%. TCK smut levels were very low in the test. Table 2.

Western Regional Soft White Winter Wheat - Kalispell

The Kalispell nursery had a mean yield of 94.74 bu/A. OR 855 was the highest yielding entry at 112.93 bu/A. Test weights were low and averaging 55.56 lbs/bu. TCK smut levels were low, with only WA 7621 and WA 7527 smut free. Table 3.

Western Regional Soft White Winter Wheat - Stillwater

The mean yield for the Stillwater site was 86.51 bu/A. ORF 75336 had the high yield (103.94 bu/A). No other varieties had yields above 100 bu/A but eight entries had yields of 90 bu/A or greater. Yield data was found nonsignificant when analyzed statistically. Test weights were average (59.44 lbs/bu). TCK smut was light with fourteen entries having a range of .5 to 8 percent. Table 4.

Intrastate Winter Wheat - Kalispell

The Kalispell location had a mean yield of 91.51 bu/A. The high yielding entry was Winridge at 121.57 bu/A. Ten lines were equal to Winridge, and above 100 bushel per acre. Test weights were good with an average of 61.38 lbs/bu. Fourteen entries had test weights above 62 lbs/bu. TCK smut was light yet was observed in all but eight entries. Stripe rust was prevalent throughout the trial and severe in twelve varieties. MT 86009 and MT 86029 were the only two varieties showing good resistance to strip rust. Table 5.

Offstation Winter Wheat Trials

The offstation winter wheat trials were grown in Ravalli County (McIntyre farm, Stevensville, MT), Lake County (Haake farm, Polson, MT.) and in Flathead County (Stillwater location, Oscar Buller farm Kalispell, MT.). The mean yields were 35.94 bu/A for Ravalli Co., 28.65 bu/A for Lake Co., and 79.86 bu/A for Flathead Co. Heights, test weights, % TCK smut and % survival observations are given in tables 7-9.

Table 1. Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT.

Date planted: Sept. 18, 1987 Harvested: July 28, 1988 Field E-1

VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGHT INCHES	%WINTER SURVIV	% TCK SMUT	-- LODGING -- SEVER	ANGLE
UT157140	97.75	58.73	157.75	48.23	97.50	.12	.0	.0
UT156751	97.35	58.98	155.25	39.86	97.75	.00	.0	.0
UT156516	97.04	55.05	152.50	36.91	96.00	.12	.0	.0
ID 326	93.49	55.48	153.25	39.47	83.75	.25	.0	.0
ORCR8608	93.44	58.18	155.25	37.11	97.00	.12	.0	.0
ORCR8602	89.70	54.53	153.50	31.59	97.00	1.12	.0	.0
ORCR8601	88.01	57.68	153.50	41.14	97.25	1.37	.0	.0
MT 8039	87.79	56.27	154.75	44.78	96.75	.88	.0	.0
ORCR8603	87.62	54.93	153.50	36.12	95.00	1.25	.0	.0
UT156775	87.34	58.30	154.75	38.19	97.75	.00	.0	.0
ID 356	86.49	56.90	155.50	39.76	93.75	.25	.0	.0
OR 8522	86.40	54.23	156.75	35.14	96.50	3.25	.0	.0
MT 79125	85.83	55.70	155.75	41.04	94.25	.12	6.3	1.3
ORCR8313	85.70	56.33	151.75	37.30	96.00	2.37	.0	.0
OR830282	84.60	55.90	154.25	40.16	95.75	.25	.0	.0
ID 381	84.09	58.15	157.00	46.26	96.75	.12	65.0	4.3
WA 7522	83.60	58.85	157.00	47.74	94.25	2.25	33.8	1.3
OR832306	81.92	52.43	153.25	33.76	98.50	7.00	.0	.0
ID 360	81.49	56.92	157.25	37.20	97.75	.63	.0	.0
ID 354	81.35	57.90	156.75	45.18	94.75	2.50	.0	.0
WA 7626	80.93	59.25	156.50	48.43	97.50	1.62	.0	.0
ID 364	80.14	55.50	155.75	39.47	97.25	.12	.0	.0
ID 380	79.14	59.15	157.00	47.93	93.75	2.13	35.0	1.5
ORCR8414	78.60	56.35	153.25	39.76	95.75	.75	.0	.0
ID 323	78.20	55.95	157.25	37.40	86.75	.00	.0	.0
WA 7523	76.85	56.43	159.25	45.57	91.25	1.25	47.9	4.0
ID 353	76.46	56.10	155.75	39.86	96.00	.63	.0	.0
ID 351	75.25	57.85	157.25	47.93	97.50	.25	5.0	.8
WA 7620	75.15	58.73	158.75	46.06	98.00	7.00	12.5	1.3
CI 13844	74.61	59.57	156.75	52.85	96.50	2.62	35.0	1.0
ID 0333	74.61	58.55	156.50	50.00	95.25	.00	25.0	2.0
ID 0335	72.78	59.85	158.50	50.89	96.75	.00	78.8	4.5
ID 0331	72.33	58.68	155.25	49.02	97.75	.00	43.8	7.0
ID 352	71.81	59.15	157.50	44.78	96.00	.12	17.5	1.8
ID 0336	71.26	58.70	157.50	50.49	97.50	.00	30.0	2.0
WA 7619	69.83	58.22	160.25	49.11	97.50	5.50	45.0	2.8
CI 1442	65.90	59.00	156.75	53.44	100.00	1.62	86.3	4.0
ID 0332	64.86	57.85	157.25	49.80	96.25	.00	92.5	7.0
MEANS	81.57	57.27	155.95	43.15	95.82	1.25	33.0	.82
F TEST 2/	5.32**	6.39**	14.54**	21.36**	6.10**	5.48**		
C.V. 2:	4.48	1.21	.33	2.92	1.27	61.79		
LSD (0.05)	10.25	1.95	1.44	3.53	3.41	2.17		

** Indicates statistical significance at the .01 level

2/ F value for variety comparison

Table 2. Agronomic data from the Western Regional Hard Red Winter Wheat nursery grown on the Oscar Buller farm, Kalispell, MT in 1988.

Date planted: Sept. 22, 1987 Date harvested: August 3, 1988

VARIETY	YIELD BU/A	TEST WT LB/BU	HEIGHT INCHES	% WINTER 1/ SURVIVAL	% TCK 2/ SMUT
UT156775	97.21	63.52	35.14	88	0
ORCR8608	96.24	62.10	31.89	100	0
UT156751	95.61	63.48	33.96	100	0
ORCR8313	94.71	63.23	35.14	95	0
ID 353	93.81	62.25	33.76	100	0
WA 7620	93.59	62.60	37.11	95	0
ID 360	91.88	61.88	28.64	98	0
OR830282	91.39	61.88	31.99	100	1
ID 356	91.09	61.63	30.51	97	0
WA 7522	89.82	62.03	39.07	100	.5
ID 0331	89.80	62.80	32.87	93	.5
ID 326	89.39	61.20	31.30	95	0
ID 323	88.60	61.83	28.94	98	0
WA 7619	88.18	63.38	38.58	95	0
MT 79125	88.10	61.18	34.74	95	0
ID 0336	88.10	62.50	39.27	100	0
WA 7626	86.80	62.82	37.30	98	0
ORCR8414	86.79	61.60	34.55	100	0
UT157140	86.61	61.80	39.96	98	0
CI 13844	85.01	62.80	42.32	96	0
ID 381	84.94	62.30	39.47	100	.5
ORCR8602	84.83	60.65	26.87	90	0
ID 351	84.54	62.87	38.48	95	0
UT156516	83.95	61.38	32.48	95	0
ID 364	83.80	61.95	33.27	98	0
MT 8039	83.79	60.87	36.42	98	0
ORCR8601	83.43	62.33	35.63	95	1
ID 380	83.35	63.55	36.52	90	0
ID 354	82.35	62.43	39.96	95	0
ID 352	81.25	63.15	37.70	98	0
ID 0333	80.54	62.25	42.81	100	0
CI 1442	79.84	61.90	42.42	95	2
WA 7523	79.65	61.50	36.22	98	0
ID 0335	79.30	62.48	41.63	100	0
OR832306	79.27	59.00	29.92	92	2
ID 0332	75.04	61.70	38.09	98	0
OR 8522	74.59	60.13	29.82	100	0
ORCR8603	69.73	59.30	29.53	88	0
EXPERIMENTAL MEANS	85.97	62.01	35.38	97	.2
F TEST 3/	1.67**	7.04**	5.51**		
CV2	5.64	.64	5.10		
LSD (0.05)	13.58	1.11	5.06		

1/ % Winter survival = % of plot survival through winter, 1 rep data only
2/ % TCK Smut by ocular observation, 1 rep data only
3/ F value for variety comparison

Table 3. Agronomic data from the Western Regional Soft White Winter Wheat nursery grown on the Northwestern Agicultural Research Center, Kalispell, MT.

Date planted: Sept. 17, 1987 Harvested: August 28, 1988

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGHT INCHES	%WINTER SURVIVL	% TCK SMUT
OR 855	PAHA//SEL.72-330/DAW	112.93a	58.18a	157.75a	40.26a	98.25	.12
ORCW8724	CORVALLIS SELECTION	103.19	56.18a	153.75	39.96a	98.75	.63
ORFW 301	DAWS/SM4//MDM/SM11,F	102.16	54.50	154.00	36.12	99.00	.12
ORCW8632	CORVALLIS SELECTION	101.38	54.93	155.00a	36.81	98.00	.25
WA 7625	WA 7163 SIB	100.50	55.88	157.25a	38.09a	98.75	.50
ID 0330	NEELY/SPN//SPN (A79	99.63	54.73	154.25	38.39a	96.25	.63
WA 7624	VPM/MS951/PECK/SPN/D	99.63	53.08b	160.00a	32.48b	98.75	.37
ID 0329	NEELY/SPN/SPN (A7911	99.54	54.62	154.00	36.81	98.00	.37
ORCW8416	NORTENO/YAMHILL//672	98.90	56.80a	159.00a	38.19a	96.75	.37
ORCW8517	TJB801-12795/STEPHEN	98.81	57.08a	153.75	42.81a	96.25	.50
ORCW8635	CORVALLIS SELECTION	98.51	57.98a	156.25a	44.78a	98.00	.63
ORCW8637	CORVALLIS SELECTION	98.31	56.43a	157.75a	38.98a	98.25	.37
WA 7163	MADSEN	97.99	56.20a	157.00a	36.91	96.75	.25
ORCW8521	TJB259-83/3/CD/P101/	97.94	57.88a	155.75a	45.28a	99.75	.63
ORCW8633	CORVALLIS SELECTION	97.74	56.50a	159.25a	36.81	98.50	1.50
CI 17596	STEPHENS 1/	97.64	54.53	153.50	35.14	97.50	.25
CI 13968	NUGAINES	97.08	57.90a	157.00a	34.94	94.00b	2.50a
OR 845	HYSLOP/YAYLA//63-112	96.93	58.45a	155.75a	37.40	99.75	.88
WA 7621	VPM/MS421//VH66354/W	95.40	54.75	158.25a	37.20	95.00	.00
WA 7623	STEPHENS/ROAZON/SEL.	94.65	54.62	156.50a	34.94	98.50	.25
CI 17917	TRES (WA 6698)	94.40	55.92	158.50a	41.93a	99.00	.63
WA 7622	TYEE/ROAZON/TRES	93.66	54.40	159.75a	36.81	95.25	.12
OR 843	HYSLOP/CERCO, H-308	92.88	55.92	157.25a	40.06a	96.75	.75
WA 7529	LUKE/VH67375//VPM/MO	92.85	54.58	157.50a	35.93	99.00	.37
ORF75336	YMH/MCD/2/T.SPELTA/3	92.75	54.80	155.50a	37.20	98.25	.37
WA 7527	TRES MULTILINE 86	92.54	55.90	157.00a	40.85a	97.25	.00
WA 7627	WA096910, MARIS HUNT	91.76	55.18	157.00a	40.94a	99.25	2.37a
OR 842	HYSLOPCERCO, B-307	91.61	55.50	157.25a	39.96a	98.00	2.25a
WA 7526	TRES COMPOSITE CROSS	91.56	56.50	159.00a	40.35a	98.50	.50
WA 7628	VD086150,WA6814/WA65	91.31	52.33b	159.75a	36.42	97.75	.12
ORFW205B	FW73830-002/3/MLD/2/	90.39	52.73b	160.25a	34.55	99.25	.37
WA 7166	HYAK	89.75	52.70b	157.25a	39.57a	98.25	.12
OR830801	CORVALLIS SELECTION	84.45b	51.15b	154.75	32.97	97.50	1.00
CI 13740	MORO	81.65b	54.23	156.75a	45.47a	99.00	1.37
CI 11755	ELGIN	76.02b	57.75a	158.50a	50.30a	98.00	.63
CI 1442	KHARKOF	74.19b	59.28a	155.75a	54.13a	99.00	4.63a
EXPERIMENTAL MEANS		94.74	55.56	156.88	39.16	97.91	.74
F TEST FOR VAR. 2/		5.73**	13.85**	16.53**	24.85**	1.41	2.89**
C.V. 2: (S OF MEAN/MEAN)*100		3.22	.90	.30	2.31	1.14	72.46
LSD (0.05)		8.55	1.40	1.33	2.54	3.12	1.51

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

Table 4. Agronomic data from the Western Regional Soft White Winter nursery grown on the Oscar Buller farm, Kalispell, MT in 1988.

Date seeded: Sept. 22, 1987 Date Harvested: August 3, 1988

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEIGHT INCHES	WINTER SURVIVAL	% TCK 1/ SMUT
ORF75336	YMH/MCD/2/T.SPELTA/3	103.94	59.73	30.91	98	0
ORCW8635	CORVALLIS SELECTION	99.31	60.30	34.74a	97	0
CI 17596	STEPHENS 2/	96.41	59.48	29.92	95	.5
ORCW8521	TJB259-83/3/CD/P101/	94.90	60.52	36.12a	97	2
WA 7526	TRES COMPOSITE CROSS	94.36	59.50	32.18a	98	1
WA 7529	LUKE/VH67375//VPM/MO	94.00	58.57	29.63	95	0
OR 845	HYSLOP/YAYLA//63-112	93.13	60.95a	31.00	95	1
ID 0330	NEELY/SPN//SPN (A79	91.09	59.38	32.38a	98	0
WA 7627	WA096910, MARIS HUNT	90.20	58.93	30.31	97	.5
WA 7166	HYAK	88.85	59.00	31.20	99	.5
CI 17917	TRES (WA 6698)	88.14	61.05a	29.92	98	0
ORCW8724	CORVALLIS SELECTION	88.11	59.63	31.99a	95	5
ID 0329	NEELY/SPN/SPN (A7911	87.91	59.18	31.69a	100	0
CI 11755	ELGIN	87.55	61.75a	38.98a	98	0
WA 7527	TRES MULTILINE 86	87.30	60.73	32.68a	95	.5
OR 855	PAHA//SEL.72-330/DAW	86.95	61.10a	30.41	100	.5
WA 7623	STEPHENS/ROAZON/SEL.	86.08	59.63	30.02	100	1
WA 7624	VPM/MS951/PECK/SPN/D	86.08	54.50b	26.77b	95	0
ORFW 301	DAWS/SM4//MDM/SM11,F	86.08	57.73b	30.02	98	0
CI 13968	NUGAINES	85.89	61.93a	27.46b	93	0
WA 7621	VPM/MS421//VH66354/W	85.49	59.50	27.85b	100	0
ORCW8416	NORTENO/YAMHILL//672	83.83	59.55	28.94	100	0
OR830801	CORVALLIS SELECTION	83.55	56.78b	27.95b	95	0
CI 13740	MORO	83.29	58.70	38.09a	95	0
WA 7625	WA 7163 SIB	83.24	59.13	29.63	98	0
WA 7628	VD086150,WA6814/WA65	82.43	58.25	27.95b	100	0
ORCW8632	CORVALLIS SELECTION	82.28	58.73	30.12	98	0
ORCW8637	CORVALLIS SELECTION	81.97	59.50	29.23	95	0
WA 7163	MADSEN	80.91	59.10	29.53	98	0
ORFW205B	FW73830-002/3/MLD/2/	80.84	56.92b	25.98b	98	0
ORCW8517	TJB801-12795/STEPHEN	80.51	60.43	34.65a	95	4
ORCW8633	CORVALLIS SELECTION	80.06	61.00a	28.44	98	8
OR 843	HYSLOP/CERCO, H-308	79.76	59.28	32.28a	98	0
WA 7622	TYEE/ROAZON/TRES	79.71	58.95	29.53	100	0
OR 842	HYSLOPCERCO, B-307	79.35	58.28	31.50	97	3
CI 1442	KHARKOF	71.04	62.08a	43.01a	98	3
	EXPERIMENTAL MEANS	86.51	59.44	31.20	97.3	.85
	F TEST FOR VAR. 3/	1.09	10.93**	36.47**		
	C.V. 2: (S OF MEAN/MEAN)*100	7.18	.77	1.86		
	LSD (0.05)	17.41	1.28	1.63		

1/ One rep data from % winter survival and TCK smut only
2/ Check variety
3/ F value for variety comparison
a/ Values significantly greater 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 Agricultural Research Center, Kalispell, MT in 1988.

Date planted: September 17, 1987 Harvested: August 29, 1988

VARIETY	YIELD BU/A	TEST WT LB/BU	HEIGHT INCHES	HEADING DATE	% TCK Smut	STRIPE RUST INF TYP	% SEVER
CI 17902 WINRIDGE 1/	121.57	61.98	47.44	158.50	.00	.20	6.25
CI 17860 NEELEY	117.11	62.88	44.49b	157.50	.00	.20	3.75
MT 86021 ID745101/LCO	114.86	61.80	41.24b	157.00	.00	.15	8.75
MT 86009 CRT//FRD1655/OLESEN(	110.46	59.53b	39.67b	155.00b	.63a	.00	.00
MT 79125 UT755079/CST56//TX65	107.82	60.10b	36.61b	156.50b	.00	.10	5.00
QT 542 HYBRITECH (87-1359)	107.58	62.78	44.19b	154.00b	.25	.35	20.00
MT 84458 CST//FRD1655/OLESEN(	106.51	61.85	39.57b	153.00b	.00	.15	5.00
MT 8039 LCO/FRD//NE69559/WNK	103.88	61.15	43.11b	156.00b	.25	.30	17.50
NA 1316 ROCKY	103.84	63.38a	45.47	156.00b	.37	.20	18.75
ND 8002 SEWARD	102.29b	62.13	50.00a	157.75	.37	.35	13.75
MT 86020 ID745101/LCO	98.75b	61.60	37.70b	156.75b	.37	.22	8.75
MT 86007 FRD SD1287//O.P. (WH	96.98b	59.90b	37.30b	155.50b	.12	.50a	55.00a
MT 86029 CST/MT 6928//MT 6927	96.84b	59.68b	38.58b	156.75b	.63a	.00	.00
MT 86022 ID745101/LCO	95.45b	59.68b	41.34b	156.00b	.25	.20	31.25a
MT 7810 FRD/WNK//MT 6928/TR	94.55b	60.05b	38.29b	157.00b	.25	.40	13.75
CI 15075 CENTURK	93.66b	62.50	45.77	156.25b	.50a	.25	15.00
MT 86031 ID745101/LCO	93.64b	61.20	36.81b	157.00	.00	.27	18.75
PI491533 NORWIN	92.61b	60.95	29.72b	158.50	.50a	.15	8.75
MT 7811 FRD/WNK//MT 6928/TR	92.50b	60.90	40.75b	157.25	.12	.30	11.25
MT 87009 MSC/CTK A+//IUL	91.63b	61.15	34.35b	157.25	.00	.25	13.75
CI 17735 NORSTAR	91.60b	62.55	53.54a	160.00	.37	.30	6.25
NA 0001 THUNDERBIRD	91.57b	62.98	39.67b	152.75b	.50a	.17	20.00
MT 86032 ID745101/LCO	88.62b	61.05	36.71b	157.00	.25	.20	10.00
MT 85202 FRD/WNK//MT 6928/TR	87.05b	61.78	46.36	158.25	.25	.50a	26.25a
MT 86003 CRT//FRD1655/OLESEN(	86.40b	58.83b	34.55b	156.75b	.25	.40	35.00a
MT 84268 CST//FRD1650/OLESEN(	85.62b	61.25	39.86b	156.50b	.12	.30	10.00
MT 85203 FRD/WNK//MT 6928/TR	85.44b	61.45	26.57b	160.00	.00	.12	7.50
MT 86036 CST//FRD1628/OLESEN(	85.23b	61.45	46.46	157.00	.12	.70a	58.75a
CI 13670 WINALTA	85.18b	62.40	51.57a	158.25	.25	.30	10.00
MT 8003 TIBER	84.98b	62.08	46.26	157.75	.25	.80a	68.75a
MT 85200 FRD/WNK//MT 6928/TR	84.31b	59.05b	35.73b	155.75b	.25	.20	22.50
CI 17439 ROUGHRIDER	83.15b	62.45	51.57a	156.75b	.25	.25	20.00
QT X1348 HYBRITECH	82.48b	59.03b	38.68b	156.50b	.37	.55a	35.00a
CI 13872 FROID	81.76b	61.55	55.51a	157.75	.37	.30	13.75
NA 362-5 ABILENE	79.28b	63.45a	31.40b	155.00b	.37	.20	23.75a
CI 17844 REDWIN	76.75b	60.80b	45.77	157.50	.12	.80a	62.50a
PI478771 AGASSIZ	74.06b	62.38	53.15a	158.25	.25	.70a	40.00a
PI491532 CREE	71.81b	62.23	51.38a	157.00	.12	.45a	46.25a
MT 86042 MARIAS/MT 6930//LCO	70.06b	62.17	48.62	156.75b	.37	.30	33.75a
MT 86038 CST//FRD1628/OLESEN(	68.55b	60.40b	45.28	157.00	.25	.85a	81.00a
CI 8885 CHEYENNE	65.29b	61.93	50.79a	158.50	.12	.45a	40.00a

Table 5. Cont'd

VARIETY	YIELD BU/A	TEST WT LB/BU	HEIGHT INCHES	HEADING DATE	% TCK Smut	STRIPE RUST INF TYP	% SEVER
EXPERIMENTAL MEANS	91.51	61.38	42.48	156.84	.24	.33	23.07
F TEST FOR VAR. 2/	3.80**	9.34**	67.58**	7.62**	1.00	6.57**	10.94**
C.V. 2: (S OF MEAN/MEAN)*100	7.45	.65	1.96	.35	71.90	24.77	25.83
LSD (0.05)	19.09	1.11	2.33	1.52	.48	.23	16.69

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

Table 6. Agronomic data from the three offstation winter wheat trials of 1988. Yield (BU/A)

CI or State #	Variety	YIELD Bushels/Acre Ravalli	Lake	Flathead
MT 8003	TIBER	36.35	29.17b	84.07
MT 8039	LCO/FRD//NE69559/WNK	28.22	23.78b	78.80
CI 15075	CENTURK	38.58	16.07b	79.20
MT 79125	UT755079/CST56//TX65	31.85	47.90	84.47
CI 13190	WARRIOR	36.08	27.07b	81.82
NA 201	ARCHER	36.74	25.27b	74.62
CI 17419	DAWS	42.02	44.17	88.30
CI 17441	VONA	47.65	15.02b	91.33
PI491532	CREE	46.29	26.30b	78.97
PI491533	NORWIN	34.29	24.02b	63.80b
CI 13670	WINALTA	32.90	16.38b	66.20b
CI 17727	WESTON	29.83	54.58	71.03
CI 17735	NORSTAR	37.65	20.15b	77.80
CI 17844	REDWIN	27.92	25.72b	79.05
CI 17860	NEELEY	30.94	33.48b	86.38
CI 17879	ROCKY	35.23	15.27b	79.12
CI 17880	WINGS	43.69	11.18b	77.85
CI 8885	CHEYENNE	31.24	31.73b	73.88
CI 17902	WINRIDGE 1/	26.75	50.33	82.75
CI 17909	LEWJAIN	31.70	36.85b	89.45
CI 17954	HILL	48.93	27.22b	88.15
	$\bar{X}$	35.94	28.65	79.86
	F value 2/	.77	13.00**	1.99*
	C.V.	20.86	11.82	6.45
	L.S.D.	21.43	9.68	14.72

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

Table 7. Agronomic data from the three offstation winter wheat trials of 1988. Test Weights (lbs/Bu)

CI or State #	Variety	TEST WEIGHTS Pounds/Bushels Lake	Ravalli	Flathead
MT 8003	TIBER	60.17	65.00	63.47
MT 8039	LCD/FRD//NE69559/WNK	59.60	62.07b	60.80b
CI 15075	CENTURK	57.90	63.83	62.77
MT 79125	UT755079/CST56//TX65	60.93	64.53	62.13
CI 13190	WARRIOR	60.50	64.07	63.47
NA 201	ARCHER	56.43b	63.33	61.63
CI 17419	DAWS	60.00	62.63b	61.70
CI 17441	VONA	56.40b	64.17	63.33
PI491532	CREE	61.47	65.33	63.60a
PI491533	NORWIN	61.27	64.33	63.23
CI 13670	WINALTA	58.90	65.27	64.07a
CI 17727	WESTON	64.53a	66.30a	64.07a
CI 17735	NORSTAR	59.87	63.80	63.97a
CI 17844	REDWIN	62.03	64.63	62.70
CI 17860	NEELEY	61.93	61.90b	63.03
CI 17879	ROCKY	56.50b	64.77	63.37
CI 17880	WINGS	60.00	65.60a	63.30
CI 8885	CHEYENNE	59.97	65.80a	63.67a
CI 17902	WINRIDGE 1/	61.03	64.23	62.47
CI 17909	LEWJAIN	60.90	60.17b	60.57b
CI 17954	HILL	59.10	60.97b	61.03b
	$\bar{X}$	59.97	63.94	62.78
	F value 2/	7.13**	12.78**	8.62**
	C.V.	1.25	.70	.58
	L.S.D.	2.14	1.28	1.05

1/ Check variety
2/ F value for variety comparison
* or ** Indicates statistical significance at the .05 or .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 8. Agronomic data from the three offstation winter wheat trials of 1988. Height (Inches)

CI or State #	Variety	HEIGHT Inches Lake	Ravalli	Flathead
MT 8003	TIBER	40.29	30.71	40.29a
MT 8039	LCO/FRD//NE69559/WNK	36.48	26.64	30.05b
CI 15075	CENTURK	39.89	26.12	31.76b
MT 79125	UT755079/CST56//TX65	34.78	28.48	31.36b
CI 13190	WARRIOR	39.50	31.63	35.30
NA 201	ARCHER	30.58b	28.61	28.35b
CI 17419	DAWS	28.35b	27.95	28.87b
CI 17441	VONA	33.07b	28.35	23.88b
PI491532	CREE	41.47	33.20	36.09
PI491533	NORWIN	23.88b	24.80	25.59b
CI 13670	WINALTA	41.73	29.92	39.11a
CI 17727	WESTON	40.94	32.28	40.16a
CI 17735	NORSTAR	40.94	31.23	39.11a
CI 17844	REDWIN	40.29	26.77	37.27
CI 17860	NEELEY	36.22	26.64	34.12
CI 17879	ROCKY	38.58	26.51	33.20b
CI 17880	WINGS	36.09	28.87	27.95b
CI 8885	CHEYENNE	39.50	27.56	38.19
CI 17902	WINRIDGE 1/	37.80	28.48	35.96
CI 17909	LEWJAIN	28.08b	24.15	25.72b
CI 17954	HILL	28.48b	29.40	26.38b
	$\bar{X}$	32.80	28.49	36.05
	F value 2/	11.49**	1.38	27.32**
	C.V.	4.76	7.16	2.81
	L.S.D.	4.46	5.83	2.90

1/ Check variety
2/ F value for variety comparison
* or ** Indicates statistical significance at the .05 or .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 9. Agronomic data from the three offstation winter wheat trials of 1988. Percent smut (Lake and Flathead Co.) and Percent winter survival (Flathead Co.only).

CI or State #	Variety	% TCK SMUT Lake	% TCK SMUT Flathead	Stand Loss Flathead Co.
MT 8003	TIBER	40.00a	.17	1.67
MT 8039	LCO/FRD//NE69559/WNK	41.67a	3.50a	1.67
CI 15075	CENTURK	60.00a	1.67	.67
MT 79125	UT755079/CST56//TX65	11.67	.00	1.00
CI 13190	WARRIOR	38.33a	.00	.67
NA 201	ARCHER	46.67a	.33	.00
CI 17419	DAWS	21.67a	.67	.67
CI 17441	VONA	75.00a	2.00a	.00
PI491532	CREE	36.67a	.00	.67
PI491533	NORWIN	55.00a	.33	.00
CI 13670	WINALTA	43.33a	.33	.00
CI 17727	WESTON	.17	.17	.67
CI 17735	NORSTAR	46.67a	.00	1.00
CI 17844	REDWIN	35.00a	1.00	3.33a
CI 17860	NEELEY	31.67a	.83	1.67
CI 17879	ROCKY	65.00a	2.67a	.67
CI 17880	WINGS	75.00a	2.67a	.00
CI 8885	CHEYENNE	33.33a	.17	1.67
CI 17902	WINRIDGE 1/	.00	.17	1.00
CI 17909	LEWJAIN	10.67	.00	.33
CI 17954	HILL	50.00a	.17	1.00
	$\bar{X}$	38.93	.80	.87
	F 2/	13.33**	3.23**	1.00
	C.V.	15.11	73.46	92.33
	L.S.D.	16.81	1.68	2.30

1/ Check variety
2/ F value for variety comparison
* or ** Indicates statistical significance at the .05 or .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: Dwarf Bunt Tillage Study

YEAR/PROJECT: 1988/756 Small Grain Production

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

SUMMARY:

Dwarf bunt (Tilletia controversa Kuhn) infection levels were low this year as well as weed populations being very high. The pressure from both downy brome and jointed goatgrass was so severe that harvest was not practical nor possible in some plots. The No-Till plots were chemical fallowed this year due to poor stands and severe weeds. The minimum till plots were about 50% cheat grass.

RESEARCH METHODS:

Five tillage techniques are 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 variety Hawk was used in 1987 because of it's susceptibility to TCK smut. The first year's yields from this test were obtained in August of 1984. The second, third, and fourth year measurements were made in August also of 1985, 1986, and 1987 respectively.

RESULTS:

With dwarf bunt infection levels down again this year and weed pressure so high yields and other agronomic data were not taken. The project has been discontinued due to lack of funds.

FUTURE PLANS:

This study has been discontinued.

YEAR/PROJECT: 1988/755 IRRIGATED ALFALFA VARIETY TRIAL
SEEDED 1988

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
In cooperation with R.Ditterline, Bozeman

Twenty alfalfa varieties were seeded on 5/3/88 at 10 lbs/a in Field P-2. Eptam was applied preplant at 4 lb.AI/a. The nursery was fertilized with 200 lbs P/a. Plots were assigned in a randomized complete block design with 4 replications. Two harvests were taken using an ALMACO forage harvester from a 68 sq.ft. area, and subsamples were weighed and dried to obtain a dry weight:wet weight conversion factor. After emergence visual estimates of plot occupancy were made. These ranged from 85% for Thor to 97% for WL-316. Differences among varieties were not significant at P=0.05. First harvest yields taken on 7/28 were significantly different at P=0.08 and ranged from 1.33 t/a for Vernal to 1.59 t/a for Edge. Second harvest was taken on 9/28, and yields ranged from 1.18 t/a for Garst-636 to 1.66 t/a for Vista-663 with variety differences significant at P=0.06. Total season yields showed differences at P<0.01. Vista-663, with 3.13 t/a, had significantly higher yield than Ladak-65, Vernal, WL-316, Wrangler, Pioneer 5432, Vista-LL3387, Kingstar, Premier, Legend and Garst-636. Pioneer 5432, with 2.56 t/a, was significantly lower than Thor, Sparta, ICB-34, Sure, Edge, Vista-663, Vista-661, and Legend.

IRRIGATED ALFALFA TRIAL SEEDED 1988 - KALISPELL

VARIETY	OCCUP %	7/28 YIELD t/a	9/28 YIELD t/a	TOTAL 1988 t/a
VISTA-663	92	1.47	1.66	3.13
EDGE	92	1.59	1.49	3.07
LEGEND	93	1.49	1.59	3.07
SPARTA	94	1.53	1.54	3.06
SURE	92	1.58	1.48	3.05
THOR	85	1.42	1.54	2.96
ICB-34	94	1.46	1.47	2.93
VISTA-661	93	1.43	1.48	2.91
ARROW	91	1.44	1.46	2.89
WL-225	94	1.46	1.40	2.86
DK-125	95	1.52	1.33	2.84
VISTA-LL3387	86	1.44	1.39	2.82
WRANGLER	92	1.44	1.37	2.81
WL-316	97	1.46	1.31	2.77
KINGSTAR	91	1.46	1.22	2.67
VERNAL	91	1.33	1.32	2.65
LADAK-65	93	1.34	1.30	2.64
PREMIER	89	1.35	1.27	2.62
GARST-636	93	1.42	1.18	2.60
PIONEER 5432	91	1.36	1.21	2.56
LSD(0.05)	6	0.16	0.29	0.31
P-VALUE	0.16	0.08	0.06	0.00
CV(s/mean)	5.0	7.7	14.6	7.8

Seeded 5/3/88 at 10 lbs/a
Fertilizer: 200 lbs/a P
Herbicide: Eptam - 4 lb AI/a

YEAR/PROJECT: 1988/755 DRYLAND ALFALFA VARIETY TRIAL
SEEDED 1988

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
In cooperation with R.Ditterline, Bozeman

Twenty varieties of alfalfa were seeded in field F-2 on 5/4/88 in a randomized complete block design with 4 replications. Seeding rate was 10 lbs/a. Eptam was applied preplant at 4 lb AI/a. Plots were fertilized with 200 lbs P/a. Stand establishment was 90% or better for all varieties but Thor(86%). First harvest was cut on 7/28, with yields ranging from 1.84 t/a for Edge to 1.46 t/a for Pioneer 5432. Yield differences were not significant at P=0.05. Second harvest was cut on 9/23. Edge and Sure, with 0.44 t/a, had significantly higher yields than Ladak-65, Legend, Garst-636, ICB-34, Vernal, WL-225, Premier, and Pioneer 5432. WL-225 had the lowest yield with 0.31 t/a. Differences between total season yields, ranging from 2.28 t/a for Edge to 1.82 t/a for Pioneer 5432, were not significant at P=0.05. The alfalfa was moisture stressed throughout the growing season. Crop year precipitation was only 13.94 inches.

DRYLAND ALFALFA TRIAL SEEDED 1988 - KALISPELL

VARIETY	HARVEST £1 7/28 STAND %	YIELD t/a	HARVEST £2 9/23 HT in	YIELD t/a	1988 TOTAL t/a
EDGE	90	1.84	7	0.44	2.28
DK-125	95	1.76	7	0.43	2.18
VISTA-663	95	1.75	7	0.41	2.16
LADAK-65	94	1.77	5	0.32	2.10
LEGEND	95	1.77	6	0.33	2.10
SURE	98	1.64	6	0.44	2.07
WRANGLER	95	1.68	6	0.39	2.06
KINGSTON	94	1.65	7	0.38	2.03
WL-316	96	1.62	7	0.41	2.03
ARROW	96	1.60	7	0.41	2.01
VISTA-661	93	1.59	7	0.39	1.98
GARST-636	94	1.64	6	0.32	1.96
THOR	86	1.56	6	0.38	1.94
VISTA-LL3387	93	1.51	6	0.40	1.90
ICB-34	92	1.55	6	0.36	1.90
SPARTA	95	1.52	6	0.38	1.90
VERNAL	91	1.55	6	0.33	1.88
WL-225	91	1.57	6	0.31	1.88
PREMIER	93	1.52	6	0.35	1.87
PIONEER 5432	93	1.46	7	0.36	1.82
LSD(0.05)	5	0.28	1	0.08	0.34
P-VALUE	0.01	0.39	0.05	0.03	0.45
CV(s/mean)	3.6	12.3	13.8	15.5	11.9

Seeded 5/4/88 at 10 lbs/a
Fertilizer: 200 lbs P/a
Crop year precipitation = 13.94 in.

YEAR/PROJECT: 1988/755 1986 INTRASTATE ALFALFA YIELD TRIAL - IRRIGATED

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
In cooperation with R.Ditterline, Bozeman

First harvest was cut on 6/14/88. Verta+ was the highest yielding variety at 3.75 t/a. Thorobred was significantly lower yielding than any other variety with only 2.94 t/a. Second harvest yields on 8/5/88 ranged from 3.97 t/a for Surpass to 3.09 t/a for Vernal-K (Apron treated). Third harvest was cut on 9/29/88. Verta+, Excalibur, Centurion and Exp.339 had the highest yields and Lakak 65 had the lowest.

The top yielding varieties for 1988 were Verta+, Excalibur, Centurion, Surpass and Exp.339. These varieties are all resistant to Verticillium Wilt. The lowest yielding varieties were Vernal, Spredor II, Thorobred and Ladak 65, all of which are susceptible to Verticillium Wilt. Three-year totals range from 22.59 t/a for Excalibur to 19.22 t/a for Ladak 65. The top seven varieties are Vert wilt resistant, while only 2 of the 7 lowest yielding varieties are.

On 10/28/88 Lexone was applied to the nursery at 0.75 lb. AI/a.

1986 INTRASTATE ALFALFA YIELD TRIAL - IRRIGATED
KALISPELL, 1988

VARIETY	VERT WILT RESIS. 1/	Harvest 6/14	8/5	9/29	1988 TOTAL
		Yield(t/a)			
VERTA +	R	3.75	3.88	2.88	10.51
EXCALIBUR	R	3.56	3.87	2.90	10.33
CENTURION	R	3.50	3.86	2.84	10.20
SURPASS	R	3.49	3.97	2.68	10.14
EXP.339	R	3.40	3.69	2.90	9.99
BAKER-K 2/	--	3.54	3.66	2.59	9.79
ANSTAR	--	3.49	3.48	2.71	9.68
SPARTA	R	3.45	3.57	2.66	9.68
WL 316	R	3.32	3.67	2.68	9.67
NY 8412	HR	3.58	3.49	2.57	9.64
ELEVATION	MR	3.56	3.49	2.57	9.62
NY 8413	HR	3.29	3.56	2.62	9.47
BLAZER	LR	3.42	3.50	2.49	9.41
THOR	--	3.53	3.30	2.57	9.40
APOLLO II	MR	3.29	3.51	2.58	9.38
AP 45	R	3.48	3.37	2.49	9.34
BAKER	--	3.51	3.45	2.35	9.31
WL 83-2	R	3.27	3.43	2.54	9.24
WL225	R	3.29	3.48	2.44	9.21
SPREDOR II	--	3.22	3.45	2.19	8.86
VERNAL	--	3.44	3.16	2.24	8.84
THOROBRED	--	2.94	3.44	2.36	8.74
VERNAL-K 2/	--	3.38	3.09	2.17	8.64
LADAK 65	--	3.42	3.32	1.88	8.62
LADAK 65-K 2/	--	3.48	3.13	1.86	8.47
LSD(0.05)		0.26	0.34	0.19	0.54
P-VALUE		0.00	0.00	0.00	0.00
CV(s/mean)		5.4	6.8	5.1	4.0

1/ LR=low resistance, MR=moderate resistance, R=resistant, HR=high resistance

2/ Seed treated with Apron + 100 lbs K/a

1986 INTRASTATE ALFALFA YIELD TRIAL - IRRIGATED

VARIETY	1986	1987	1988	TOTAL
	t/a			
EXCALIBUR	4.12	8.14	10.33	22.59
VERTA +	4.13	7.85	10.51	22.49
CENTURION	3.85	7.73	10.20	21.78
EXP. 339	3.94	7.80	10.01	21.75
SPARTA	3.88	7.87	9.68	21.43
SURPASS	3.66	7.62	10.13	21.41
ELEVATION	3.77	7.81	9.61	21.19
THOR	3.85	7.78	9.39	21.02
ANSTAR	3.66	7.65	9.69	21.00
BLAZER	3.63	7.90	9.41	20.94
BAKER-K	3.65	7.37	9.79	20.81
NY 8412	3.85	7.28	9.65	20.78
APOLLO II	3.81	7.60	9.37	20.78
NY 8413	3.65	7.52	9.48	20.65
WL 316	3.61	7.36	9.67	20.64
WL 83-2	3.78	7.61	9.25	20.64
WL 225	3.65	7.54	9.21	20.40
AP 45	3.37	7.54	9.34	20.25
SPREDOR II	3.57	7.76	8.86	20.19
BAKER	3.55	7.12	9.31	19.98
THOROBRED	3.59	7.54	8.74	19.87
VERNAL-K*	3.52	7.61	8.63	19.76
VERNAL	3.47	7.23	8.83	19.53
LADAK 65	3.27	7.34	8.62	19.23
LADAK 65-K	3.36	7.37	8.49	19.22
LSD(0.05)	0.26	0.40	0.54	
P-VALUE	0.00	0.00	0.00	
CV(s/mean)	10.2	3.7	4.0	

Seeded 4/30/86 at 10 lbs/a
4/29/86 - Eptam 4 lbs AI/a + 2,4-DB
5/15/86 - 180 lbs P205/a
7/2/86 - Imidan 1-lb AI/a for weevil control
3/25/87 - 100 lbs K/a
Fall '87 - 110 lbs P205/a
45 lbs S/a
K-plots: 100 lbs K/a
10/28/88 - Lexone: 0.75 lbs AI/a

YEAR/PROJECT: 1988/755 1984 INTRASTATE ALFALFA YIELD TRIAL
KALISPELL, IRRIGATED

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
In cooperation with Ray Ditterline, Bozeman

In the first harvest Oneida VR and Arrow produced twice as much forage as Thor and Drummor. Although winterhardiness of these varieties are all classified as moderately hardy to hardy, Oneida VR and Arrow are resistant to Verticillium wilt, while Thor and Drummer are not. The pattern was similar for second and third harvests and for the season total yields. Sums of yields from 1984 - 1988 reveal that six of the top ten yielding varieties have Verticillium wilt resistance while only one of the lowest ten varieties does.

1984 INTRASTATE ALFALFA YIELD TRIAL KALISPELL 1988

VARIETY	VERT RES	1/ OCC %	6/21/88 Harvest-1	8/3/88 Harvest-2	10/3/88 Harvest-3	TOTAL
			t/a			
ONEIDA VR	HR	71	3.27	2.75	1.90	7.91
ARROW	R	78	3.07	2.48	1.90	7.45
WL 316	R	59	2.83	2.59	1.70	7.12
DK-135	MR	58	2.75	2.27	1.75	6.77
COMMANDOR	MR	75	2.84	2.19	1.62	6.65
BAKER	--	42	2.85	2.00	1.46	6.31
LADAK 65	--	44	2.77	1.78	1.13	5.67
WRANGLER	LR	60	2.62	1.69	1.25	5.56
526	--	47	2.43	1.83	1.24	5.50
DK-120	--	30	2.33	1.72	1.34	5.38
SPECTRUM	--	60	2.18	1.78	1.35	5.30
ADVANTAGE	--	64	2.35	1.51	1.26	5.12
532	--	35	2.11	1.65	1.18	4.94
CHALLENGER	--	45	2.15	1.59	1.19	4.93
BEAVER	--	32	2.42	1.57	0.92	4.91
VERNAL	--	54	2.12	1.66	1.10	4.88
IROQUOIS	--	34	2.16	1.55	1.11	4.82
PHYTOR	--	58	2.23	1.42	1.16	4.80
MAXIM	R	51	1.90	1.52	1.14	4.56
JUBILEE	--	45	2.01	1.45	1.10	4.56
MOHAWK	--	58	2.07	1.41	1.05	4.53
DECATHLON	MR	39	1.93	1.50	1.10	4.53
NY 8302	--	35	1.79	1.36	0.99	4.14
THOR	--	39	1.57	1.11	0.77	3.45
DRUMMOR	--	38	1.51	1.07	0.72	3.31
LSD(0.05)		23	0.27	0.24	0.17	0.55
P-VALUE		0.00	0.00	0.00	0.00	0.00
CV (S/MEAN)		28.0	7.1	8.4	8.1	6.3

1/ Occupancy is related to number of plants/sqft.
Herbicides: Lexone - .75 lb AI/a 10/28/88

IRRIGATED ALFALFA VARIETY TRIAL - KALISPELL MT. - SEEDED 1984.

VARIETY	1984	1985	1984-88 YIELD - T/A 1986	1987	1988	TOTAL
ONEIDA VR *	3.72	6.93	6.10	7.96	7.91	32.62
DK-135 *	4.06	6.76	6.56	8.14	6.77	32.29
ARROW *	4.02	6.74	6.17	7.56	7.45	31.94
WL 316 *	3.60	6.94	6.06	7.31	7.12	31.03
BAKER	3.94	6.44	6.01	7.34	6.31	30.04
COMMANDOR *	3.78	6.66	5.98	6.89	6.65	29.96
526	4.04	7.32	6.08	5.87	5.50	28.81
ADVANTAGE	3.89	6.87	5.81	6.20	5.12	27.89
DK-120	3.78	6.61	5.87	6.08	5.38	27.72
WRANGLER *	3.70	6.37	5.71	6.26	5.56	27.60
SPECTRUM	4.07	7.02	5.42	5.53	5.30	27.34
IROQUOIS	3.81	6.98	5.88	5.78	4.82	27.27
532	3.66	7.11	5.78	5.51	4.94	27.00
LADAK-65	3.63	6.10	5.61	5.96	5.67	26.97
MAXIM *	4.01	6.87	5.87	5.65	4.56	26.96
DECATHLON *	3.97	7.03	5.78	5.57	4.53	26.88
CHALLENGER	4.04	6.79	5.60	5.51	4.93	26.87
PHYTOR	3.83	6.45	5.90	5.78	4.80	26.76
MOHAWK	3.92	6.83	5.54	5.60	4.53	26.42
NY 8302	3.70	6.96	5.61	5.49	4.14	25.90
VERNAL	3.76	6.49	5.60	5.16	4.88	25.89
BEAVER	3.49	6.17	5.68	5.62	4.91	25.87
JUBILEE	3.86	6.28	5.41	5.51	4.56	25.62
DRUMMOR	4.43	6.76	5.87	4.79	3.31	25.16
THOR	4.07	6.76	5.56	4.76	3.45	24.60
LSD (0.05)	0.34	0.47	0.44	0.76	0.55	
P-VALUE	0.00	0.00	0.00	0.00	0.00	
CV (S/MEAN)	6.2	4.9	5.4	8.8	6.3	

* Varieties that have vert wilt resistance.

NOTES:

Planting Date: 4/24/84
Previous Crop: Fallow
Fertilizer: Spring 1984 - 260 lbs/a P205
Fall 1986 - 88 lbs/a P205, 100 lbs/a K20, 50 lbs/a S
Seeding Rate: 10 lbs PLS/a
Herbicides: 1984 - Eptam + 2,4-DB
10/14/86 & 10/20/87 - Sencor - 1 lb AI/a
10/28/88 - Lexone - 3/4 lb AI/a

YEAR/PROJECT: 1988/755 1984 INTRASTATE ALFALFA YIELD TRIAL
DRYLAND

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
In cooperation with R. Ditterline, Bozeman

Three cuttings were taken in 1984, on 6/8, 8/2 and 9/22. There were significant differences in yields among varieties for all harvests and the total. Yields for the first cutting ranged from 3.07 t/a for Jubilee to 3.59 t/a for Decathlon. Second cutting yields went from 3.18 t/a for Arrow to 2.45 t/a for Ladak 65. Third harvest yields varied from 1.27 t/a for Spectrum to 0.61 t/a for Beaver. Highest total season yields were attained by Arrow, Decathlon, 532, Spectrum, WL 316, 526, DK-135, Commandor, Oneida VR, and Wrangler. Lowest yielding varieties were Jubilee, Challenger, Mohawk, Drummor, Advantage, Vernal, Beaver, and Ladak 65. The total yields for 1984-88 ranged from 32.90 t/a for 532 to 29.56 t/a for Lakak 65. On 10/28 Lexone was applied to the nursery at 3/4 lb AI/a. Of the top 12 producing varieties in 1988, 10 had some level of resistance to Vert wilt. This shows that the disease is affecting yields even though the classic yellowing symptoms are not present.

1984 INTRASTATE ALFALFA YIELD TRIAL - DRYLAND - KALISPELL,MT

VARIETY	VERT WILT RESISTANCE	1988 YIELDS - T/A 1ST CUT 6/8	2ND CUT 8/2	3RD CUT 9/22	TOTAL
ARROW	R	3.51	3.18	1.17	7.85
DECATHLON	MR	3.59	2.99	1.14	7.72
532	--	3.56	3.00	1.12	7.68
WL 316	R	3.45	3.06	1.16	7.67
SPECTRUM	--	3.33	3.06	1.27	7.66
526	--	3.55	2.87	1.06	7.47
DK-135	MR	3.32	3.05	1.09	7.46
COMMANDOR	MR	3.35	3.01	1.05	7.41
ONEIDA VR	HR	3.40	2.90	1.08	7.39
WRANGLER	LR	3.44	2.87	1.02	7.33
DK-120	--	3.28	2.90	1.06	7.24
MAXIM	R	3.36	2.79	1.06	7.21
IROQUOIS	--	3.27	2.87	1.06	7.19
PHYTOR	--	3.26	2.82	1.11	7.18
NY 8302	--	3.30	2.73	1.11	7.14
BAKER	--	3.09	2.94	1.01	7.04
THOR	--	3.33	2.72	0.95	7.00
CHALLENGER	--	3.22	2.72	0.99	6.92
JUBILEE	--	3.07	2.72	1.14	6.92
MOHAWK	--	3.30	2.62	0.98	6.90
ADVANTAGE	--	3.17	2.73	0.96	6.85
DRUMMOR	--	3.37	2.63	0.82	6.81
VERNAL	--	3.18	2.54	0.86	6.57
BEAVER	--	3.26	2.53	0.61	6.39
LADAK 65	--	3.23	2.45	0.69	6.37
LSD(0.05)		0.24	0.27	0.19	0.58
P-VALUE TRTS		0.00	0.00	0.00	0.00
CV (S/MEAN)		5.1	6.7	12.9	5.7

1984 INTRASTATE ALFALFA YIELD TRIAL - DRYLAND

	YIELDS - t/a					
VARIETY	1984	1985	1986	1987	1988	TOTAL
532	1.20	4.96	11.47	7.59	7.68	32.90
WL 316 *	1.12	4.88	11.28	7.66	7.67	32.61
Wrangler *	1.23	4.88	11.32	7.42	7.33	32.18
Spectrum	1.19	4.60	11.06	7.33	7.66	31.84
Thor	1.16	4.87	11.16	7.64	7.00	31.83
DK-135 *	1.18	4.60	10.96	7.47	7.46	31.67
Decathlon	1.12	4.59	10.49	7.72	7.72	31.64
Mohawk	1.14	4.62	10.85	7.92	6.90	31.43
DK-120	1.15	4.57	10.72	7.67	7.24	31.35
Arrow *	1.04	4.46	10.57	7.42	7.85	31.34
526	1.07	4.46	10.37	7.93	7.47	31.30
Commandor *	1.10	4.47	10.47	7.76	7.41	31.21
Iroquois	1.09	4.58	11.03	7.27	7.19	31.16
Drummor	1.25	4.76	10.87	7.40	6.81	31.09
Jubilee	1.23	4.63	10.98	7.28	6.92	31.04
Maxim *	1.10	4.48	10.87	7.31	7.21	30.97
Advantage	1.19	4.62	10.94	7.31	6.85	30.91
Baker	1.23	4.50	10.52	7.33	7.04	30.62
Phytor	1.17	4.22	10.36	7.46	7.18	30.39
Vernal	1.15	4.32	10.60	7.34	6.57	29.98
Beaver	1.20	4.32	10.48	7.56	6.39	29.95
Oneida VR *	1.02	4.21	9.94	7.21	7.39	29.77
Challenger	1.16	4.32	10.02	7.30	6.92	29.72
NY 8302	1.06	4.09	9.68	7.66	7.14	29.63
Ladak 65	1.28	4.15	10.36	7.40	6.37	29.56
LSD(0.05)	0.30	0.25	0.65	0.65	0.58	
P-VALUE TRTS	0.00	0.00	0.01	0.71	0.00	
CV (s/mean)	7.4	18.3	9.2	6.2	5.7	
Crop Year Precip. (in)	19.93	17.56	23.23	21.97	13.94	

* Varieties that have Vert wilt resistance

NOTES:

Planting date: 5/4/84 @10 lbs PLS/a
Fertilizer: Spring 1984 - 180 lbs/a P2O5
Fall 1986 - 88 lbs/a P2O5, 100 lbs/a K2O, 50 lbs/a S
Pesticides: 1984 - Eptam 4 lbs AI/a - preplant
7/2/86 - Imidan - 1-lb AI/a for weevils
10/14/86 - Sencor - 1 lb AI/a
10/20/87 - Sencor - 1 lb AI/a
10/28/88 - Lexone - .75 lb AI/a

YEAR/PROJECT: 1988/755 1985 WESTERN REGIONAL ALFALFA YIELD TRIAL

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
In cooperation with R.Ditterline, Bozeman

This was the third and final year after establishment. Stand occupancy, based on visual estimates, ranged from 88% (Lahonton) to 38% (Cuf 101). Moapa, with 57%, was significantly higher than Cuf but lower than the other 6 varieties. Yield differences for all 3 harvests and the total were significant at $P<0.01$. At first harvest on 6/22 Vernal, Ranger, and Spredor II had higher yields than Lahonton's, which were higher than Moapa's, which were higher than Cuf's, which were the lowest at 1.48 t/a. At second harvest on 8/3 Mesilla, Vernal, Ranger, Saranac, and Lahonton yielded higher than Moapa and Cuf. At third harvest on 9/23 Mesilla had significantly higher yield than all other varieties, and Spredor II had lower yield than the others. Mesilla, Vernal, Ranger, and Saranac had higher total seasonal yields than Moapa, which was higher than Cuf. Cuf yielded only 65% of Mesilla's crop. Mesilla's performance in this trial was surprising since its winterhardiness is not highly rated. Visual stand estimation on 9/27 showed a range from 85% (Lahonton) to 52% (Cuf). Four-year yield totals ranged from 19.72 t/a for Saranac AR to 14.91 t/a for Cuf 101.

1985 WESTERN REGIONAL ALFALFA YIELD TRIAL
KALISPELL - IRRIGATED - 1988

VARIETY	4/8 STAND %	6/22 HARV-1 t/a	8/3 HARV-2 t/a	9/23 HARV-3 t/a	TOTAL t/a	9/27 STAND %
MESILLA	80	2.56	1.73	1.35	5.64	80
VERNAL	85	2.90	1.58	1.03	5.51	75
RANGER	85	2.77	1.63	1.07	5.48	80
SARANAC AR	81	2.56	1.57	1.03	5.16	70
SPREDOR II	83	2.74	1.43	0.90	5.07	84
LAHONTAN	88	2.44	1.58	1.02	5.05	85
MOAPA 69	57	1.93	1.30	1.03	4.25	78
CUF 101	38	1.48	1.18	1.01	3.66	52
LSD(0.05)	11	0.26	0.19	0.11	0.50	12
P-VALUE	0.00	0.00	0.00	0.00	0.00	0.00
CV (S/MEAN)	10.0	7.4	8.8	6.9	6.9	11.1

1985 WESTERN REGIONAL ALFALFA YIELD TRIAL - IRRIGATED - KALISPELL. MT

VARIETY	1985	1986	1987	1988	TOTAL
	t/a				
SARANAC AR	3.04	5.36	6.17	5.15	19.72
VERNAL	2.59	5.20	5.99	5.51	19.29
MESILLA	2.62	4.82	6.23	5.63	19.30
RANGER	2.61	4.85	5.92	5.48	18.86
SPREDOR II	2.26	4.92	5.60	5.06	17.84
MOAPA 69	2.59	3.89	4.98	4.24	15.70
LAHONTAN	2.12	3.95	5.20	5.05	16.32
CUF 101	2.68	3.96	4.62	3.65	14.91
LSD(0.05)	0.46	0.62	0.44	0.50	
P-VALUE	0.02	0.00	0.00	0.00	
CV (S/MEAN)	12.2%	9.0%	5.3%	6.9%	

Planting Date: 5/8/85
Previous Crop: Fallow
Fertilizer: Spring 1985 - 180 lbs/a P205
Fall 1987 - 53 lbs/a P205, 60 lbs/a K20,
20 lbs/a S
Seeding Rate: 12 lbs PLS/a
Herbicide: Eptam + 2,4-DB
Fall 1986 & 1987 - Sencor - 1 lb. AI/a
Insecticide: Imidan - 1 lb. AI/a 7/2/86

YEAR/PROJECT: 1988/755 DRYLAND ALFALFA TRIAL SEEDED 1980
PROJECT PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye

On 15 April, alfalfa occupancy in each plot was determined using a 2"x20" grid and counting the number of 1" squares containing new growth. Differences were not significant. First harvest was taken on June 8 and 9 with most plots at 5% bloom. Ladak-65, Perry, Baker, Classic, Spredor II, Anchor, Vancor, Armor and Vernal were the highest yielding varieties, and Thor, Cascade, Ranger, Raidor and Marathon were the lowest. Second harvest on August 2 resulted in Ladak-65, Armor, Super 721, Vancor, Baker, Perry, Classic, Spectrum, Cascade, WL 220, and Anchor as the high yielders, while Vernal, Ranger, Thor, Spredor II, Raidor, and Marathon were low yielders. Yields were not significantly different for third harvest. Total yields for 1988 were highest (in order) for Ladak-65, Armor, Perry, Super 721, Baker, Classic, Vancor, Anchor, Spectrum, and WL 220, and lowest for Marathon, Raidor, Spredor II, Thor and Ranger. On October 28 Lexone was applied at 0.75 lb. AI/a. Nine-year total yields ranged from 35.58 t/a for Vancor to 28.23 t/a for Ranger.

DRYLAND ALFALFA TRIAL SEEDED 1980 - KALISPELL - 1988 DATA

VARIETY	4/15/88 OCCUPANCY %	9/20/88 STAND %	6/8/88 HARVEST-1 t/a	8/2/88 HARVEST-2 t/a	9/20/88 HARVEST-3 t/a	1988 TOTAL t/a
LADAK-65	82	78	2.59	2.02	0.47	5.08
ARMOR	83	75	2.30	1.99	0.54	4.83
PERRY	88	62	2.55	1.82	0.42	4.79
SUPER 721	78	90	2.21	1.93	0.56	4.70
BAKER	86	60	2.48	1.85	0.33	4.66
CLASSIC	83	83	2.42	1.80	0.38	4.60
VANCOR	80	80	2.31	1.86	0.37	4.54
ANCHOR	79	67	2.34	1.70	0.35	4.39
SPECTRUM	79	80	2.20	1.77	0.31	4.28
WL 220	82	68	2.21	1.71	0.34	4.26
VERNAL	77	65	2.26	1.61	0.30	4.17
CASCADE	78	65	2.03	1.72	0.40	4.15
RANGER	78	50	1.98	1.60	0.47	4.05
THOR	79	50	2.09	1.49	0.27	3.85
SPREDOR II	83	38	2.37	1.38	0.10	3.85
RAIDOR	73	45	1.81	1.32	0.22	3.35
MARATHON	75	48	1.78	1.29	0.21	3.27
LSD(0.05)	10	36	0.33	0.41	0.29	0.86
P-VALUE	0.40	0.20	0.00	0.01	0.21	0.01
CV(s/mean)	7.8	33.7	9.0	14.5	49.4	12.1

DRYLAND ALFALFA VARIETY TRIAL - SEEDED 1980 - KALISPELL, MT

	YIELDS - T/A									
VARIETY	1980	1981	1982	1983	1984	1985	1986	1987	1988	TOTAL
VANCOR	1.81	4.48	2.51	2.98	3.41	5.59	4.44	5.82	4.54	35.58
ARMOR	1.79	4.14	2.34	2.91	3.12	5.36	4.49	6.04	4.83	35.02
LADAK-65	1.48	4.29	2.81	3.31	3.19	4.76	4.26	5.74	5.08	34.92
THOR	1.99	4.73	2.75	2.71	3.32	5.17	4.42	5.36	3.85	34.30
ANCHOR	1.70	4.53	2.68	2.65	3.05	5.04	4.56	5.63	4.39	34.23
SPREDOR II	1.52	4.74	2.48	3.19	3.55	5.22	4.28	5.28	3.85	34.11
BAKER	1.81	4.07	2.30	2.61	3.01	5.04	4.26	6.20	4.66	33.96
SPECTRUM	1.80	4.63	2.69	2.80	3.07	4.93	3.93	5.47	4.28	33.60
CASCADE	1.86	3.90	2.42	2.67	3.09	5.52	4.24	5.61	4.15	33.46
SUPER 721	1.45	3.99	2.44	2.85	3.00	5.35	4.21	5.36	4.70	33.35
RAIDOR	1.84	4.40	2.40	2.86	3.33	5.43	3.93	4.99	3.35	32.53
PERRY	1.67	4.06	2.38	2.43	3.18	4.79	3.86	5.24	4.79	32.40
WL 220	1.69	4.02	2.01	2.46	3.40	4.99	4.06	5.48	4.26	32.37
VERNAL	1.79	4.09	2.62	2.32	2.97	4.82	4.03	5.28	4.17	32.09
CLASSIC	1.74	3.78	2.05	2.83	2.81	4.84	4.09	5.29	4.60	32.03
MARATHON	1.66	4.07	2.39	2.44	2.86	4.52	3.53	4.83	3.27	29.57
RANGER	1.34	3.38	2.32	2.34	2.41	4.20	3.50	4.69	4.05	28.23
LSD(0.05)		0.49	0.72	0.61	0.92	1.26	0.86	0.83	0.86	
P-VALUE		0.00	0.73	0.08	0.78	0.78	0.49	0.06	0.01	
CV(s/mean)		8.3	20.8	15.8	20.9	17.5	14.7	10.8	12.1	
Crop Year Precip(in)	23.6	23.7	18.2	21.0	19.9	17.6	23.2	22.0	13.9	

FERTILIZER: Spring 1980 - 132 lbs/a P2O5
Fall 1981 - 52 lbs/a P2O5
Spring 1984 - 90 lbs/a P2O5, 50 lbs/a K2O, 40 lbs/a S
Fall 1986 - 88 lbs/a P2O5, 120 lbs/a K2O, 50 lbs/a S

HERBICIDES: 1980 - Eptam + 2,4-DB
Fall 1984,1986,1987 - Sencor - 1 lb AI/a
Fall 1988 - Lexone - 0.75 lb AI/a

YEAR/PROJECT: 1988/755 IRRIGATED GRASS STUDY

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
Cooperating with R.Denny Hall, USDA SCS

On 11/5/87 Kenmont Tall Fescue, Slender Wheatgrass, Jose Tall Wheatgrass, Shoshone Beardless Wild Rye, Latar Orchardgrass, Garrison Creeping Foxtail, and Regar Meadow Bromegrass were seeded in field P-2. Plots consisted of 4 - 15' rows 1 foot apart with 2' between plots. Species were arranged in a randomized complete block design with 4 replications.Plots were trimmed back to 12' and a 48 sq.ft. area harvested with an ALMACO forage harvester. Subsamples were taken and dried to determine dry matter yield. The nursery was harvested on 7/12,8/23 and 10/12.

On 5/24 stands were recorded using visual estimates. Latar, Regar, Jose and Slender had the best with over 85%, and Garrison was the worst with only 31%. Latar had significantly higher total season yields than any other species and was among the highest for each harvest. Slender's yields were similar to Latar's in the first cutting, but showed very poor regrowth. Regar had the second highest total yields, and Garrison and Shoshone had the poorest with only 25% of Latar's.

IRRIGATED GRASS STUDY - KALISPELL
Seeded 11/5/87

SPECIES	5/24 STAND %	7/12 HT in	7/12 YIELD t/a	8/23 YIELD t/a	HT in	10/12 YIELD t/a	TOTAL YIELD t/a
Latar Orchardgrass	90	38	2.22	1.13	23	1.62	4.96
Regar Meadow Brome	86	35	1.84	1.26	17	1.22	4.31
Jose Tall Wheatgrass	93	43	1.95	0.73	12	0.71	3.39
Kenmont Tall Fescue	51	29	0.91	1.12	14	1.06	3.09
Slender Wheatgrass	94	45	2.33	0.13	8	0.15	2.60
Garrison Creep. Foxtail	31	24	0.49	0.44	11	0.41	1.34
Shoshone Beardless Wild Rye	76	26	0.38	0.55	10	0.18	1.11
LSD(0.05)	14	4	0.33	0.15	2	0.20	0.46
P-VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CV(s/mean)	13.0	8.9	15.5	13.4	12.2	17.5	10.4

Fertilizer: 70 lbs N/a on 4/6/88
70 lbs N/a and 150 lbs P/a on 5/6/88

YEAR/PROJECT: 1988/ANNUAL FORAGE LEGUME MANAGEMENT FOR N SUSTAINABILITY

PERSONNEL: Leader - Leon Welty
Research specialist - Louise Prestbye
In cooperation with M.Westcott, Corvallis

Nitro alfalfa, Bigbee Berseem clover, and Gallatin barley were seeded in field P-3 on 5/3/88. Seeding rates were 30 seeds per linear foot, 30 seeds per linear foot, and 60 lbs/a, respectively. Eptam at 3 lbs AI/a was preplant incorporated. Experimental design was a split plot in randomized complete blocks with 4 replications. Main plots were the 2 annual legume species and the barley reference crop, and subplots were 5 harvest management schedules for the legumes in 1988 and 5 N fertilizer rates for the reference plots in 1989 when the whole nursery will be seeded to barley. Subplots consisted of eight 13' rows spaced 1' apart with 2' between subplots and 8' between whole plots. Reps were separated by 22' alleys. Plots were trimmed back to 12' after emergence, and a 120 sq.ft. harvest area sampled from each annual legume subplot according to the following schedules: H-0) No forage removed; all growth disced down for green manure on 10/11; H-1) Forage harvested on 7/11 and remaining growth disced on 10/11; H-2) Forage harvested on 7/11 and 8/26 and remaining growth disced 10/11; H-3) Forage harvested on 7/11, 8/26 and 10/11, with only stubble disced on 10/11; H-4) Forage harvested on 7/11, 8/11, and 9/11 and disced on 10/11. Barley plots were harvested on 8/21 and grain yield, test weight and % plump recorded. Straw was incorporated back into the soil. Annual legume plots were harvested with an ALMACO forage harvester and green weight recorded. Subsamples were dried to determine dry matter yield and ground in a Wiley mill to be analyzed for total N. On 10/11 all forage but the small subsamples were returned to the plots (except for Treatment H-3) and incorporated as green manure the next day.

The nursery was irrigated 4 times: 6/23 (8 hrs.), 7/25(6 hrs.), 8/19(8 hrs.), and 8/30(8 hrs.). Crop year precipitation was 13.94".

In the spring of 1988, before seeding, soil samples were taken from 4 parts of the nursery area to determine indigenous N. Depths sampled were 0-10", 10-20", 20-40", and 40-60". On 9/21/88 samples were taken from each legume subplot and each barley whole plot from 0-6", 6-12", 1-2', 2-3', and 3-4'. Similar samples (but including barley subplots) will be taken in spring and fall of 1989 and 1990 to determine N distribution in the soil profile over time.

There were significant differences between harvest schedules in the amount of forage hay and green manure. Treatment H-3 (3 cuttings with no green manure stockpiling) had the highest hay yields, which were almost identical for Nitro and Bigbee. Bigbee had higher hay yields for treatment H-2 than Nitro, while Nitro had slightly higher yields for H-4. In both cases, the 3 hay cuttings on 7/11, 8/26,and 10/11 had significantly higher hay yields than H-4 with cuttings on 7/11, 8/11 and 9/11. Treatment H-0 for Bigbee had 43% more plant material available for green

manure than Nitro and 52% more for treatment H-1. In a system with green manure only or one hay cutting plus green manure Bigbee was clearly superior in terms of dry matter available for disc-down, and it produced more hay in a 2 hay cutting/green manure (2H/GM) system. In terms of total dry matter production, Bigbee produced 3.24 t/a in a 1H/GM schedule, which was not significantly different from a 2H/GM or a 3H schedule for Bigbee or a 3H/GM schedule for Nitro. Bigbee showed higher yields than Nitro for all but the 3H/GM treatment.

ANNUAL FORAGE LEGUME MANAGEMENT FOR N SUSTAINABILITY
KALISPELL - IRRIGATED - 1988

SPECIES	CUTTING SCHEDULE	Harvest 1st	Harvest 2nd	Harvest 3rd	TOTAL HAY	GREEN MANURE
		~~kg/ha~~ T/A				
Nitro	GM				0	1.83
	7/11,GM	0.83			0.83	1.53
	7/11,8/26,GM	0.85	1.20		2.05	0.89
	7/11,8/26,10/11	0.83	1.19	1.02	3.04	0
	7/11,8/11,9/11,GM	0.91	0.97	0.97	2.85	0.16
Bigbee	GM				0	2.62
	7/11,GM	0.92			0.92	2.32
	7/11,8/26,GM	1.09	1.63		2.72	0.64
	7/11,8/26,10/11	0.90	1.56	0.58	3.05	0
	7/11,8/11,9/11,GM	0.97	0.83	0.73	2.52	0.14
	LSD(0.05) between harvest schedules =				0.18**	0.17**

ANNUAL FORAGE LEGUME MANAGEMENT FOR N SUSTAINABILITY
KALISPELL - IRRIGATED - 1988

HARVEST DATES	SPECIES Nitro	Bigbee	Means
	Yield (t/a)		
10/11-GM	1.83	2.62	2.22
7/11,10/11-GM	2.36	3.24	2.80
7/11,8/26,10/11-GM	2.95	3.36	3.15
7/11,8/26,10/11-HAY	3.04	3.05	3.04
7/11,8/11,9/11,10/11-GM	3.01	2.66	2.83
Means	2.64	2.98	

LSD(0.05) between harvest means = 0.22 t/a (P=0.00)
LSD(0.05) of interaction means = 0.55 t/a (P=0.00)
Difference between species means is not significant (P=0.12)

YEAR/PROJECT: 1988/758 STATEWIDE LEGUME ADAPTATION TRIAL - IRRIGATED

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
Cooperated with James Sims, Bozeman

On 5/10/88 eleven small-seeded and six large-seeded annual legumes were planted in Field Y-2. Seeding rates were as follows: 4 lbs/a - Maral Shaftal Clover; 9 lbs/a - Bigbee Berseem, Multicut Berseem, Common Yellow, Harbinger Medic, Youchi Arrowleaf, George Black; 13 lbs/a - Jemalong Medic, Tornafield Medic; 18 lbs/a - Mt.Barker, Sapo Medic; 22 lbs/a - Paraponto Medic; 27 lbs/a - Indianhead Lentil, Robinson Medic; 71 lbs/a - Austrian Pea, Tinga Flatpea; 89 lbs/a - SEMU-SI Pea, Primorski Lupins, Ultra Lupins; 107 lbs/a - Chickling Vetch. Seed was mixed with species specific inoculum and planted in 15 ft. rows (8/plot) with 3 replications. Plots were fertilized with 50 lbs P/a. A harvest area of 54 sq.ft. was cut from each plot with an ALMACO forage harvester and subsamples taken and dried to determine dry weight yield and to be analyzed for quality. All species were harvested on 7/26. All small-seeded species plus Tinga Flatpea were harvested on 8/29, and Chickling Vetch plus small-seeded except Robinson Medic and Paraponto Medic were harvested on 10/6.

Multicut Berseem Clover and Maral Shaftal Clover had the highest total yields. SEMU-SI Feed Pea and NC8-3 Chickling Vetch were highest of the large-seeded legumes and were similar to Jemalong Barrel Medic. Poorest yields came from Primorski and Ultra Lupins, Robinson Snail and Paraponto Gamma Medic, and Youchi Arrowleaf Clover. Superior regrowth after the first harvest was responsible for the high yields of Multicut Berseem and Maral Shaftal Clovers. The second cutting of Multicut yielded more than the first cut. SEMU Pea had the highest first cutting yield but there was no regrowth.

STATEWIDE LEGUME ADAPTATION TRIAL - IRRIGATED
KALISPELL. 1988 Seeded 5/10/88

LEGUME	EMERG	STAND	7/26/88 HT	7/26/88 YIELD	8/29 YIELD	10/6 YIELD	TOTAL YIELD
	days	%	in	t/a	t/a	t/a	t/a
SEMU-SI Feed Pea	11	71	46	3.24			3.24
NC8-3 Chickling Vetch	10	71	39	2.32		0.72	3.04
Austrian Winter Pea	11	85	45	2.11			2.11
Tinga Tangier Flatpea	11	75	41	1.72	0.39		2.11
Indianhead Lentil	10	92	21	2.11			2.11
Primorski Lupins	11	63	25	1.45			1.45
Ultra Lupins	11	55	25	1.06			1.06
Bigbee Berseem Clover	7	95	28	1.92	1.30	0.52	3.74
Multicut Berseem Clover	7	95	27	1.54	1.92	0.95	4.41
Maral Shaftal Clover	11	93	28	2.02	1.30	0.76	4.08
Jemalong Barrel Medic	11	98	21	2.10	0.85	0.25	3.20
Tornafield Disc Medic	12	78	22	1.52	0.77	0.34	2.63
Sapo Gamma Medic	9	71	20	1.66	0.50	0.26	2.42
Harbinger Strand Medic	14	83	19	1.63	0.35	0.36	2.34
George Black Medic	12	80	19	1.40	0.64	0.10	2.14
Mt. Barker Sub.Clover	12	95	10	1.17	0.68	0.22	2.07
Common Yellow Sweetclover	12	59	24	1.41	0.61	0.03	2.05
Robinson Snail Medic	14	91	22	1.49	0.11		1.60
Paraponto Gamma Medic	15	55	19	1.13	0.33		1.46
Youchi Arrowleaf Clover	13	82	16	0.84	0.45	0.15	1.44
LSD(0.05)	5	8	5	0.49	0.34	0.16	0.55
P-VALUE	0.28	0.00	0.00	0.00	0.00	0.00	0.00
CV(s/mean)	26.7	6.0	10.8	17.7	27.8	24.6	13.7

YEAR/PROJECT: 1988/758 BERSEEM CLOVER SEEDING RATE AND ROW SPACING STUDY

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye

Berseem clover was seeded on 5/9/88 in field Y-9. Prior to seeding Eptam was incorporated at 3 lbs AI/a, and phosphorus at 50 lbs/a was spread on the nursery. Fifteen treatments comprised of 3 different row spacings (6,12,and 24 inches) and 5 different seeding rates (10,20,30,40,50 seeds/sq.ft.) were arranged in an RCB design with 4 replications. Plots were seeded to 15 ft. and then trimmed to 12 ft., leaving a harvest area of 60 sq.ft.

Occupancy of each plot was determined on 6/6/88 by counting the number of square inches containing seedlings in a 2"x20" grid randomly placed in 4 locations in each plot. Forage was harvested with an ALMACO forage harvester on 7/26/88.

Data were analyzed as a 2-factor RCB with 4 replications. Differences between main effect means were highly significant for both occupancy and forage yield. Seeding rates of 30,40, and 50 seeds/sq.ft. resulted in better stands and higher yields than 20 or 10 seeds/sq.ft. Row spacings of 6 or 12 inches produced almost double the yields of the 24 inch spacing. The interacting effects of rate and spacing revealed significant differences in yield with an 8% probability of error: seeding 40-50 seeds/sq.ft.(10.9-13.6 lbs/a) in rows 6-12" apart was optimal at this time and place.

1988 BERSEEM CLOVER SEEDING RATE and ROW SPACE STUDY
KALISPELL - IRRIGATED

Stand Occupancy - 6/6/88
%

Seeding Rate (seeds/sqft)	Row Spacing(inches) 6	12	24	Mean
10	31	55	61	49
20	56	70	71	65
30	74	85	83	81
40	84	87	89	87
50	82	82	90	85
Mean	65	76	79	

LSD(0.05) between seeding rate means = 7.7, P=0.00
LSD(0.05)between row space means = 5.9, P=0.00
LSD(0.05) for interaction = 13.2, P=0.16

1988 BERSEEM CLOVER SEEDING RATE and ROW SPACE STUDY
KALISPELL - IRRIGATED

1st Harvest
Yield
t/a

Seeding Rate (seeds/sqft)	Row Spacing(inches) 6	12	24	Mean
10	0.58	0.61	0.32	0.50
20	0.94	0.74	0.45	0.71
30	1.05	1.00	0.61	0.89
40	1.19	1.15	0.57	0.97
50	1.24	1.11	0.63	0.99
Mean	1.00	0.92	0.51	

LSD(0.05) between seeding rate means = 0.10, P=0.00
LSD(0.05)between row space means = 0.08, P=0.00
LSD(0.05) for interaction = 0.18, P=0.08

1988 BERSEEM CLOVER SEEDING RATE and ROW SPACE STUDY
KALISPELL - IRRIGATED

2nd Harvest Yield t/a

Seeding Rate (seeds/sqft)	Row Spacing(inches) 6	12	24	Mean
10	1.38	1.52	1.21	1.37
20	1.45	1.52	1.13	1.37
30	1.43	1.43	1.02	1.29
40	1.47	1.65	0.99	1.37
50	1.52	1.56	1.05	1.37
Mean	1.45	1.53	1.08	

LSD(0.05) between seeding rate means - not significant
LSD(0.05)between row spacing means = 0.13, P=0.00
LSD(0.05) for interaction - not significant

1988 BERSEEM CLOVER SEEDING RATE and ROW SPACE STUDY
KALISPELL - IRRIGATED

TOTAL YIELD t/a

Seeding Rate (seeds/sqft)	Row Spacing(inches) 6	12	24	Mean
10	1.96	2.13	1.53	1.87
20	2.39	2.26	1.59	2.08
30	2.48	2.43	1.63	2.18
40	2.66	2.80	1.56	2.34
50	2.75	2.66	1.67	2.36
Mean	2.45	2.45	1.59	

LSD(0.05) between seeding rate means = 0.22, P=0.00
LSD(0.05)between row spacing means = 0.17, P=0.00
LSD(0.05) for interaction - not significant

YEAR/PROJECT: 1988/754,758 BERSEEM CLOVER HERBICIDE TRIAL
PROJECT PERSONNEL: Leaders - Leon E.Welty, Vern Stewart
Research Specialists - Louise Prestbye
Todd Keener

Berseem clover was seeded on 9 May,1988, at 32 seeds/sqft in 10'x15' plots with 8 rows/plot and 18" between plots. Plots were fertilized with 50 lbs P/a. Before harvest, plots were trimmed back to a 10'x10' harvest area. Ten weed control treatments were imposed in an RCB pattern over 4 replications. Treatments included: 1) EPTC, 48 oz AI/a PPI; 2) EPTC, 64 oz AI/a PPI; 3) Bromoxynil, 3 oz AI/a - 3rd trifoliate leaf; 4) Bromoxynil, 4 oz AI/a - 3rd trifoliate leaf; 5) Bromoxynil+Sethoxydim+COC, 3+3 oz AI/a + 1 qt/a - 3rd trifoliate leaf; 6)Sethoxydim + COC, 4.5 oz AI/a + 1 qt/a; 7)2,4-DB, 0.5 lb AI/a post emergence; 8) handweeded once after 3rd trifoliate leaf; 9) handweeded twice - at weed emergence and after 3rd trifoliate leaf; 10) untreated check. Plots were harvested with an ALMACO forage harvester on 7/25 and 9/13. Subsamples of approximately 500 g were taken, weighed fresh, frozen, and separated into clover, grass, broadleaf weeds, and wild oats, and dried to determine dry matter yields.

For the first harvest, EPTC at both rates resulted in the highest clover yields of any herbicide treatment even though the berseem clover was stunted by the EPTC (particularly at the 64 oz rate). Bromoxynil at both rates and in combination with Sethoxydim + COC did not increase clover yields over the untreated check. Total dry matter yield was highest for the untreated check, but this was 98% wild oats. Percent broadleaf weeds were highest in EPTC and Sethoxydim+COC plots, but the better wild oat control compensated for most of the clover yield differences. Second harvest clover yields followed the same pattern, but since clover accounted for more regrowth, the total dry matter yields were also highest for EPTC and hand-weeded treatments. Wild oat control still correlated with clover yield. For total season clover yields EPTC at 48 or 64 oz AI/a ranked highest, while Bromoxynil and 2,4-DB did not improve yields over the untreated check, apparently due to injury to the crop.

BERSEEM CLOVER HERBICIDE TRIAL - KALISPELL, 1988

1st Harvest: 7/25/88

TREATMENT	VIGOR 1/	HT in	TOTAL YIELD t/a	CLOVER %	GRASS %	B.L. WEEDS %	WILD OATS %	CLOVER YIELD t/a
HW-1	10.0	23	1.33	100.0	0.2	0.1	0.0	1.33
HW-2	9.9	23	1.55	75.0	2.8	0.3	46.6	1.15
EPTC-48	6.5	21	1.47	73.4	0.3	28.8	31.9	1.07
EPTC-64	4.0	21	1.19	86.2	0.6	25.0	14.4	1.02
Seth+COC	9.4	22	1.66	48.6	0.0	19.3	59.4	0.72
Brom-3	4.3	21	1.94	25.0	4.4	0.0	91.9	0.45
2,4-DB	4.6	23	2.59	16.5	1.4	0.1	95.0	0.40
Untr.check	10.0	26	3.58	6.5	0.0	2.7	98.3	0.22
Brom-4	1.8	18	1.82	19.3	6.9	0.2	91.3	0.22
Bro+Seth+COC	1.4	19	1.67	8.7	0.0	1.8	97.4	0.11
LSD(0.05)	1.5	3	0.73	25.0	4.5	16.1	32.8	0.42
P-VALUE	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00
CV(s/mean)	8.4	8.9	26.6	37.6	187.2	141.7	36.1	43.5

1/ Vigor ratings 0-10, 0=dead plants, 10=normal, healthy plants
Taken on 6/30/88

BERSEEM CLOVER HERBICIDE TRIAL - KALISPELL, 1988

2nd Harvest: 9/13/88

TREATMENT	HT in	TOTAL YIELD t/a	CLOVER %	GRASS %	B.L. WEEDS %	WILD OATS %	CLOVER YIELD t/a
HW-1	14	1.26	98.5	0.1	0.1	1.4	1.24
EPTC-64	15	1.31	89.8	0.4	2.7	7.0	1.18
EPTC-48	14	1.20	92.0	0.2	2.4	5.4	1.10
HW-2	15	1.22	83.3	0.2	0.6	15.9	1.04
Seth+COC	12	0.83	91.8	0.2	2.2	5.9	0.77
Brom-3	10	0.55	77.5	1.0	1.3	20.3	0.43
Brom-4	11	0.60	58.0	0.9	0.1	41.0	0.40
2,4-DB	8	0.42	70.9	0.2	2.6	26.3	0.29
Bro+Seth+COC	10	0.65	27.6	0.2	0.2	72.1	0.21
Untr.check	9	0.24	66.5	0.6	0.6	32.4	0.17
LSD(0.05)	3	0.42	22.8	0.9	3.9	22.5	0.39
P-VALUE	0.00	0.00	0.00	0.44	0.73	0.00	0.00
CV(s/mean)	20.3	34.9	20.8	158.5	209.1	68.1	39.9

BERSEEM CLOVER HERBICIDE TRIAL - KALISPELL, 1988

TREATMENT	------1988 TOTAL------ FORAGE YIELD t/a	CLOVER YIELD t/a
HW-1	2.58	2.57
EPTC-64	2.50	2.20
HW-2	2.77	2.19
EPTC-48	2.67	2.17
Seth+COC	2.48	1.49
Brom-3	2.49	0.88
2,4-DB	3.00	0.68
Brom-4	2.42	0.62
Untr.check	3.81	0.40
Bro+Seth+COC	2.32	0.32
LSD(0.05)	0.57	0.72
P-VALUE	0.00	0.00
CV(s/mean)	14.7	37.0

YEAR/PROJECT: 1988/758 WESTERN REGIONAL DRY PEA YIELD TRIAL

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
In cooperation with Dr.Fred Muehlbauer, USDA,
Pullman,WA

Ten varieties of peas were seeded on 4/7/88 at 160 lbs/a. Seed had been pretreated with fungicide. Plots consisted of four 12 ft. rows with 1 ft. row spacing and 2 ft. between plots. Plots were later trimmed to 8 ft., resulting in a 40 sq.ft. harvest area. The design was an RCB with 4 replications.

Emergence varied from 14-16 days after planting, with PS210158, Latah, and Umatilla emerging first and Trapper and PS210686 last. Stands were all more than 90%. First bloom occurred earliest in Columbian and latest in Trapper. First flowering node varied from 8th node in Columbian, PS410095, PS210686, and Latah to 13 in Umatilla. Umatilla was earliest to mature and Trapper was latest. Flavanda af was by far the shortest variety, with very short internode spaces, and it was also the highest yielding variety with an 11% higher yield than the next highest (PS310126). Trapper had significantly lower seed weight than all others, and Flavanda, PS210158, PS210686, and Umatilla had the largest seeds.

Flavanda's short upright growth habit and high yields indicate it should be considered as a well-adapted dryland dry pea crop for this area.

WESTERN REGIONAL DRY PEA YIELD TRIAL KALISPELL, MT 1988

VARIETY	EMERGENCE days 1/	STAND %	1ST FLOWER days 2/	nodes	MATUR. days 3/	HT. in.	SEED £/lb	YIELD lbs/a
Flavanda af	15	94	66	12	98	22	1927	3410
PS310126	15	95	64	11	102	32	2160	3077
Trapper	16	91	71	11	105	38	3430	2942
Alaska 81	15	94	59	7	102	37	2108	2898
Columbian	15	94	57	8	99	34	2215	2852
PS410095	15	93	60	8	102	35	2207	2799
PS210686	16	93	58	8	97	34	1881	2763
PS210158	14	94	62	9	98	37	1898	2719
Latah	14	94	62	8	101	39	2278	2571
Umatilla	14	96	66	13	95	35	1809	2477
LSD(.05)	0.8	4.5	1.3	1.4	3.1	4.2	115.6	261.7
P-VALUE	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00
CV(S/MEAN)	3.5	3.3	1.5	10.4	2.1	8.4	6.3	3.6

Seeding date: 4/7/88
1/ Day 15 = 4/22/88
2/ Day 66 = 6/12/88
3/ Day 98 = 7/14/88

YEAR/PROJECT: 1988/758 WESTERN REGIONAL LENTIL YIELD TRIAL

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
In cooperation with Dr.Fred Muehlbauer, USDA
Pullman,WA

Ten lentil varieties were seeded in an RCB design with 4 replications on 4/7/88. Plots consisted of four 12 ft. rows spaced one ft. apart with 2 ft. between plots Rows were trimmed to 8 ft. resulting in a harvest area of 40 sqft. All plants from each plot were pulled as each reached maturity and thrashed when dry.

There were no significant differences in emergence or stand. The time from seeding to first bloom was shortest for Palouse, Redchief, Brewer, and Benewah and longest for Laird and Emerald. LC460004, Palouse, and Brewer were earliest to mature, while Laird and Emerald were latest. (These were 2 of the 3 highest yielders.) Laird was tallest at maturity, followed closely by Emerald. LC460004 was significantly shorter than any other variety. Hishest yields came from Emerald, Giza, Laird and Benewah; lowest were LC360038, Palouse, and LC460004. High seed yields seemed to accompany slower maturity and more vegetative growth (taller plants). LC460004 had the smallest seeds, while Benewah and Palouse had the biggest.

WESTERN REGIONAL LENTIL TRIAL KALISPELL, MT 1988

VARIETY	EMERGENCE days 1/	STAND %	1ST BLOOM days 2/	MATUR. days 3/	HT. in.	SEED £/lb	YIELD lbs/a
Emerald	12	89	70	110	16	7325	2867
Giza 9	13	86	67	103	13	11830	2591
Laird	12	90	71	110	18	6055	2525
Benewah	13	94	65	101	15	6175	2491
Chilean 78	13	88	66	104	15	8326	2420
Redchief	12	89	64	100	14	8100	2316
Brewer	13	90	65	99	14	8080	2133
LC460004	12	93	66	96	12	14050	2040
Palouse	13	93	65	97	14	7069	1959
LC360038	12	86	67	103	15	8129	1747
LSD(.05)	1	6	2	3	1	1125	377
P-VALUE	0.43	0.19	0.00	0.00	0.00	0.00	0.00
CV(S/MEAN)	5.3	4.8	1.8	2.3	5.3	11.3	9.1

Seeding date: 4/7/88
1/ Day 12 = 4/19/88
2/ Day 71 = 6/17/88
3/ Day 110 = 7/26/88

YEAR/PROJECT: 1988/758 WINTER RAPESEED NATIONAL VARIETY TRIAL

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
In cooperation with Dick Auld, University of Idaho, Moscow, ID

Sixteen varieties of winter rapeseed were planted on 8/19/87 in field P-2 at 16 lbs/a seeding rate. Treflan was incorporated at 1/2 lb. AI/a just prior to seeding. N fertilizer was applied at 70 lbs/a on 4/6/88.

Stand counts were made approximately one week after emergance in the fall and on 4/12/88 the following spring to determine % survival over winter. Because of standing water in the spring, reps 3 and 4 had very low stands. Bridger, Dwarf Essex, and Cascade had the highest fall stands, while Crystal and SV0220 had the lowest. In the spring, SV0261 stands were best, while Jet Neuf was lowest. SV0261 had the highest over-winter survival rate, while AWR0107, Jet Neuf, and Dwarf Essex had the poorest. SV0223 was rated highest for spring vigor, and Bienvenu and AWR0110 were poorest. On 5/23/88 two racimes in each plot were enclosed in bags to obtain self-pollinated seed for determination of fatty acid composition and glucosinolate content. The date when 50% of the plants in a plot had racimes with open flowers was recorded. Cascade and SV0261 matured earliest, while K8-3 was latest. Plant height was measured when each variety reached maturity. SV0261 was tallest at maturity and Bridger was shortest. The plants were cut and bundled to be thrashed with the Hege plot combine when dry. A harvest area of 72 sqare feet (6'x12') was used to determine yields. Because of the sparse stands in reps 3 and 4, plot weights from reps 1 and 2 only were used. K8-3 and SV0223 produced the highest yields, and SV0261 and AWR0110 produced the lowest. Note that SV0261, which had the 2nd lowest yields, had the best over-winter survival, was tallest and earliest to mature, and was highly rated for spring vigor. Apparently this variety sacrifices seed production for more vegetative growth.

WINTER RAPESEED NATIONAL VARIETY TRIAL - 1988
Kalispell,MT

VARIETY	FALL STAND --plants/sqft--	SPRING STAND --plants/sqft--	SURV --%--	BLOOM date	VIGOR 0-5	MATUR date	HT in	YIELD lbs/a
K8-3	25.5	12.4	49	5/15	4.5	7/22	48	3166
SV0223	33.0	14.2	43	5/11	5.0	7/13	44	2368
Jet Neuf	25.0	6.1	24	5/13	2.5	7/18	40	2270
K8-1	33.0	10.7	33	5/14	3.0	7/10	42	2210
Bridger	41.5	13.4	33	5/12	3.5	7/12	31	1923
Crystal	24.0	12.0	51	5/14	4.5	7/13	49	1915
Glacier	34.0	11.3	34	5/15	3.5	7/14	44	1869
SV0253	27.5	7.9	29	5/14	4.5	7/15	45	1786
Dwarf Essex	39.5	8.4	22	5/14	4.0	7/17	43	1784
AWR0107	29.0	7.4	25	5/12	3.0	7/12	43	1728
Bienvenu	29.0	8.2	28	5/11	2.0	7/12	37	1686
SV0220	23.0	7.9	35	5/13	2.5	7/14	43	1611
SV0238	27.0	7.3	27	5/15	3.0	7/15	44	1522
Cascade	39.5	13.9	36	5/10	2.5	7/7	42	1465
SV0261	31.0	17.7	57	5/14	4.5	7/7	54	1451
AWR0110	30.5	9.4	31	5/13	2.0	7/14	35	1285
LSD(0.05)	5.0	5.8	23	2	1.4	4	5	808
P-VALUE	0.00	0.03	0.13	0.00	0.00	0.00	0.00	0.02
CV(s/mean)	7.6	26.1	31	6.6	18.9	15.4	6	20.2

YEAR/PROJECT: 1988-89/758 WINTER RAPE FORAGE STUDY

PERSONNEL: Leader - Leon Welty
Research Specialist - Louise Prestbye
Cooperating with Bob Wilson

Nine winter rape varieties were seeded at 10 lbs/a in field X-2 on 8/16/88. Experimental design was a split plot with 3 replications. Three spring harvest dates (whole plots) were randomly assigned to each rep with 9 varieties (subplots) randomized within. Plot size was 6' x 12' with 23' alleys between reps. The occupancy of fall stand was measured using a 2"x 20" grid. Plant heights were recorded prior to harvest. All plots were harvested on 10/21/88 using an ALMACO forage harvester. Yield was determined for each plot, and subsamples from each plot in rep 2 were dried to determine dry matter and to analyze for quality.

The first stand evaluation (9/16/88) showed Dwarf Essex had significantly lower occupancy than any other variety. Civastro-R and Purple Top had the highest occupancy. The second evaluation (9/29/88) showed Dwarf Essex and Maris Kestral had poorer stands than any other variety, while Purple Top had the highest. Maris Kestral and Dwarf Essex were shorter and had lower yields than any other variety. Polaris and Civastro-R were tallest and with Purple Top had the highest yields.

In spring of 1989 harvest date treatments will be imposed on approximately 1 April, 1 May, and 1 June.

WINTER RAPE FORAGE TRIAL - FALL, 1988

VARIETY	STAND 9/6/88	STAND 9/29/88	HEIGHT	YIELD
	-------%-------		--in--	lbs/a
Polaris	83	96	12	1094
Civastro-R	86	94	13	1040
Purple Top	93	97	10	990
Forage Star	83	95	10	944
Emerald	73	92	10	676
Tyfon	72	85	10	676
Premier	74	82	8	398
Maris Kestral	40	55	6	161
Dwarf Essex	29	46	5	151
LSD(0.05)	10	14	1	136
P-VALUE	0.00	0.00	0.00	0.00
CV(s/mean)	14.4	17.4	11.8	21.2