THIRTY-FOURTH ANNUAL REPORT

1982

Research Report No. 206

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

4570 Montana 35
Kalispell, Montana 59901

Prepared By
Vern R. Stewart
Professor of Agronomy and Superintendent

Leon E. Welty
Associate Professor of Agronomy

ADMINISTRATION 750

In this project report are recorded personnel items and equipment purchased that may or may not be used in the office. Generally, this report is reflective on all center projects.

Below listed are employees, dates hired and when terminated if this is applicable.

Vern R. Stewart, Superintendent and Professor of Agronomy[1/] (April 1, 1952)
Leon E. Welty, Associate Professor[1/] (January 15, 1973)
Jeanette Calbick, Secretary II (September 1, 1963)
Todd Keener, Agric. Research Technician II (March 27, 1978)
Glenn Fulbright, Ag Res. Tech. I (January 1 1979 thru June 30, 1982)
Rocky Keller, Farm/Ranch Hand II (October 1980 thru February 10, 1982)
Gary Haaven, Farm/Ranch Hand II (April 15, 1982) Ag Res. Tech. I (July 1, 1982)
Gerard Byrd, Laborer (June 14, 1982) Field Aide I (October 1982)

1/ Promoted in 1982

Summer Help:

Barbara Barton (June 14 thru September 15)
Jeanne Borer (September 13 thru September 16)
Jeffrey Borer (June 14 thru September 17)
Mary Bowdon (April 1 thru May 7, parttime)
Kristi Carda (June 14 thru September 10)
LaVonne Gardner (April 23 thru May 25, parttime)
John A. Hall (graduate student) (June 1 thru August 31)
Stacy Isch (August 2 thru September 10)
Russel Miller (March 29 thru September 30)
Carl Norton (April 29 thru May 21, parttime)
Sandra Perez (April 22)
Sandra Schumacher (June 14 thru July 30)
Robert Sharp (April 28 thru June 18, parttime)
Barbara Trippet (June 14 thru September 10)
Herbert Young (yard care)(August 26)

Youth Program:

Tony Buff (June 1 thru September 30)

Purchases:

An electric Kroy 80 lettering machine was purchased at a cost of $629. It will be used in making signs.

At a cost of $2950 we purchased a Royal photocopy machine, Model 115. This is a much needed piece of equipment and will enable us to make several copies of the same document in very little time. It will be a great addition to our office.

PHYSICAL PLANT 751

A new building, south of the Crops Research Building was built for the specific use of storage and dispensing of chemicals. The building is 12'x 14' and has a lab for mixing chemicals, storage shelves, and a concrete pad with drain to enhance the cleaning of equipment.

A new carpet was installed at Residence II in the living room. The old blue carpet was replaced with a warm brown colored one.

GENERAL FARM 752

Two pieces of equipment were purchased this year; a straw chopper for $1483, and a forage plot harvester for $3540. An irrigation pump was installed for $984.

ACTIVITIES FOR 1982

Date	Activity	Staff	Location
1/4	Soil Conservation Dist. Supervisor Meeting	Stewart	Kalispell
1/15	Kalispell Chamber Agricultural Meeing	Stewart	Kalispell
1/18-19	Research Review	Stewart Welty	Missoula
1/25-27	MABA Meeting	Stewart	Billings
2/1	Kalispell Chamber Agricultural Meeting	Stewart	Kalispell
2/2	Federal Land Bank Annual Meeting	Stewart	Kalispell
2/11	Farmers Meeting	Welty	Creston
2/13	Equity Annual Meeting	Stewart	Kalispell
2/15-16	Glean Meeting with DuPont	Stewart	Denver, CO
2/16	N. W. Crop Meeting	Stewart Welty	Kalispell
2/18	West. and N. W. Advisory Committee Meeting	Stewart Welty	Allentown
2/19	Kalispell Chamber Agricultural Meeting	Stewart	Kalispell
2/27	Farmer Union Annual Meeting	Stewart	Kalispell
3/1-5	Planning Conference	Stewart Welty	Bozeman
3/5	TCK Smut Meeting	Stewart	Spokane, WA
3/8-10	Weed Science Meeting	Stewart	Denver, CO
3/11	Mint Growers	Stewart	Kalispell
3/14-16	Res. Infor. Study Comm. & Private meetings	Stewart	Bozeman
3/18	Equity Supply Fertilizer Meeting	Stewart	Kalispell
3/19	Kalispell Chamber Agricultural Meeting	Stewart	Kalispell
3/24	Kalispell Feed & Grain Meeting	Stewart	Kalispell
3/26	Eastside Grange (gave talk)	Stewart	Creston
3/27	Annual Meeting Electric Cooperative	Stewart	Kalispell
3/30	County Agents Up-Dating Meeting	Stewart Welty	Ronan
4/14	Budget Meeting	Stewart	Bozeman
4/16	Kalispell Chamber Agricultural Meeting	Stewart	Kalispell
5/11	Cherry Orchard Sale	Stewart	Polson
5/21	Kalispell Chamber Agricultural Meeting	Stewart	Kalispell
5/28	4-State Wheat Meeting	Stewart Welty	Creston
6/3	Research Center Study Comm.	Stewart	Bozeman
6/17	N. W. Crops Improvement Assn.	Stewart	Kalispell
6/22	SCS Representatives Tour	Welty	Creston
6/30	Pea & Lentil Meeting	Welty	Moscow, ID
7/8	Make Tapes @ KGVO, KYSS & KPAX-TV	Stewart	Missoula
7/13	Northern Seedman's Assoc.	Stewart	Kalispell

Activities 1982 (con't)

Date	Activity	Staff	Location
7/16	75th Anniversary @ Central Agric. Res. Cnt.	Stewart	Moccasin
7/17	Weed Fair	Stewart	Missoula & Ravalli Co.
7/19-22	Field Day & Fnd. Seed Comm. Meeting	Stewart Welty	Sidney
7/29	Field Day at N. W. Agric. Res. Center	Stewart Welty	Creston
8/5	Legume Tour	Stewart Welty	Creston
8/20	Second Wind Organization Tour	Stewart	Creston
10/7	CARE Meeting	Stewart	Missoula
10-14-15	Superintendents Meeting	Stewart	Lewistown
10-21-22	Conferences w/Staff-Dean's Adv. Council	Stewart	Bozeman
11/13	Meeting to prepare for Adv. Comm. Meeting	Stewart	Missoula
11/19	Kalispell Chamber Agricultural Meeting	Stewart	Kalispell
11/28-12/2	ASA Convention	Stewart Welty	Anahiem, CA
12/8	Advisory Council Meeting	Stewart	Bozeman
12/9-10	Research Center Faculty Meeting	Stewart Welty	Bozeman

VISITORS:

Date	Visitor	Representing	Address
1/ 4/82	John Zalman	Farmer	Kalispell
1/ 5/82	Bill Dopp	Weed District Supt.	Kalispell
1/ 5/82	Floyd LaBrant	Farmer	Kalispell
1/ 7/82	Ron Richwine	Neighbor	Kalispell
1/ 7/82	Les Shirley	Neighbor	Kalispell
2/ 5/82	Bruce Benson	Farmer	Missoula
2/ 8/82	Bruce Benson	Farmer	Missoula
2/10/82	Luther Lalum	SCS	Kalispell
2/12/82	John Sheldon	Farmer	Kalispell
2/17/82	Dick Snellman	Ronan Co-op	Ronan
2/17/82	Jim LeFevan	Job Applicant	
2/19/82	Dick Lund	MSU	Bozeman
3/ 5/82	Ivan Tyler	Frontier Airlines	Salt Lake City, UT
3/ 8/82	Roger Morin	Farmer	Arlee
3/15/82	Clyde Pederson	Farmer	Kalispell
3/16/82	Bill Ambrose	Farmer	Kalispell
3/21/82	Keith Johnson	Chem. Rep. DuPont	Bismarck, ND
3/21-22	Jack Saladine	Chem. Rep. DuPont	Denver, CO
3/29/82	Brett Bradburg	Job Applicant	Bigfork
3/31/82	Gary Haaven	Job Applicant	Kalispell
3/31/82	Mark Lalum	Vo-Ag Teacher	Kalispell
4/ 1/82	Don Graham	West. Ag. Res. Cnt.	Corvallis
4/ 1/82	Grange Alves	San Francisco Ranch	Ronan
4/ 1/82	Carla Heintz	N.W. Mont. Human Res.	Kalispell
4/ 5/82	C. R. Hunt	Monsanto	Great Falls
4/ 5/82	Kim Richwine	Student	Kalispell
4/ 7/82	Nancy Callan	W. Ag. Res. Cnt.	Corvallis
4/ 7/82	Jerry Williams	Farmer	Kalispell
4/ 7/82	Kermit Welty	Retired	Sidney
4/ 9/82	George Darrow	Farmer	Bigfork
4/13/82	Carl Heintz	N.W. Mont. Human Res.	Kalispell
4/20/82	Roger Joy	W. Ag. Res. Cnt.	Corvallis
4/21/82	Don Walker	Cenex	Seattle, WA
4/21/82	Harlen Johnson	Cenex	Billings
4/21/82	Jim Lensky	Cenex	St. Paul, MN
4/21/82	Bruce Huffine	Cenex	Polson
4/28/82	Dan Casazza	Farmer	Eureka
5/ 3/82	Dan Toya	Stauffer Chemical	Blackfoot, ID
5/ 5/82	Deana Power	Job Applicant	Kalispell
5/12/82	Jim Krall	MAES - MSU	Bozeman
5/12/82	Wes Roath	Retired Supt.	Bigfork
5/20/82	Leonard Stanley	Job Applicant	Kalispell
5/26/82	Carla Heintz	N.W. Mont. Human Res.	Kalispell
5/27/82	Dr. & Mrs. W. Solonar	M.D.	Havre
6/ 2/82	Carla Heintz	N.W. Mont. Human Res.	Kalispell
6/ 8/82	Li Then Qi	N.W. Coll. of Ag.	Wugon,Shaanxi,China
6/ 8/82	Mareike Reinhold	Plant Pathology-MSU	Bozeman
6/ 8/82	Bernard Sally	Plant Pathology-MSU	Bozeman
6/14/82	Agnar Berg	Student MSU	Norway

Visitors (con't)

Date	Visitor	Representing	Address
6/18/82	Art Jenson	American Cyanmid	Orinda, CA
6/21/82	Darrell Logan	Farmer	Kalispell
6/21/82	Jim Buechle	Farmer	Kalispell
6/29/82	C. R. Hunt	Monsanto	Great Falls
6/30/82	Mr. & Mrs. Jay Yocum	Retired farmers	Huntley, WY
6/30/82	Kathy Stewart	Minister (Youth)	Sacremento, CA
6/30/82	Jenifer Bennet	Student	Minneapolis, MN
7/ 3/82	Roger Stewart	SRS-USDA	Washington D.C.
7/10/82	Gene Hockett	USDA-MSU	Bozeman
7/10/82	Tom Greenway	Vander Hav	England
7/12/82	Joan Speelman	Kalispell Weekly News	Kalispell
7/14/82	Dan Toya	Stauffer Chem.	Blackfoot, ID
7/16/82	Michael Smith	U of C Ag. Center	Paso Robles, CA
7/21/82	Everett Hamann	Farmer	LaGrande, OR
7/23/82	Mark Bronsom	Dailey InterLake	Kalispell
7/26/82	Charles White	Kal. Feed & Grain	Kalispell
7/28/82	Keith Johnson	DuPOnt	Bismarck, ND
7/28/82	Mark Holston	KCFW	Kalispell
8/ 2/82	Jim Hoffman	USDA-ARS	Logan, UT
8/ 3/82	Lloyd Hall	Farmer	Kalispell
8/ 5/82	Don Graham	W. Ag. Res. Cnt.	Corvallis
8/ 9/82	Bernard Sally	Plant Pathology-MSU	Bozeman
8/10/82	Ivan Lorentzen	Farmer	Kalispell
8/11/82	Gary Graham	MSU	Bozeman
8/15/82	George Evans	Plant & Soils-MSU	Bozeman
8/16/82	Ed & Joan Mink	County Agent	Grangevill, ID
8/18/82	Oakfield Bain	MT Dept. of Ag.	Helena
8/18/82	Barbara Mullen	MT Dept. of Ag.	Helena
8/18/82	Nancy Callan	W. Ag. Res. Center	Corvallis
8/19/82	Larry Alexander	USDA-ARS	Bozeman
9/23/82	Al Luke	Union Carbide	Idaho Falls, ID
9/15/82	Harold Small	Farmer	Kalispell
9/22/82	C. R. Hunt	Monsanto	Great Falls
9/28/82	Jack Walden	USDA-ARS	Pullman, WA
10/12/82	Mareike Reinhold	Plant Pathology-MSU	Bozeman
10/12/82	Bernard Sally	Plant Pathology-MSU	Bozeman
10/12/82	Dr. Li	Visiting Plant Path.	Bozeman
10/25/82	Barry Hembry	MSU	Bozeman
10/27/82	Andy VanTeylingen	Faculty Planning-MSU	Bozeman
11/ 2/82	Larry Hendricks	BASF	Minneapolis, MN
11/ 4/82	Arne Grob	Farmer-Contractor	Kalispell
11/ 9/82	Bill Walker	Farmer	Kalispell

TABLE OF CONTENTS

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Copies

2 Office of Director, Montana Agricultural Experiment Station

1 Plant and Soil Science Department - Dr. Dwane G. Miller

4 Research Staff at Northwestern Agricultural Research Center

- V. R. Stewart
- L. E. Welty
- Library (2)

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- Program Coordinator - Bill Peterson
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2 Northwest Montana Banks

- First Interstate Bank of Kalispell
- Western Montana National Bank - Missoula

1 Agricultural Stabilization and Conservation - Audrey Fenske

1 Farmers Home Administration - Marvin Jones

1 Soil Conservation Service - Tim Wiersum

1 Federal Land Bank Association - Bernie Herman

4 Feed Mills

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

CLIMATOLOGICAL DATA

NORTHWESTERN AGRICULTURAL RESEARCH CENTER
Kalispell, MT

The weather data has been observed since 1949 when the Northwestern Agricultural Research Center first began. This is done in cooperation with the National Climatic Center at Asheville, North Carolina. The maximum, minimum air temperatures, soil temperatures and precipitation are recorded at 8 a.m. daily.

SUMMARY OF THE 1981-82 CROP YEAR

The precipitation total from September 1981 throught August 1982 was below normal. In May and June, when precipitation is so important to the emerging crops, precipitation was below normal. July was above normal, but again in August the precipitation was .50 inch below normal.

The mean temperature, 43.2°F was the same as the long time average. The warmest day was 97°F on August 8, which is below the average daily maximum temperatures over the 33 year period. The coldest days were February 9 and 10 when the mercury dipped to 23°F below zero. The cropping season of 1981-82 was about average, see Table 1.

After the record breaking frost free period we experienced in the crop year of 1980-81 of 142 days, the 108 days experienced this crop year seemed very short. However, it was closer to the long time average of 111 days.

For more detailed information on the weather at the Northwestern Agricultural Research Center for the crop years 1949-82 see Tables 2 through 5. Precipitation for each day of 1982 is found in Table 6. In Tables 7 through 10 you will find a summary of the climatic data from 1950 through 1982.

Table 1. Summary of climatic data by months for the 1981-82 crop year (September to August) and averages for the period 1949-82 at the Northwestern Agricultural Research Center, Kalispell, MT.

Item	Sept. 1981	Oct. 1981	Nov. 1981	Dec. 1981	Jan. 1982	Feb. 1982	Mar. 1982	Apr. 1982	May 1982	June 1982	July 1982	Aug. 1982	Total or Average
Precipitation (inches)													
Current Year	.77	.56	1.49	1.91	2.38	1.48	1.16	1.60	1.25	2.41	2.08	1.17	18.26
Ave. 1949 to 1981-82	1.45	1.38	1.42	1.69	1.62	1.16	1.07	1.37	2.22	2.90	1.42	1.68	19.38
Mean Temperature (F)													
Current Year	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
Ave. 1949 to 1981-82	53.8	43.6	32.9	26.5	21.5	28.0	33.3	43.0	51.6	58.3	64.1	62.9	43.3
Last killing frost in spring*													
1982					May 30 (31°F)								
Ave. 1949-82					May 27								
First killing frost in fall*					September 15 (23°F)								
Ave. 1949-82					September 13								
Frost free period													
1982					108 days								
Ave. 1949-82					111 days								
Maximum summer temperature					91°F on August 8, 1982								
Minimum winter temperature					23°F below zero February 9 and 10, 1982								

* 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, 1982.

	Average temperature by month and year Degrees Fahrenheit												$\bar{x}$ for
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Year
1949-50	54.1	41.5	38.5	25.0	4.2	25.6	31.2	41.9	49.7	57.0	64.0	62.5	41.3
1950-51	53.8	45.9	31.5	29.5	20.2	27.7	27.0	42.1	50.0	54.2	64.7	60.4	42.3
1951-52	50.6	40.8	30.8	16.9	18.0	26.6	29.3	45.8	52.4	56.7	61.8	62.8	41.0
1952-53	56.0	45.5	30.4	27.6	36.0	32.9	37.2	41.2	49.5	54.6	64.3	63.1	44.9*
1953-54	56.1	46.2	37.0	31.3	21.1	31.2	29.6	40.8	52.5	54.9	63.4	60.1	43.7*
1954-55	52.9	41.5	38.8	28.8	25.7	22.1	24.5	39.1	47.7	58.8	62.7	62.2	42.1
1955-56	52.5	44.6	23.5	21.8	23.3	20.9	31.5	44.2	54.0	59.0	64.8	62.0	41.8
1956-57	55.2	44.1	30.9	28.5	10.2	23.4	33.3	43.7	55.6	59.7	65.4	62.4	42.7
1957-58	55.8	41.4	32.1	32.4	29.1	30.4	32.2	43.6	59.6	62.3	65.2	67.9	46.0*
1958-59	55.5	44.6	32.8	28.2	24.7	23.1	35.3	45.2	48.1	59.9	64.5	61.0	43.6*
1959-60	53.0	43.9	25.5	27.6	19.4	25.2	32.3	44.3	50.6	59.6	68.8	60.6	42.6
1960-61	55.0	45.2	34.4	24.9	27.8	37.0	38.3	42.0	52.6	64.7	66.2	67.8	46.3*
1961-62	49.6	42.3	28.2	23.6	17.4	25.7	30.9	47.2	51.5	58.6	62.1	62.1	41.6
1962-63	54.7	44.7	38.0	32.5	11.8	33.1	38.7	43.2	51.4	59.4	63.0	64.9	44.6*
1963-64	58.7	47.4	35.8	24.0	28.5	28.3	30.6	42.8	51.1	58.7	64.3	58.9	44.1*
1964-65	51.2	43.7	33.7	22.1	30.2	28.7	28.6	45.2	50.6	57.6	64.6	63.6	43.3*
1965-66	46.4	47.6	35.0	28.8	26.3	27.7	34.5	42.9	54.3	56.0	64.5	61.7	43.8*
1966-67	59.3	43.4	33.4	30.2	31.0	33.2	32.9	40.6	52.2	59.4	66.1	67.2	45.7*
1967-68	61.0	45.9	33.8	25.1	23.3	32.8	41.2	42.0	49.8	59.0	64.6	61.3	45.0*
1968-69	53.8	42.9	33.4	19.9	13.1	24.0	29.6	47.1	53.9	58.8	62.3	63.6	41.9
1969-70	56.0	40.0	35.2	27.7	21.9	29.9	32.8	40.2	53.2	62.0	64.8	62.6	43.9*
1970-71	48.7	40.1	31.3	26.2	23.6	29.8	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	44.2	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
$\bar{x}$	53.8	43.6	32.9	26.5	21.5	28.0	33.3	43.0	51.6	58.3	64.1	62.9	

Mean temperature for all years = 43.3

* Denotes years above average temperature.

Table 3. Summary of temperature data obtained at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1982.

	Average maximum temperature by month and year Degrees Fahrenheit												$\bar{x}$ for
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Year
1949-50	71.4	52.4	45.7	32.1	14.4	34.6	38.4	52.3	63.1	70.1	78.6	79.5	52.7
1950-51	70.9	55.8	38.2	36.3	28.7	36.6	37.3	57.9	63.2	66.6	82.4	77.0	54.2
1951-52	64.2	47.5	37.2	23.6	25.9	35.7	39.5	61.8	65.7	70.2	79.2	79.5	52.5
1952-53	73.4	62.6	40.6	33.2	41.3	39.1	46.8	51.5	62.5	66.8	83.3	79.5	56.7*
1953-54	72.3	61.0	45.6	36.7	29.1	38.4	40.0	51.0	67.2	67.0	80.1	74.4	55.2*
1954-55	66.4	53.4	45.9	34.9	31.8	31.2	33.9	48.1	60.5	74.7	76.9	82.4	53.3
1955-56	67.6	55.5	30.8	29.2	30.7	30.1	39.7	57.4	67.5	73.3	81.2	77.8	53.4
1956-57	71.0	53.7	37.6	35.5	19.0	33.2	43.3	55.3	70.2	72.4	82.1	80.0	54.4
1957-58	74.3	50.5	40.1	38.5	33.7	37.9	43.5	54.4	77.5	75.7	80.8	85.5	57.7*
1958-59	69.7	57.9	39.6	34.1	31.8	31.9	43.9	57.9	61.5	74.3	83.2	76.3	55.2*
1959-60	64.0	53.6	33.9	33.3	27.5	34.1	43.4	56.1	63.0	74.8	88.7	74.1	53.9
1960-61	72.1	57.8	41.1	29.8	35.0	43.1	48.2	51.6	65.3	82.0	83.7	86.3	58.0*
1961-62	62.3	53.3	35.1	30.4	26.0	33.4	40.5	60.7	62.7	74.2	79.2	77.5	52.9
1962-63	71.7	54.7	43.8	37.9	19.9	41.4	48.9	55.7	67.1	71.8	79.6	82.5	56.2*
1963-64	74.6	59.4	43.4	30.2	35.1	37.7	39.7	53.3	63.5	71.4	80.3	72.9	55.1*
1964-65	63.9	55.0	41.0	28.9	35.1	36.9	41.0	57.6	64.3	71.4	80.8	77.1	54.4
1965-66	57.5	61.1	42.6	35.4	31.8	35.3	45.4	54.8	69.8	69.1	81.2	78.4	55.2*
1966-67	74.9	55.1	41.1	35.8	36.7	40.9	41.3	52.6	66.0	73.3	84.8	87.2	57.5*
1967-68	78.9	55.8	41.3	30.8	31.5	40.8	52.6	54.2	63.4	72.2	82.7	75.7	56.6*
1968-69	65.9	53.1	40.6	27.3	20.8	32.5	40.9	59.5	68.7	72.0	78.9	83.0	53.8
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
$\bar{x}$	68.8	55.5	40.4	33.2	29.1	36.3	43.1	54.7	64.9	71.8	80.5	79.4	

Mean temperature for all years = 54.8

* Denotes years above average.

Table 4. Summary of temperature data obtained at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1982.

Year	Average minimum temperature by month and year, Degrees Fahrenheit												$\bar{x}$ for
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Year
1949-50	36.7	35.0	31.2	17.8	-6.0	16.6	23.9	31.5	36.3	43.9	49.4	45.5	30.2
1950-51	36.6	36.0	24.8	22.6	11.7	18.8	16.6	26.2	36.7	41.7	46.9	43.7	30.2
1951-52	37.0	34.0	24.4	10.1	10.0	17.4	19.1	29.8	39.1	43.1	44.3	46.1	29.5
1952-53	38.6	28.3	20.2	21.9	30.6	26.7	27.5	30.9	36.5	42.3	45.3	46.7	33.0*
1953-54	39.8	31.4	28.4	25.9	13.1	24.0	19.2	30.6	37.7	42.8	46.7	45.7	32.1*
1954-55	39.3	29.5	31.6	22.7	19.5	13.0	15.0	30.0	34.9	42.8	48.5	42.0	30.7
1955-56	37.3	33.6	16.1	14.4	15.9	11.7	23.3	30.9	40.5	44.7	48.2	46.1	30.2
1956-57	39.4	34.4	24.2	21.5	1.4	13.6	23.2	32.0	40.9	47.0	48.7	44.8	30.9
1957-58	37.2	32.3	24.1	26.2	24.5	22.8	20.9	32.8	41.7	48.8	49.5	50.3	34.3*
1958-59	41.2	31.2	26.0	22.2	17.5	14.2	26.6	32.4	34.7	45.4	45.8	45.6	31.9*
1959-60	42.0	34.1	17.0	21.8	11.2	16.3	21.1	32.4	38.1	44.3	48.8	47.0	31.2
1960-61	37.9	32.5	27.6	19.9	20.6	30.9	28.4	32.3	39.8	47.4	48.7	49.2	34.6*
1961-62	36.8	31.2	21.2	16.8	8.7	17.9	21.2	33.7	40.3	43.0	45.0	46.6	30.2
1962-63	37.6	34.6	32.2	27.1	3.7	24.7	28.4	30.6	35.7	47.0	46.4	46.9	32.9*
1963-64	42.7	35.3	28.1	17.7	21.8	18.9	21.4	32.2	38.6	46.0	48.3	44.9	33.0*
1964-65	38.4	32.3	26.4	15.3	25.3	20.4	16.2	32.7	36.9	43.8	48.4	50.0	32.2*
1965-66	35.2	34.0	27.4	22.1	20.8	20.0	23.6	30.9	38.7	42.8	47.7	45.0	32.4*
1966-67	43.6	31.7	25.6	24.6	25.3	25.5	24.5	28.6	38.4	45.4	47.4	47.2	34.0*
1967-68	43.1	35.9	26.3	19.4	15.0	24.8	29.7	29.8	36.1	45.7	46.4	46.8	33.3*
1978-69	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
$\bar{x}$	38.7	31.8	25.2	19.8	13.9	19.7	23.4	31.2	38.2	44.8	47.8	46.4	

Mean temperature for all years = 31.7

* Denotes years above average temprature.

Table 5. Summary of precipitation records obtained at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1982.

	Total precipitation in inches by month and year												
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Total
1949-50	1.03	1.05	1.67	.92	2.62	1.13	2.31	.84	.15	3.90	3.12	.75	19.49*
1950-51	.52	2.30	1.16	2.48	.94	1.29	.62	2.32	3.77	2.26	1.03	2.86	21.55*
1951-52	1.49	5.62	1.01	3.31	1.03	.98	.97	.17	1.32	3.95	.56	.69	21.10*
1952-53	.13	.05	.60	.98	1.84	1.14	.98	2.07	2.00	3.31	T	1.62	14.72
1953-54	.71	.03	.87	1.30	2.65	.79	.83	.79	1.52	2.98	2.91	3.79	19.17
1954-55	1.09	.54	1.00	.43	1.00	1.31	.44	.82	1.18	1.86	3.08	.00	12.75
1955-56	1.64	1.89	1.97	2.38	1.76	1.53	.87	1.28	1.06	4.20	2.13	3.21	23.92*
1956-57	1.16	1.10	.53	.96	1.47	1.14	.75	1.22	1.75	2.51	.52	.78	13.89
1957-58	.10	1.59	.96	1.76	1.56	2.67	.97	1.47	2.20	2.56	.84	.58	17.26
1958-59	1.99	1.16	2.90	2.77	1.95	1.33	.75	1.62	4.10	1.75	T	.91	21.23*
1959-60	4.22	3.36	4.32	.34	1.67	1.10	1.01	1.23	3.27	.69	.13	2.43	23.77*
1960-61	.55	1.44	1.72	1.24	.65	1.46	1.96	2.26	4.02	1.45	.76	.64	18.15
1961-62	3.40	1.22	1.77	2.09	1.33	1.15	1.59	.96	2.59	1.15	.11	.72	18.08
1962-63	.58	1.85	1.13	.91	1.69	1.21	.85	1.07	.57	5.00	1.44	2.10	18.58
1963-64	1.46	.75	.95	1.70	1.46	.41	1.57	.87	3.33	3.86	3.01	1.64	21.01*
1964-65	2.27	.85	1.62	3.62	2.25	.64	.24	2.55	.81	2.30	1.15	4.74	23.04*
1965-66	1.72	.21	1.31	.55	1.42	.67	.53	.76	1.18	6.57	2.49	1.64	19.05
1966-67	.79	1.34	3.33	1.68	1.50	.62	1.27	.99	1.30	2.53	.02	.01	15.38
1967-68	.91	1.88	.62	1.16	.79	1.15	.68	.57	3.92	2.22	1.00	3.42	18.3[illegible]
1968-69	4.51	2.39	1.59	3.12	3.05	.75	.69	1.39	1.19	5.21	.70	.09	24.6[illegible]
1969-70	1.54	1.90	.31	1.14	3.10	.89	1.49	.76	1.97	4.37	3.08	.44	20.99*
1970-71	1.79	1.38	1.75	.99	1.84	.77	.69	.58	2.45	4.42	1.31	1.11	19.08
1971-72	.94	.87	1.70	1.62	1.10	1.65	2.11	.95	1.48	3.28	1.77	.98	18.45
1972-73	1.38	1.84	.80	2.19	.52	.56	.70	.45	1.13	2.14	.01	.63	12.35
1973-74	1.37	1.41	2.95	1.94	1.35	1.32	1.40	3.36	1.82	1.80	1.01	.62	20.35*
1974-75	.80	.12	1.10	1.31	1.56	1.08	1.50	1.27	1.50	1.40	1.08	4.26	16.98
1975-76	1.18	2.96	.85	1.39	.91	1.12	.34	1.92	1.90	2.49	1.49	3.42	19.97*
1976-77	.96	.62	.73	.86	.83	.71	1.40	.41	2.90	.52	3.60	1.50	15.04
1977-78	2.84	.56	1.62	4.10	2.15	.99	.72	2.54	3.56	2.63	3.90	3.34	28.96*
1978-79	1.90	.15	.96	.91	1.70	1.45	.82	2.33	2.67	1.23	.40	1.79	16.31
1979-80	1.03	1.75	.50	1.03	1.53	2.03	.97	1.88	5.48	3.89	1.08	2.45	23.62*
1980-81	1.20	.82	.78	2.58	1.18	1.85	2.17	1.75	3.86	4.70	1.17	.96	23.66*
1981-82	.77	.56	1.49	1.91	2.38	1.48	1.16	1.60	1.25	2.41	2.08	1.17	18.26
$\bar{x}$	1.45	1.38	1.42	1.69	1.62	1.16	1.07	1.37	2.22	2.90	1.42	1.68	

Mean precipitation for all crop years = 19.38

* Denotes years above average precipitation.

Table 6. Precipitation by day for crop year, September 1, 1981 thru August 31, 1982. Northwestern Agricultural Research Center, Kalispell, MT.

Date	Sept. 1981	Oct. 1981	Nov. 1981	Dec. 1981	Jan. 1982	Feb. 1982	Mar. 1982	Apr. 1982	May 1982	June 1982	July 1982	Aug. 1982
1	.08	.08		.02	.09	.04	T	.06			.14	
2	.08			.21		.06	.12				.15	.14
3				T	.04	T	.03	.06			.11	.08
4					.11		.05	.12	.09	.04	.20	.23
5					.12		.01	.25	T	.11	.03	
6				.14	T	.02		T		.15	.09	
7				.06	T	.06	.01		.04	.30		
8		.04		.03	T	.01			.05		.33	
9		.03					.31	.08	T		.02	.25
10		.08		.06					T			.18
11		.06	.04		.31			.32				
12			.08		.02	.04	T	.26				
13			.23		.03	.09		.03	T		.02	
14			.22	.21		.22		.14			.64	.06
15						T	.06	T			T	.20
16			.03	.34	T	.11	.13	.06		.12	.29	.01
17			.24		.42					.04	.04	
18			.38		T			.10	.07		T	
19	T		.05	.05	T	.15	.16	.10	.16			
20	.08			.07	.02	.42	T					
21	.02		.01		.04	.07	T					
22	.05		.05		.02	.12	T					
23	.02				.41				.29	.03		
24			.15	.11	.63	.07						
25	.03	.03	.01	.11								
26	.08								T			
27	.20	.09		.22			T		.40	.09		
28	.08	.02		.21			T		.07	.05		
29	.05	.03		.04	T		.12		.08	.19		
30		.10		T	T		T	.02	T	1.29	.02	.02
31				.03	.12		.16					T
Total	.77	.56	1.49	1.91	2.38	1.48	1.16	1.60	1.25	2.41	2.08	1.17

Table 7. Frost Free period at the Northwestern Agricultural Research Center from 1950 thru 1982.

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

Table 8. Temperature extremes at the Northwestern Agricultural Research Center, Kalispell, MT from 1950 thru 1982.

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

Table 9. Summary of temperature records obtained at the Northwestern Agricultural Research Center, January 1950 thru December 1982.

	Average Temperature by Month and Year Degrees Fahrenheit												$\bar{x}$ for
Date	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1950	4.2	25.6	31.2	41.9	49.7	57.0	64.0	62.5	53.8	45.9	31.5	29.5	41.4
1951	20.2	27.7	27.0	42.1	50.0	54.2	64.7	60.4	50.6	40.8	30.8	16.9	40.5
1952	18.0	26.6	29.3	45.8	52.4	56.7	61.8	62.8	56.0	45.5	30.4	27.6	42.7
1953	36.0	32.9	37.2	41.2	49.5	54.6	64.3	63.1	56.1	46.2	37.0	31.3	45.8*
1954	21.1	31.2	29.6	40.8	52.5	54.9	63.4	60.1	52.9	41.5	38.8	28.8	42.9
1955	25.7	22.1	24.5	39.1	47.7	58.8	62.7	62.2	52.5	44.6	23.5	21.8	40.4
1956	23.3	20.9	31.5	44.2	54.0	59.0	64.8	62.0	55.2	44.1	30.9	28.5	43.2*
1957	10.2	23.4	33.3	43.7	55.6	59.7	65.4	62.4	55.8	41.4	32.1	32.4	43.0
1958	29.1	30.4	32.2	43.6	59.6	62.3	65.2	67.9	55.5	44.6	32.8	28.2	46.0*
1959	24.7	23.1	35.3	45.2	48.1	59.9	64.5	61.0	53.0	43.9	25.5	27.6	42.7
1960	19.4	25.2	32.3	44.3	50.6	59.6	68.8	60.6	55.0	45.2	34.4	24.9	43.4*
1961	27.8	37.0	38.2	42.0	52.6	64.7	66.2	67.8	49.6	42.3	28.2	23.6	45.0*
1962	17.4	25.7	30.9	47.2	51.5	58.6	62.1	62.1	54.7	44.7	38.0	32.5	43.8*
1963	11.8	33.1	38.7	42.3	51.4	59.4	63.0	64.9	58.7	47.4	35.8	24.0	44.3*
1964	28.5	28.3	30.6	42.8	51.1	58.7	64.3	58.9	51.2	43.7	33.7	22.1	42.8
1965	30.2	28.7	28.6	45.2	50.6	57.6	64.6	63.6	46.4	47.6	35.0	28.8	43.9*
1966	26.3	27.7	34.5	42.9	54.3	56.0	64.5	61.7	59.3	43.4	33.4	30.2	44.5*
1967	31.0	33.2	32.9	40.6	52.2	59.4	66.1	67.2	61.0	45.9	33.8	25.1	45.7*
1968	23.3	32.8	41.2	42.0	49.8	59.0	64.6	61.3	53.8	42.9	33.4	19.9	43.7*
1969	13.1	24.0	29.6	47.1	53.9	58.8	62.3	63.6	56.0	40.0	35.2	27.7	42.6
1970	21.9	29.9	32.8	40.2	53.2	62.0	64.8	62.6	48.7	40.1	31.3	26.2	42.8
1971	23.6	29.9	33.2	43.6	52.5	54.9	61.9	68.2	49.5	40.4	34.1	22.0	42.8
1972	17.4	27.3	38.5	40.6	51.9	59.3	61.4	65.9	52.0	40.0	33.7	19.9	42.3
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	21.2	32.3	33.6	42.7	48.0	61.5	64.8	61.6	52.8	43.5	34.8	30.1	43.9*
1975	22.0	21.5	29.8	37.6	48.6	55.9	69.1	59.8	52.1	42.9	35.4	27.5	41.9
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	42.3
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
$\bar{x}$	21.5	28.0	33.3	43.0	51.6	58.3	64.1	62.9	53.8	43.6	32.6	26.5	

Mean temperature for all years = 43.3

* Denotes years above average mean.

Table 10. Summary of precipitation records obtained at the Northwestern Agricultural Research Center, Kalispell, MT, January 1950 thru December 1982.

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

Mean annual precipitation for 33 yeaars = 19.42

* Denotes years above average.

TITLE: Chemical control of wild oats (Avena fatua) in small grains

PROJECT: Weed Investigations MS 754

YEAR: 1982

LOCATION: Northwestern Agricultural Research Center

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - Weed Research Committee
Montana Wheat Research & Marketing Committee
Chemical Company Research & Development Reps.

OBJECTIVES:

1. Evaluation of properly applied, recommended herbicides for efficacy of wild oat control in spring and winter wheat.
2. To determine the effect of herbicides on spring and winter wheat yields and grain quality.
3. To determine the effect of a seed treatment "safner" in protecting spring wheat from high rates of triallate.

MATERIAL AND METHODS:

Three studies were conducted in 1982 to evaluate chemicals for wild oat control in spring and winter wheat.

Wild oat control in spring wheat (1)

The primary objective of this study was to observe the effects of labeled wild oat herbicides when applied at various stages of growth of the wild oat. Herbicides used and growth stages when applied are found in the tabular data.

Newana spring wheat was seeded in strips 12 ft. wide, 300 ft. long at 70 lbs/a. This was done with a 12 ft. press drill. Herbicides were applied perpendicular to the drill strips in a 10 ft. swath giving a plot area of 120 sq. ft. Each treatment was replicated four times in a complete randomized block design. To control broadleaf weeds a uniform application of bromoxynil + MCPA was applied.

Fargo (triallate) "Safner" study on spring wheat (2)

Injury to the semi-dwarf types spring wheat from the herbicide triallate have been noted. To protect wheat seed from injury a safner was applied to Newana spring wheat. The products used were coded by Monsanto Chemical as MON5000 and MON5500. These materials were applied directly to the spring wheat as a seed treatment. Rates used are found in the tabular data. Seeding technique, plot layout are described in the previous experiment. Fargo applications were applied prior to seeding and incorporated with a vibra shank cultivator which had a mulcher attached. Fargo rates and dates of application are found in the tabulated data.

Herbicides were applied to Experiment 1 and 2 with a research type tractor mounted sprayer. Plots were harvested with a Hege 125B plot combine. Plot size and harvest areas varied with each experiment.

No-Till Fargo (triallate) Test (3)

This study was conducted in an established field of Luke winter wheat. Various formulations of Fargo (triallate) were used in this study and are given in the tabulated data. Techniques of application were also evaluated. These techniques are explained under results and discussion.

RESULTS AND DISCUSSION:

Wild Oat Control in Spring Wheat (1)

Dr. Pete Fay of Montana State University coordinated this study statewide. He had published an application chart for use by the growers in determining the stage of growth of wild oats thus pinpointing more finely the time to make the application of the herbicide per labeling instructions.

The data presented here bares out the necessity of making the application of post emergence herbicides at the specified time.

Avenge was applied to the test when the wild oats were in the four leaf stage and air temperatures were quite high. This resulted in some crop injury which accounts in part for the reduction in yields with this treatment. Table 2

Fargo (triallate) "Safner" Study in Spring Wheat (2)

The Monsanto safner MON5000 and MON5500 provided good protection to germinating spring wheat that had been treated with high rates of Fargo (triallate). Where seed treatments were not used in conjunction with high rates of Fargo, yields were decreased as the rates of Fargo increased. Plant counts also diminished as Fargo rates increased in non-protected plots. The safners decreased the loss of stand due to chemical injury, however populations were less at the higher rates of Fargo in safner treated plots. Wild oat control was good throughout the study indicating the safners do not interfere with season long wild oat control. Test weights from Fargo plots not treated with safners decreased with an increase in the Fargo rate. This variation was not observed in the safner plots.

Plant stand numbers indicated the higher Fargo rates diminished stands dramatically. This was readily apparent in the non-safner treatments and was observed to have slightly effected the safner treatments.

It was also found that the safners without Fargo also decreased yields and plant counts. It is the synergistic effect of the combined chemicals which provided season long wild oat control and protection from higher rates of Fargo. Table 3

No-till Fargo Test (3)

The fall and spring Fargo applications to winter wheat were carried out using a Volmar air spreader, low volume flat fan nozzles, Micro Max® CDA applicators and normal gallonage flat fan nozzles. The location of the study offered varied stands throughout and therefore unpredictable yields. Also, there was no weed pressure at all in which to gauge the herbicide efficacy of each treatment.

Fall applications of granules seemed to provide better plot yields in this study than spring applied treatments. The new flowable formulation of Fargo tried in this study, did not seem any more injurious to the crop than other formulations. Stand variation and no weed pressure prevented through evaluation of the application techniques involved. Table 4

Table 1. Chemicals used in wild oat studies on small grains.

Common Name	Trade Name	Chemical Name	Company
barban	Carbyne	4-chloro-2-butynyl-m-chloro-carbanilate	Velsicol
diclofop	Hoelon	2-[4-(2,4-dichlorophenoxy)pheonoxy propanoic acid	American Hoechst
difenzoquat	Avenge	1,2-dimethyl-3,5-diphenyl-1H pyrazolium	American Cyanamid
triallate	Fargo	S-(2,3,3-trichloroallyl)diisopropylthio-carbamate	Monsanto
	MON 5000	seed treatment safner (no chemistry available)	Monsanto
	MON 5500	seed treatment safner (no chemistry available)	Monsanto

Table 2. Agronomic data from the wild oat herbicide application study. Northwestern Agricultural Research Center cooperation with Dr. Pete Fay of Montana State University. Plot size: 48 sq ft

Date seeded: May 12, 1982 Date harvested: September 20, 1982

TREATMENT	RATE LB/A	STG	YIELD BU./A	T.W. LB./BU	# W.O.PANICLES AT HARVEST/FT²	WILD OAT CONTROL 1/ 7-20	8-27
CARBYNE	.375	2 LF	68.57a	57.08	7.50b	9.6	7.9
HOELON	1.0	2 LF	79.02a	58.47a	10.00b	9.1	8.9
AVENGE	1.0	2 LF	65.42a	56.73	13.25b	7.9	4.1
CARBYNE	.375	3 LF	76.35a	58.40a	6.50b	9.8	9.3
HOELON	1.0	3 LF	81.40a	58.30a	8.50b	9.1	9.3
AVENGE	1.0	3 LF	73.57a	56.58	7.00b	9.9	9.3
CARBYNE	.375	4 LF	76.27a	58.77a	8.75b	8.5	8.5
HOELON	1.0	4 LF	80.38a	59.30a	2.75b	9.9	9.8
AVENGE	1.0	4 LF	66.75a	58.20a	14.25b	2.6	5.0
CARBYNE	.375	5 LF	75.05a	58.67a	9.50b	8.3	6.8
HOELON	1.0	5 LF	77.72a	59.08a	6.25b	9.9	9.9
AVENGE	1.0	5 LF	80.20a	58.88a	4.50b	9.6	9.5
CHECK	--	--	53.95	56.18	18.00	0.0	0.0
		$\bar{X}$	73.44	58.07	8.81		
		F/2	3.495**	3.248**	13.10**		
		SEX	4.196	.586	1.194		
		LSD(.05)	9.197	1.284	2.619		
		CV %	5.713	1.008	13.567		

1/ WILD OAT CONTROL RATINGS, SCALE OF 0-10; 0=NO CONTROL, 10 = COMPLETE

2/ F VALUE FOR TREATMENT COMPARISON, ** INDICATES STATISTICAL SIGNIFICANCE AT THE .01 LEVEL.

APPLICATION DATA

APPLN. STAGE OF WILD OATS	DATE	TEMPS.(F) AIR	SOIL	WIND(MPH)	RELATIVE HUMIDITY	CLOUD COVER	SOIL MOIST	WILD OAT DENSITY
2 LEAF	5-27	60	52	4 1/2	24%	CLDY	V.WET	9/FT
3 LEAF	6-1	65	65	0-2	4%	SUNNY	DRY	7.5/FT
4 LEAF	6-8	56	60	0	55%	HAZY	INTER.	8/FT
5 LEAF	6-14	78	75	0	23%	SUNNY	DRY	8/FT

Table 3. Effect of MON5000 and MON5500 on yield of spring wheat (Newana) sprayed with triallate. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field R-13.

Date seeded: 5/4/82 Date harvested: 9/20/82
Size of Plot: 48 sq. ft.

Triallate Rates	Seed Treatment					
		MON5000		MON5500		
	Check	1/8	1/4	1/8	1/4	$\bar{x}$
			Yield (bu/a)			
0.0	73.17	62.27	53.03	54.23	55.97	59.73
1.0	74.97	71.70	71.10	65.93	73.97	71.53
1.5	69.37	71.87	64.43	60.60	60.60	65.37
2.0	62.60	67.77	64.47	62.63	63.60	64.21
2.5	56.90	70.53	70.87	61.80	58.50	63.72
3.0	52.47	69.43	65.50	67.70	65.73	64.17
$\bar{x}$	64.91	68.92	64.90	62.15	63.06	64.77
F[1]	5.782*	1.447NS	3.301NS	.647NS	.887NS	
			Plant Counts[2] (wheat)			
0.0	14.8	11.8	11.2	10.7	9.6	11.62
1.0	13.4	12.2	9.1	9.6	10.2	10.90
1.5	11.1	11.3	9.6	10.2	10.2	10.48
2.0	10.8	10.1	9.9	11.6	7.9	10.06
2.5	9.0	8.3	7.7	11.0	8.9	8.98
3.0	7.0	8.3	9.6	9.6	9.5	8.80
$\bar{x}$	11.02	10.33	9.52	10.45	9.38	10.14
			Wild Oat Weed Control[3]			
0.0	.67	0.0	0.0	0.0	0.0	.13
1.0	9.70	8.0	9.8	9.8	8.7	9.20
1.5	9.70	10.0	9.8	10.0	9.8	9.86
2.0	9.70	7.8	9.8	9.8	9.8	9.38
2.5	9.50	10.0	10.0	10.0	10.0	9.90
3.0	9.8	9.7	9.8	10.0	9.0	9.66
$\bar{x}$	8.1	7.6	6.5	8.3	7.9	8.00

1/ F - value for treatment comparison
2/ Plants per two feet of linear row
3/ Scale 0-10: 0 = no control; 10 = complete control
* Indicates statistical significance at the .05 level

APPLICATION DATA:

All Fargo (triallate) applications were made PPI (pre plant incorporated) being incorporated 1½-2 inches with a spike tooth harrow at right angles.

The safners MON5000 and MON5500 were applied by seed treatment method just prior to planting on May 4, 1982.

Date: 5/4/82 Air Temperature: 48°F Soil Temperature: 46°F
Velocity: 4-6 mph Humidity: 51%

Table 4. Evaluation of several triallate formulations and application techniques on no-till Luke winter wheat yields and test weight. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field No. R-7c.

Date seeded: September 29, 1981 Date harvested: August 23, 1982
Size of plot: Approximately 375 sq. ft.

Treatment/Time	Technique	Form	Rate Lb ai/A	Yield Bu/A	Test Wt Lbs/Bu.
Triallate/Fall	Granular Applicator	10G	1.2	70.00a	59.0
Triallate/Fall	Granular Applicator	10G	1.5	63.4a	59.3
Triallate/Fall	Granular Applicator	10G	2.0	56.3a	60.0
Check				37.5	59.3
Triallate/Fall	Flat Fan,5 gpa	Flowable	1.5	26.7	57.7
Triallate/Fall	Flat Fan,5 gpa	Flowable	3.0	44.6	58.7
Triallate/Fall	Micro, 5 gpa	Flowable	1.5	28.6	55.3
Triallate/Fall	Flat Fan,10 gpa	Flowable	1.5	21.9b	57.4
Triallate/Fall	Micro, 10gpa	Flowable	1.5	24.5b	57.0
Triallate/Fall	Micro, 10gpa	Flowable	3.0	31.5	54.4
Check				26.0	56.0
Triallate/Spring	Granular Applicator	10G	1.2	44.5	57.2
Triallate/Spring	Granular Applicator	10G	1.5	35.7	55.5
Triallate/Spring	Granular Applicator	10G	2.0	25.8	57.5
Check				38.1	58.0
Triallate/Spring	Flat Fan,22.26gpa	Flowable	1.5	28.1	57.2
Triallate/Spring	Flat Fan,22.26gpa	Flowable	3.0	56.9a	60.4
			$\bar{x}$	38.8	57.6
			F_1	26.07**	1.232NS
			S.E.$\bar{x}$	5.7848	1.519
			L.S.D.(.05)	13.007	3.415
			C.V. %	7.54	2.635

1/ F - value for treatment comparison
** Indicates statistical significance at the .01 level
a/ Values significantly greater than check at .05 level
b/ Values significantly less than check at .05 level
NOTE: Yields varied due to dramatic field stand variation

APPLICATION DATA:	Date	Air Temperature	Soil Temperature	Wind(mph)	Humidity
Fall	10/20/81	43°F	50°F	2-4	24%
Spring	4/ 5/82	41°F	40°F	1-3	30%

Granules applied via Volman Air Machine(R) (granulator)
Micro applications done with Micro Max(R) applicator
Flat Fan applications - 5 gpa low volume nozzles or
22.26 gpa, 8003 nozzles

TITLE: Chemical control of broadleaf weeds in small grains

PROJECT: Weed Investigations MS 754

YEAR: 1982

LOCATION: Northwestern Agricultural Research Center, Kalispell
Joe Holland Farm, Plains, MT

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - Weed Research Committee MAES
Montana Wheat Research & Marketing Committee
Chemical Research & Development Representatives

OBJECTIVES:

Evaluation of herbicides and herbicide combinations for efficacy in weed control.

MATERIALS AND METHODS:

Six broadleaf herbicide studies were conducted in 1982, five on station and one in Sanders County on the Joe Holland farm. The 1982 studies included:

1. Glean plant back study, spring barley first crop
2. Broadleaf herbicide evaluations on Newana spring wheat
3. Dryland/irrigated spring wheat herbicide study
4. Dryland/irrigated winter wheat herbicide study
5. Broadleaf herbicide evaluations on Luke winter wheat
6. Off station winter wheat herbicide study

Herbicides used in this experiment are listed in Table 1.

In studies No. 2 and 3 spring wheat was seeded in 12 ft. strips using an International press drill at 70 lbs/a. The herbicides were applied perpendicular to the strips in a swath 10 ft. wide, providing a treated area of 120 sq. ft. Each treatment was replicated four times in a randomized block design. The broadleaf herbicide study (No. 2) was treated with diclofop to control wild oats.

The remaining broadleaf herbicide studies (No.'s 1, 4, 5 & 6) were conducted in established stands of spring barley or winter wheat.

Three application techniques were utilized throughout these six experiments.

1. Post Plant Incorporated (PPI) - Used in test No.'s 2, 3, 4 and 5 concerning SSH0860, R40244 and trifluralin. PPI applications were incorporated with a spike tooth harrow in tests No. 3 and 4 and lightly incorporated by hand rake in tests No. 2 and 3.

2. Pre Emergence Surface (PES) - Used in tests No.'s 1, 2 and 5 for R40244, Glean and linuron.

3. Post Emergence (POST) - Used in tests No.'s 1, 2, 5 and 6. Post applications were timed according to weed stages or the developmental stages of grain.

All Herbicides were applied with a research type tractor mounted sprayer. Plot areas were harvested using a Hege 125B plot combine. Plot sizes, harvest areas and observations taken varied for each study. The following discussions and tables will list and describe the characteristics of each test.

Weeds evaluated in each study are listed below:

Common Name	Scientific Name	Test No's
Blue mustard	Chorispora tenella	6
Gromwell	Lithospermum arvense	4,5,6
Cheatgrass	Bromum secalinus	6
Henbit	Lamium amplexicaule	1,2,6
Wild buckwheat	Polygonum convolvulus	1,3,4
Tumble mustard	Sisymbrium altissimum	4,5
Wild oats	Avena fatua	3
False flax	Camelina satira	3
Fanweed	Thlaspi arvense	1,2,3,5
Chickweed	Stellaria media	1,2,3
Silene	Silene noctiflora	1,2,3
Nightshade	Solanum nigrum	1
Lambsquarter	Chenopodium album	5

RESULTS & DISCUSSION:

Experiment No. 1 - Glean plant back study.

Several rates of Glean (chlorsulfuron) and a related compound were tested at various rates and applications on spring barley. All treatments resulted in good to excellent weed control. Post emergence applications provided better weed control at the lower rates. The addition of a surfactant offered no additional weed control. Yields throughout the study did vary significantly, however post emergence applications had higher yields than most of the pre emergence surfact applications. Several of the test weights from PES treatments were significantly less than the check. Both compounds tested had slightly better overall performances than the standard herbicide applications of bromoxynil + MCPA. Table 2

In another plant back study conducted during the 1981-82 season it was found that subsequent plantings of lentils, alfalfa, potatoes, and corn were injured by Glean (chlorsulfuron) carryover. Most susceptible were alfalfa, lentils, and potatoes which were effected at all rates tested (.0625 - 1.0 oz ai/A). Corn populations were thinned out at the higher rates. Barley was the only crop which showed no phytotoxcity when planted into ground previously treated with Glean.

Experiment No. 2 - Broadleaf herbicide applications on Newana spring wheat.

Spring wheat yields were significantly less in the metribuzin treatments (Table 3). These plots, as well as others produced test weights significantly lower than the check. Broadleaf weed control was good to very good for all herbicides tested. The best performance in yield was seen with R40244, PES at .25 lb ai/A. Table 3

Experiment No. 3 - Dryland/irrigated spring wheat herbicide study.

Field conditions varied between the dryland and irrigated locations of this study. Higher yields were obtained from the dryland study. Yields within the dryland location did not vary significantly but R40244 at .5 lb/a provided the highest yield. R40244 was weak in wild buckwheat control at both rates and demonstrated just fair control of chickweed at the low rate. SSH0860 exhibited fair to good control of chickweed and performed well in respect to all other weeds. Table 4

Yields in the irrigated site for spring wheat did not vary significantly. R40244 was weak in controlling wild oats, wild buckwheat and pigweed at the lower rate. SSH0860 was effective in controlling all weeds except wild oats. Table 5

Experiment No. 4 - Dryland/irrigated winter wheat herbicide study.

Field positioning contributed to varied stands within this study which resulted in higher yields being taken from the dryland location. Dryland yields were good, although not varying significantly, with SSH0860 at 1.0 lb ai/A giving the highest yield. SSH0860 provided good control of the weeds observed, whereas R40244 was weak on wild buckwheat and did not control gromwell. Table 6

Irrigated yields were less than dryland yields. The treatment yields were found to be non-significant. SSH0860 at 2.0 lbs ai/A provided the highest yield. All SSH treatments demonstrated excellent weed control. Again R40244 proved to be a little weak controlling gromwell and wild buckwheat. Table 7

Experiment No. 5 - Broadleaf herbicide evaluations on Luke winter wheat.

Yields within this study did not vary signficantly when statistically analyzed, but high yields were taken from plots treated with DPX4189 (chlorsulfuran) and bromxoynil. Test weights were high and uniform throughout the whole study. Good to excellent weed control was observed for all treatments except where linuron was applied. For weeds observed see Table 8.

Experiment No. 6 - Off station winter wheat herbicide study.

This study was established in a field of Nugaines winter wheat that had severe weed pressure from blue mustard and gromwell. Good yields were observed with all treatments and all were significantly higher than the check. Glean (chlorsulfuron) provided excellent control of all weeds except at the lower rates. The bromoxynil and bromoxynil plus MCPA or dinoseb combinations were not as effective controlling cheatgrass, henbit and gromwell. Most treatments seemed to fail in season-long gromwell control except for Glean at the high rate, bromoxynil + MCPA + dinoseb, bromoxynil + R40244, and bromxoynil + MCPA. Seasonal control of blue mustard was accomplished by all treatments. Table 9

Table 1. Chemicals used in the broadleaf herbicide trials in small grains.

Common Name	Trade Name	Chemical Name	Company
bromoxynil	Buctril or	3,5-dibromo-4-hydroxybenzonitrile	Rhone/ Poulenc
	Brominal+		Union Carbide
chlorsulfuron	Glean	2-chloro-N[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]benzene-sulfonamide	duPont
diclofop	Hoelon	2-[4-(2,4-dichlorophenoxy)phenoxy]propanoic acid	American Hoechst
dinoseb	Premerge 3	2-sec-butyl-4,6-dinitrophenol	Dow
	DPX-T6376	Methyl 2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]benzoate	duPont
linuron	Loroxe	3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea	duPont
MCPA	MCPA	[(4-chloro-o-tolyl)oxyl]acetic acid	Amchem
metribuzin	Sencor	4-amino-6-tert-butyl-3-(methylthio)-as-triazin-5(4H)one	Mobay
	R 40244	1-(m-trifluoromethylphenyl)-3-chlor-4-chloromethyl-2-pyrrolidone	Stauffer
	R 40244/ R 29148	R 40244 + antidote	Stauffer
	SSH 0860	1-amino-3-(2,2-dimethylpropyl)-6-(ethyl-thio)-1,3,5-triazine-2,4(1H, 3H)-dione	Mobay
trifluralin	Treflan	α,α,α-trifluror-2,6-dinitro-N,N-dipropyl-p-toluidine	Elanco

Table 2. Evaluation of DPX4189 (Glean) and related compounds at various rates, applications and mixtures with surfactants in spring barley. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field No. R-13.

Planting Date: May 10, 1982 Harvest Date: September 17, 1982
Size of Plot: 88 sq. ft.

Treatment		Rate lbs ai/a oz ai/a*	Yield bu/a	Test Wt lbs/bu	% Plump	Weed Control 1/ FW	Sil	BW	NS	HB	CW
DPX-T6376	PES	.0625*	75.03	50.07b	81.33	6.0	6.7	8.7	8.7	7.0	5.7
DPX-T6376	PES	.125*	76.77	50.47b	84.67	8.7	7.1	7.1	8.3	9.7	10.0
DPX-T6376	PES	.25*	69.80	50.17b	79.00	10.0	10.0	10.0	9.6	10.0	10.0
DPX-T6376	PES	.50*	62.53	49.00b	80.67	10.0	10.0	9.7	10.0	10.0	10.0
DPX-4189(Glean)	PES	.0625*	76.97	50.60	81.00	6.3	7.3	7.5	9.8	9.2	8.3
DPX-4189(Glean)	PES	.125*	69.23	49.83b	78.67	9.8	10.0	9.8	9.7	10.0	10.0
DPX-4189(Glean)	PES	.25*	77.73	50.30b	81.00	10.0	10.0	10.0	9.3	10.0	10.0
DPX-4189(Glean)	PES	.50*	77.70	50.70	82.33	10.0	10.0	9.0	9.5	10.0	10.0
Check		---	78.43	50.93	85.00	2.3	1.7	2.3	2.7	2.0	1.7
DPX-T6376	POST EM	.0625*	80.20	50.20b	83.33	9.8	10.0	10.0	10.0	10.0	10.0
DPX-T6376	POST EM	.125*	86.13	50.90	84.67	10.0	10.0	9.0	10.0	10.0	10.0
DPX-T6376	POST EM	.25*	79.40	50.37	81.00	9.3	9.7	10.0	9.8	9.3	9.7
DPX-T6376	POST EM	.50*	77.37	50.23b	80.67	10.0	10.0	10.0	10.0	10.0	10.0
DPX-4189(Glean)	POST EM	.0625*	83.23	51.03	83.33	10.0	9.3	9.5	10.0	10.0	10.0
DPX-4189(Glean)	POST EM	.125*	78.77	51.07	85.67	10.0	10.0	10.0	10.0	10.0	10.0
DPX-4189(Glean)	POST EM	.25*	79.60	50.63	85.33	10.0	10.0	10.0	10.0	10.0	10.0
DPX-4189(Glean)	POST EM	.50*	80.60	50.87	84.00	10.0	10.0	10.0	10.0	10.0	10.0
DPX-T6376+Surf	POST EM	.0625*	84.37	50.57	83.33	10.0	10.0	9.7	10.0	10.0	10.0
DPX-T6376+Surf	POST EM	.125*	60.60	50.57	84.33	10.0	10.0	10.0	10.0	10.0	10.0
DPX-4189(Glean) + Surf	POST EM	.0625*	80.13	50.17	86.67	10.0	9.8	9.8	10.0	10.0	10.0
DPX-4189(Glean) + Surf	POST EM	.125*	84.00	50.57	85.00	10.0	10.0	10.0	10.0	10.0	10.0
Bromoxynil + MCPA	POST EM	.375 + .375	76.67	49.77b	83.00	10.0	9.7	10.0	10.0	7.7	9.2
DPX-T6376 + diclofop	POST EM	.0625* + .75	77.40	49.43b	79.33	10.0	10.0	10.0	9.8	10.0	10.0
Check (weedy)		----	78.90	51.10	86.00	0.0	0.0	0.0	0.0	0.0	0.0
$\bar{x}$			77.15	50.40	82.89						
F 2/			1.12NS	4.055**	.83NS						
S.E.$\bar{x}$			5.83	.258	2.57						
L.S.D.(.05)			16.58	.534	7.32						
C.V. %			7.55	.51	3.10						

1/ Weed Control Scale 0-10: 0 = no control; 10 = complete control
Weed Code: FW = fanweed (Thlaspi arvense)
Sil= Silene (Silene noctiflora)
BW = wild buckwheat (Polygonum convolvulus)
NS = nightshade (Solanum nigrum)
HB = henbit (Lamium amplexicaule)
CW = chickweed (Stellaria media)

2/ F-value for treatment comparisons
** Indicates statistical significance at the .01 level
b/ Values significantly less than the check at .05 level
NOTE: Surfactant added in designated treatments was X-77 at .125% V/A

Table ____. (con't)

Application Data:

	Pre emergence	Post emergence
Date	5/13/82	6/8/82
Air Temperature	68°F	62°F
Soil Temperature	77°F	63°F
Humidity	17%	36%
Wind Velocity	3-5mph	4-9mph

Table 5. Broadleaf herbicide evaluations on Newana spring wheat. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field No. R-13

Planting Date: May 12, 1982 Harvest Date: September 20, 1982 Size of Plot: 48 sq. ft.

Treatment		Rate lbs ai/a	Yield bu/a	Test Wt lbs/bu	Phyto[1]	Stand Loss[1]	Weed Control[2] FW	Sil	CW	HB
R 40244	POST	.25	70.9	57.0b	2.3	17.5	10.0	10.0	10.0	10.0
R 40244 + MCP	POST	.25 + .375	75.4	57.7b	2.1	16.3	10.0	9.9	10.0	10.0
R 40244 + bromoxynil	POST	.25 + .25	74.1	57.6b	2.3	13.8	10.0	10.0	10.0	10.0
R 40244 + metribuzin	POST	.25 + .25	56.6b	50.8b	5.6	28.8	10.0	10.0	10.0	10.0
R 40244	PES	.25	85.5	58.3b	1.3	8.8	10.0	8.5	9.0	9.9
R 40244	PES	.50	74.8	56.6b	1.4	7.8	10.0	10.0	10.0	10.0
R 40244 + DPX-4189 (chlorsulfuron)	PES	.25 + .031oz	77.5	58.5	1.3	7.5	10.0	10.0	10.0	10.0
R 40244 + Trifluralin	PEI	.25 + .25	71.9	58.4b	1.5	8.3	9.9	8.5	6.8	8.3
Metribuzin	POST	.25	64.9b	53.2b	3.4	12.0	10.0	10.0	10.0	10.0
Bromxoynil	POST	.25	73.8	58.5	1.4	6.0	10.0	10.0	9.8	9.9
MCPA	POST	.375	72.6	58.5	1.4	5.8	9.4	7.5	4.0	4.9
DPX-4189 (chlorsulfuron)	POST	.125oz	77.7	58.3b	1.6	5.8	10.0	10.0	10.0	10.0
DPX-4189 (chlorsulfuron)	PES	.031oz	80.9	59.0	1.3	4.0	10.0	10.0	10.0	10.0
Bromoxynil + MCPA	POST	.375 + .375	76.2	58.1b	1.1	4.3	7.5	9.8	9.1	9.6
Bromoxynil + MCPA + dinoseb	POST	.375 + .375 + .375	76.3	58.3b	1.5	8.3	10.0	9.6	9.3	9.9
Bromoxynil + dinoseb	POST	.375 + .375	76.9	57.8b	1.5	9.3	9.9	10.0	10.0	10.0
Dinoseb	POST	.375	73.1	59.0	1.5	7.8	7.8	3.8	4.3	3.3
Check		---	77.1	59.5	1.3	4.5	0.0	0.0	0.0	0.0
$\bar{x}$			74.23	57.49						
F[3]			1.953*	16.76**						
S.E.$\bar{x}$			4.385	.5236						
L.S.D.(.05)			8.929	1.066						
C.V. %			5.91	.911						

1/ Phyto = Phytotoxicity ratings 0-10: 0 = no phyto; 10 = dead plants due to chemical or mechanical injury.
Stand Loss = ocular estimate of percent stand thinned

2/ Weed Control scale 0-10; 0 = no control; 10 = complete control, rated 6/25/82.
Weed Codes: FW = fanweed (Thlaspi arvense)
SIL= Silene (Silene noctiflora)
CW = chickweed (Stellaria media)
HB = henbit (Lamium amplexicaule)

3/ F - value for treatment comparison
** indicates statistical significance at .01 level
b values significantly less than check at .05 level

APPLICATION DATA:

Application	Date	Temperature Air	Soil	Wind(mph)	Humidity
PES	5/13/82	68°F	77°F	3-5	17%
PEI	5/13/82	68°F	77°F	3-5	17%
POST	6/ 8/82	60°F	58°F	4-6	35%

Table 4. Effect of herbicides on dryland spring wheat yields. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field R-13.

Date seeded: 5/12/82 Date harvested: 9/20/82
Size of Plot: 48 sq. ft.

Treatment	Rate ai/A	Weed Control[1] Wild Oats	False Flax	Buckwheat	Fanweed	Chickweed	Silene	Phyto[2]	% Less Stand	Yield Bu/A	Test Wt Lbs/Bu
SSH0860	1.0	9.6	4.5	10.0	10.0	5.5	9.3	0.0	2.8	56.63	57.9
SSH0860	1.5	6.0	5.3	8.6	10.0	6.8	10.0	0.3	2.5	54.65	58.3
SSH0860	2.0	8.4	6.0	9.8	10.0	7.6	8.8	0.6	6.3	59.83	58.4
R 40244	0.25	7.1	3.6	2.3	8.3	5.8	8.0	0.9	6.3	57.93	58.9
R 40244	0.50	9.1	4.5	5.6	10.0	7.0	10.0	0.0	5.0	60.63	58.2
Check	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	52.64	59.1
$\bar{x}$										57.05	58.46
F[3]										.537NS	.575NS
S.E.$\bar{x}$										4.166	.598
L.S.D.(.05)										12.255	1.759
C.V. %										7.303	1.023

1/ Weed control rating 0-10 scale: 0 = no control; 10 = complete control
Wild Oats (Avena fatua)
False Flax (Camelina satira)
Wild Buckwheat (Polygonum convolvulus)
Fanweed (Thlaspi arvense)
Chickweed (Stellaria media)
Silene (Silene noctiflora)

2/ Phyto = Phytotoxicity 0-10 scale: 0 = no phyto; 10 = dead plants due to chemical injury

3/ F - value for treatment comparison

NOTE: Poor field stands and wild oat pressure resulted in lower yields in irrigated versus dryland plots.

APPLICATION DATA: (All treatments post plant incorporated)

Date:	5/13/82
Air Temperature:	68°F
Soil Temperature:	77°F
Humidity:	17%
Wind Velocity:	3.5 - 7.5 mph
Volume:	26.86 gpa
Nozzle:	8003
Pressure:	32 psi
Incorporation Technique:	1½" incorporation w/2 passes of spike tooth harrow

Table 5. Effect of herbicides on irrigated spring wheat yields. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field R-13.

Date seeded: 5/12/82 Date harvested: 9/20/82 Size of Plot: 48 sq. ft.

Treatment	Rate ai/A	Weed Control[1] Wild Oats	False Flax	Buck-wheat	Fan-weed	Lambs-quarter	Silene	Pig-weed	Phyto[2]	% Less Stand	Yield Bu/A	Test Wt Lbs/Bu
SSH 0860	1.0	5.0	8.5	9.4	8.9	10.0	7.1	7.5	0.9	7.5	41.64	58.0
SSH 0860	1.5	5.8	9.1	9.6	10.0	9.8	9.3	8.8	0.9	5.0	42.02	58.1
SSH 0860	2.0	8.2	8.4	7.5	10.0	10.0	9.8	4.9	2.0	15.8	55.74	58.1
R 40244	0.25	3.1	5.6	6.1	9.8	7.6	9.0	5.8	0.3	0.0	38.93	56.6
R 40244	0.50	3.6	8.7	5.5	10.0	9.5	9.3	9.5	0.0	4.5	41.81	58.1
Check	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.10	57.7
										$\bar{x}$	43.37	57.76
										F[3]	1.482NS	.604NS
										S.E.$\bar{x}$	5.072	.759
										L.S.D.(.05)	14.846	2.233
										C.V. %	11.694	1.314

1/ Weed control rating 0-10: 0 = no control; 10 = complete control
Weeds: Wild oats (Avena fatua)
False flax (Camelina sativa)
Wild buckwheat (Polygonum convolvulus)
Fan weed (Thlaspi arvense)
Lambsquarter (Chenopodium album)
Silene (Silene noctiflora)
Pigweed (Amaranthus retroflexus)

2/ Phyto = Phytotoxicity 0-10: 0 = no phyto; 10 = dead plants due to chemical injury

3/ F - value for treatment comparison

NOTE: poor field stands and wild oat pressure resulted in lower yields in irrigated versus dryland plots.

APPLICATION DATA: (All treatments post plant incorporated)

Date: 5/13/82 Air Temperature: 68°F Soil Temperature: 77°F Humidity: 17%
Wind Velocity: 3.5-7.5 mph Volume: 26.86 gpa Nozzle: 8003 Pressure: 32 psi
Incorporation Technique: 1½" incorporation w/2 passes of spike tooth harrow

Table 6. Effects of various herbicides on dryland Luke winter wheat yields and weed control in 1982. Field No. R-3a.

Date seeded: 9/24/81 Date harvested: 8/19/82
Size of Plot: 64 sq. ft.

Treatment	Rate Lb/A	% Less Stand	Weed Control[1] Gromwell	Buck-wheat	Tumble Mustard	Yield Bu/A	Test Wt Lbs/Bu
SSH 0860	1.0	11.3	7.6	10.0	10.0	79.42	60.8
SSH 0860	1.5	12.5	8.3	10.0	10.0	65.69	60.2
SSH 0860	2.0	18.8	8.3	10.0	10.0	70.09	59.7
R 40244	0.25	7.5	0.0	7.5	10.0	55.83	59.3
R 40244	0.50	11.3	1.3	6.3	10.0	66.52	60.5
Check	0.0	5.0	0.0	0.0	0.0	56.93	59.5
					$\bar{x}$	65.75	59.99
					F^2	1.420NS	1.401NS
					S.E.$\bar{x}$	7.343	.481
					L.S.D.(.05)	21.497	1.407
					C.V. %	11.169	.801

1/ Weed control scale 0-10: 0 = no control; 10 = complete control
Weeds: Gromwell (Lithospermum arvense)
Wild buckwheat (Polygonum convolvulus)
Tumble mustard (Sisymbrium altissimum)
2/ F - value for treatment comparison

APPLICATION DATA:

Date:	9/27/81
Air Temperature:	52°F
Soil Temperature:	56°F
Humidity:	63%
Wind Velocity:	0 mph
Volume:	23.9 gpa
Nozzle:	8003
Pressure:	32 psi

All applications post plant pre emergence and incorporated with spike tooth harrow.

Table 7. Effects of various herbicides on irrigated Luke winter wheat yields and weed control in 1982. Field No. R-3a.

Date seeded: 9/24/81 Date harvested: 8/19/82
Size of Plot: 64 sq.ft.

Treatment	Rate Lb/A	% Less Stand	Weed Control[1] Gromwell	Buck-wheat	Tumble Mustard	Yield Bu/A	Test Wt Lbs/Bu
SSH 0860	1.0	21.3	10.0	9.9	10.0	46.79	59.5
SSH 0860	1.5	22.5	10.0	10.0	10.0	43.69	60.2
SSH 0860	2.0	26.3	10.0	10.0	10.0	47.49	59.7
R 40244	0.25	22.5	7.3	8.3	10.0	42.94	59.7
R 40244	0.50	23.8	7.0	7.6	10.0	43.16	59.4
Check	0.0	13.8	0.0	0.0	0.0	39.61	60.1
					$\bar{x}$	43.95	59.75
					F^2	.786NS	.447NS
					S.E.$\bar{x}$	3.235	.472
					L.S.D.(.05)	9.470	.138
					C.V. %	7.36	.790

1/ Weed control 0-10: 0 = no control; 10 = complete control
Weeds: Gromwell (Lithospermum arvense)
Wild buckwheat (Polygonum convolvulus)
Tumble mustard (Sisymbrium altissimum)
2/ F - value for treatment comparison

APPLICATION DATA:

Date:	9/27/81
Air Temperature:	52°F
Soil Temperature:	56°F
Humidity:	63%
Wind Velocity:	0 mph
Volume:	23.9 gpa
Nozzle:	8003
Pressure:	32 psi

All applications post plant pre emergence and incorporated with spike tooth harrow.

Table 8. Evaluation of several herbicides in Luke winter wheat for control of weeds. Northwestern Agricultural Research Center, Kalispell, MT. Field R-7a.

Date seeded: 9/30/81 Date harvested: 8/25/82
Size of Plot: 64 sq. ft.

		Weed Control[2]						
Treatment	Rate Lb/A	Lentils	Fan-weed	Tumble Mustard	Lambs-quarter	Gromwell	Yield Bu/A	Test Wt Lbs/Bu
SSH 0860[1]	0.75	4.0	9.5	8.8	9.8	7.8	85.47	62.68
SSH 0860[1]	1.00	6.4	10.0	9.8	10.0	10.0	90.44	62.40
SSH 0860[1]	1.50	7.0	10.0	10.0	10.0	10.0	91.99	62.33
R 40244	2.00	6.6	10.0	10.0	10.0	10.0	90.59	62.35
R 40244	0.25	2.8	10.0	10.0	9.3	10.0	84.04	62.93
R 40244	0.50	4.0	10.0	10.0	9.5	10.0	86.07	62.37
R 40244	1.00	5.8	10.0	10.0	9.9	10.0	89.14	63.27
DPX 4189	0.625oz	7.5	9.3	10.0	10.0	8.5	83.37	62.95
DPX 4189	0.125oz	5.8	10.0	10.0	9.8	10.0	94.46	62.83
DPX 4189	0.25oz	7.3	10.0	10.0	10.0	10.0	89.17	63.20
DPX 4189	0.50oz	8.8	10.0	10.0	10.0	10.0	93.56	62.55
R 40244 + linuron	0.25 + 0.50	1.3	10.0	10.0	7.3	10.0	91.19	62.63
Linuron	0.50	2.5	3.5	6.3	5.0	7.3	89.40	63.18
Check	0.0	0.5	0.0	0.0	0.0	2.5	84.31	62.95
R 40244/ R29148	0.50	2.3	10.0	10.0	8.0	10.0	88.47	62.98
Bromoxynil	0.375	7.8	7.8	9.8	9.6	10.0	93.23	63.33
						$\bar{x}$	89.06	62.81
						F[3]	.73	1.26
						S.E.$\bar{x}$	4.12	.31
						L.S.D.(.05)	11.73	.87
						C.V. %	4.63	.49

1/ Shallow incorporation w/hand rake.
2/ Weed control 0-10: 0 = no control; 10 = complete control
Weeds: Lentils (volunteer)
Fanweed (Thlaspi arvense)
Tumble mustard (Sisymbrium altissimum)
Lambsquarter (Chenopdoium album)
Gromwell (Lithospermum arvense)
3/ F - value for treatment comparison

APPLICATION DATA:	PPI	DPX	Bromoxynil
Date:	10/1/81	4/16/82	4/21/82
Air Temperature:	68°F	39°F	55°F
Soil Temperature:	62°F	34°F	45°F
Humidity:	10%	50%	18%
Wind Velocity:	3-7 mph	4 mph	5 mph
Volume:	23.9 gpa	22.3 gpa	22.3 gpa
Nozzle:	8003	8003	8003
Pressure	32 psi	32 psi	32 psi

Table 9. Evaluation of spring applied herbicides to Nusaines winter wheat. Northwestern Agricultural Research Center and Joe Holland Farm, Plains, MT. 1982. Plot size: 64 sq. ft.

Date seeded: September 20,1981 Harvested August 10,1982

TREATMENT	RATE AI/A	YIELD BU./A	TEST WT. LBS./BU	WEED CONTROL 1/ MAY 19,1982 BM	GW	CG	HB	JULY 9,1982 BM	GW
BROMOXYNIL	.375	87.1a	59.5	8.2	6.0	5.0	2.3	10.0	7.3
BROMOXYNIL+ MCPA	.375+ .375	88.9a	60.0	8.8	9.7	5.8	6.3	10.0	9.0
BROMOXYNIL+ DINOSEB	.375+ .375	69.6a	60.3	7.5	6.3	3.3	3.3	10.0	6.0
BROMOXYNIL+ MCPA+ DINOSEB	.375+ .375+ .375	73.9a	59.5	9.5	8.8	9.8	7.0	10.0	10.0
R 40244	.25	82.1a	59.1	6.3	5.7	6.0	9.8	10.0	4.0
R 40244+ BROMOXYNIL	.25 .25	77.6a	59.9	9.8	9.2	10.0	10.0	9.0	9.0
GLEAN	1/16 OZ.	79.8a	59.2	9.8	5.5	6.7	9.7	10.0	1.0
GLEAN	1/8 OZ.	82.1a	59.7	9.9	9.5	9.5	8.8	10.0	5.3
GLEAN	1/4 OZ.	80.8a	60.2	10.0	8.5	9.2	9.5	10.0	6.3
GLEAN	1/2 OZ.	85.5a	59.9	10.0	9.8	9.2	9.9	10.0	10.0
CHECK	---	43.1	59.0	0	0	0	0	0	0
X		77.3	59.7						
F 2/		4.94**	1.021						
SEX		5.669	.445						
LSD(.05)		14.81	1.159						
C.V. %		7.36	.746						

1/ WEED CONTROL SCALE 0-10; 0= NO CONTROL, 10= COMPLETE CONTROL
WEED CODES: BM= BLUE MUSTARD Chorispora tenella
GW= GROMWELL Lithospermum arvense
CG= CHEATGRASS Bromus secalinus
HB= HENBIT Lamium amplexicaule

2/ F VALUE FOR TREATMENT COMPARISONS.
** INDICATES STATISTICAL SIGNIFICANCE AT THE .01 LEVEL
a/ INDICATES VALUES SIGNIFICANTLY GREATER THAN THE CHECK AT THE .05 LEVEL.

APPLICATION DATA:

ALL TREATMENTS	TEMPS: AIR 44	WIND(MPH)	REL HUM.	WEATHER
APPLIED 4-7-82	SOIL 40	2-4	23%	PRTLY-CLDY.

SIZE OF PLOTS: 10' X 24'
HARVESTED AREA: 64 SQ. FT.

TITLE: Chemical Weed Control in Lentils

PROJECT: Weed Investigations MS 754

YEAR: 1982

LOCATION: Northwestern Agricultural Research Center

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - Weed Research Committee MAES
Research & Development Representatives
from Chemical Companies

OBJECTIVES:

1. Evaluation of herbicides for effective weed control in lentils and determination of their effect on yields.

2. Evaluation of several rates and applications of metribuzin on lentils.

MATERIALS AND METHODS:

The following lentil herbicide experiments were conducted in 1982:

1. Evaluation of herbicides on lentil yields and weed control.

2. Evaluation of several rates of metribuzin in combination with triallate on lentils. Sandy loam soil.

3. Evaluation of several rates of metribuzin in combination with triallate on lentils. Silty loam soil.

4. Evaluation of herbicides for wild oat control and the effects on lentil yields.

Tests #1 and #2 were conducted in a solid seeded stand of lentils. Plots were 10' x 20', or 200 sq. ft. in size. In tests #3 and #4 lentils were seeded in 12' strips, and herbicide treatments were applied perpenicular to the strips. Plot area in test #3 and #4 were 10' x 12' or 120 sq. ft. All studies were replicated four times in a randomized block design. Herbicides were applied with a research type tractor mounted sprayer. Pre plant incorporated treatments in test #1 and #3 were incorporated with a spike tooth harrow whereas in test #4 they were lightly incorporated with a hand rake. Pre emergence and post applications were made based on weed or crop stage of growth.

Weed scores and growth observations were taken throughout the season. Twenty-five square feet was harvested from each plot by hand, field dried and threshed with a Hege 125B combine.

RESULTS AND DISCUSSION:

Experiment #1 - Evaluation of herbicides on lentil yields and weed control.

Results and Discussion (con't)

The aphid population throughout the valley was so severe an emergency (or special local need) use permit was granted for cygon (dimethoate) systemic insecticide. Yields were near average this year even with an aphid infestation during the season. Of thirty treatments evaluated on lentils two produced significantly higher yields than the check. Those treatments producing significantly less in yield were PPI treatments with trifluralin, pendimethalin, ethalfluralin + EPTC, and pre emergence surface applications of oxyflurorfen. Oxyflurorfen was phytotoxic to lentils at all rates and in all combinations. None of the metribuzin treatments were injurious to the lentils this year which was due in part to precipitation patterns.

Plant counts were significantly higher in the higher yielding plots as were the three treatments where triallate was used in combination with another herbicide. Stand reductions were noted in plots treated with propham, metolachlor, EPTC and oxyflurorfen.

Excellent weed control was observed in the following treatments: 1) triallate + metribuzin; 2) triallate + R40244; 3) pendimethalin + dinoseb; 4) R40244 and 5) oryzalin + metribuzin. Table 2.

Experiment #2 - Evaluation of several rates of metribuzin in combination with triallate for weed control in lentils. Field R-4b, 3.3% organic matter.

Contrasted to last years results, when we had a high degree of phytotoxicity from metribuzin applications, there was no apparent crop injury in 1982. This could be due in part to a higher soil organic matter level or rainfall patterns which were quite different. Weed control was good in all treatments except the post application of metribuzin at the high rate. Table 3.

Experiment #3 - Evaluation of several rates of metribuzin in combination with triallate for weed control in lentils. Field R-13, 4.2% organic matter, silty loam soil.

Yields were depressed due to a severe aphid outbreak and high broadleaf weed pressure. There were no significant differences in yield and plant counts in this study. No phytotoxic symptoms were observed for any of the metribuzin applications. Broadleaf herbicide control was best at the .5 lb PES application of metribuzin. Lambsquarter and fanweed were the only weeds effectively controlled by the post applications of metribuzin. Table 4.

Experiment #4 - Evaluation of herbicides for wild oat control and the effects on lentil yields.

Sethoxydim, barban, and diclofop all offered good wild oat control in lentils. Difenzoquat, barban and pendimethalin provided good Setaria sp control throughout the season. The yields from this study were low and did not vary significantly. Metribuzin plus either sethoxydim, diclofop, or barban was a good combination for wild oat control in lentils. Table 5.

Table 1. Chemicals used in the lentil herbicide studies.

Common Name	Trade Name	Chemical Name	Company
barban	Carbyne	4-chloro-2-butynyl-m-chlorocarbanilate	Velsicol
diclofop	Hoelon	2-[4-(2,4-dichlorophenoxy)phenoxy] propanoic acid	American Hoechst
difenzoquat	Avenge	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium	American Cyanamide
dinoseb	Permerge 3	2-sec-butyl-4,6-dinitropheno	Dow
EPTC	Eptam	S-ethyl dipropylthiocarbamate	Stauffer
ethalfluralin	Sonalan	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl)benzenamine	Elanco
metolachlor	Dual	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide	Ciba-Geigy
metribuzin	Sencor Lexone	4-amino-6-tert-butyl-3-(methythio)-as-triazin-5(4H)-one	Mobay duPont
oryzalin	Surflan	3,5-dinitro-N^4,N^4-dipropylsulfanilamide	Elanco
oxyfluorfen	Goal	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene	Rhom and Haas
pendimethalin	Prowl	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	American Cyanamide
propham	Chem-Hoe	isopropyl carbanilate	PPG
	R 40244	1-(m-trifluoromethyl phenyl)-3-chlor-4-chloromethyl-2-pyrrolidone	Stauffer
sethoxydim	Poast	2-[1-(ethoxyimino)butyl]-5-[2-(ethyl-thio)propyl]-3-hydroxy-2-cyclohexen-1-one	BASF
triallate	Fargo	S-(2,3,3-trichloroallyl)diisopropylthio-carbamate	Monsanto
trifluralin	Treflan	α,α,α-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine	Elanco

Table 2. Evaluations of herbicides on lentil yields and weed control. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field No. R-4c.

Planting Date: May 5, 1982 Harvest Date: August 17, 1982
Size of Plot: 25 sq. ft.

Treatment		Rate lbs ai/a	Yield lbs/a	Plants per 3' of row	% Stand* Reduction	Phyto* 1/	Weed Control 2/* SW	LQ	Set	FW
Triallate	PPI	1.25	1684.5a	17.4a	0.0	0.0	8.8	8.0	9.3	10.0
Triallate + metribuzin	PPI/ PES	1.25 + .125	1514.3	18.3a	0.0	0.0	7.5	9.6	9.3	10.0
Triallate + metribuzin	PPI/ PES	1.25 + .1875	1585.4	16.8	0.0	0.0	9.8	9.3	9.3	10.0
Triallate + metribuzin	PPI/ PES	1.25 + .25	1339.5	15.7	0.0	0.0	3.5	6.9	9.4	10.0
Triallate + dinoseb	PPI/ PRE	1.25 + 3.0	1484.7	17.2a	0.0	0.0	7.6	7.5	9.3	10.0
Triallate + R 40244	PPI PPI	1.25 + .5	1361.8	19.4a	0.0	0.0	5.8	6.8	10.0	10.0
Triallate + R 40244	PPI/ PES	1.25 + .5	1100.6	13.8	0.0	0.0	9.6	9.5	9.3	10.0
Triallate + trifluralin	PPI PPI	1.25 + .75	1140.9	15.9	0.0	0.0	5.5	9.8	9.8	9.1
Propham	PPI	3.0	1141.7	15.3	2.5	2.5	3.8	8.5	9.5	8.8
Propham	PPI	4.0	1251.5	14.9	0.0	0.0	3.0	8.8	9.5	7.8
Trifluralin	PPI	.75	992.2b	13.9	0.0	0.0	7.5	10.0	10.0	7.5
Trifluralin + dinoseb	PPI/ PES	.75 + 3.0	1038.0	14.0	0.0	0.0	6.0	10.0	10.0	5.0
Trifluralin + EPTC	PPI/ PPI	.75 + 2.0	1029.5b	14.0	0.0	0.0	4.5	7.0	10.0	4.8
Trifluralin + metolachlor	PPI PPI	.75 + .5	1283.8	15.4	1.3	2.5	5.0	10.0	9.8	9.3
Pendimethalin	PPI	1.0	960.4b	14.5	0.0	0.0	5.3	9.8	10.0	8.8
Pendimethalin + dinoseb	PPI/ PES	1.0 + 1.5	1334.9	13.4	0.0	0.0	8.5	10.0	10.0	10.0
Ethalfluralin	PPI	.75	1467.4	16.7	0.0	0.0	6.8	9.3	10.0	9.8
Ethalfluralin/ EPTC	PPI	.75 + 2.0	836.3b	13.2	1.3	0.0	6.1	10.0	9.5	9.5
Metolachlor	PPI	3.0	1334.9	13.3	0.0	0.0	5.3	10.0	10.0	6.0
Metolachlor + EPTC	PPI PPI	3.0 + 2.0	1113.2	13.7	6.3	0.0	0.5	9.5	9.5	9.4
EPTC	PPI	2.0	1331.8	14.7	0.0	0.0	0.0	7.5	8.5	7.8
R 40244	PES	.25	1427.1	16.0	0.0	0.0	8.3	5.0	6.0	10.0
R 40244	PES	.50	1281.1	15.5	0.0	0.0	10.0	9.3	8.6	10.0
R 40244	PEI	.50	1440.5	16.2	0.0	0.0	2.0	4.8	4.3	10.0

Table 2 . (con't)

Treatment		Rate lbs ai/a	Yield lbs/a	Plants per 3' of row	% Stand* Reduction	Phyto* 1/	Weed Control 2/* SW	LQ	Set	FW
Oryzalin	PES	.75	1366.8	17.0	0.0	0.0	8.8	8.8	6.3	9.4
Oxyfluorfen	PES	.375	370.7b	14.6	16.3	0.0	8.8	8.1	8.8	7.5
Oxyfluorfen	PES	.5	146.0b	8.7b	77.5	0.0	10.0	10.0	9.0	10.0
Oxyfluorfen + oryzalin	PES	.375 + .75	369.7b	12.6b	41.3	0.0	9.8	8.8	7.5	10.0
Oryzalin + metribuzin	PES	.75 + .125	1653.7a	19.9a	0.0	0.0	8.6	10.0	9.3	10.0
Check		----	1313.8	14.9	0.0	0.0	0.0	0.0	0.0	0.0
$\bar{x}$			1190.1	15.2						
F 3/			5.81**	3.283**						
S.E.$\bar{x}$			39.620	1.209						
L.S.D.(.05)			284.111	2.257						
C.V.%			12.789	7.955						

1/ Phyto = phytotoxicity ratings 0-10: 0 = no phyto; 10 = dead plants due to chemical injury

2/ Weed Control Scale 0-10: 0 = no control; 10 = complete control
Weed Codes: GW = gromwell (Lithospermum arvense)
LQ = lambsquarter (Chenopodium album)
Set= Setaria (Setaria viridis)
FW = fanweed (Thlaspi arvense)

3/ F - value for treatment comparison

** Indicates statistical significance at the .01 level

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

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

Application Data:

Application	Date	Temperature Air	Soil	Wind(mph)	Humidity
PPI	5/5/82	45°F	47°F	0-3	22%
PRE	5/6/82	48°F	45°F	0	32%
PES	5/6/82	48°F	45°F	0	32%

Soil ph = 7.5
Soil Organic Matter = 3.7%

NOTE: Plant counts were made - 6/16/82

* Stand estimates, phyto readings and weed control scores were recorded - 7/21/82

Table 3. Evaluation of several rates of metribuzin in combination with triallate for weed control in lentils. Northwestern Agricultural Research Center. Kalispell, MT in 1982. Field No. R4c.

Planting Date: May 5, 1982 Harvest Date: August 17, 1982
Size of Plot: 32 sq. ft.

Treatment	Rate lbs ai/a	Yield lbs/a	Plants/ 3' of row	Phyto[1/]	Weed Control[2/] Wild Oats	Grom-well	Setaria
Triallate + PPI/ metribuzin PES	1.25 + .125	1218.9	19.5	0	10.0	6.3	10.0
Triallate + PPI/ metribuzin PES	1.25 + .25	1279.2	18.3	0	9.5	10.0	10.0
Triallate + PPI/ metribuzin PES	1.25 + .375	1662.2	16.9	0	10.0	9.3	10.0
Triallate + PPI/ metribuzin PES	1.25 + .50	1520.1	16.0	0	10.0	10.0	10.0
Triallate + PPI/ metribuzin POST	1.25 + .125	1274.2	17.3	0	10.0	10.0	10.0
Triallate + PPI/ metribuzin POST	1.25 + .189	1366.4	15.2	0	10.0	7.0	6.7
Triallate(check)PPI	-	1622.2	17.6	0	10.0	0.0	0.0
$\bar{x}$		1420.6	17.3				
F[3/]		2.564NS	2.016NS				
S.E.$\bar{x}$		96.16	1.024				
L.S.D. (.05)		316.29	3.329				
C.V. %		6.845	5.930				

1/ Phyto = Phytotoxicity rating 0-10: 0 = no phyto; 10 = dead plants due to chemical injury

2/ Weed control scale 0-10: 0 = no control; 10 = complete control
Weeds rated: Wild oats (Avena fatua)
Gromwell (Lithospermum arvense)
Sataria (Setaria viridis) foxtail grass

3/ F - value for treatment comparison

Application Data:

Application	Date	Temperature Air	Soil	Wind (mph)	Humidity
PPI or PES	May 14	68°F	77°F	3-5	17%
POST	June 11	78°F	80°F	0	12%

Soil pH = 7.5
Soil organic matter = 3.3%

Table 4. Evaluation of several rates of metribuzin in combination with triallate for weed control in lentils. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field No. R-13.

Treatment	Rate lbs ai/a	Yield lbs/a	Plants/ 3' of row	Phyto[1]	Weed Control[2] LQ	FW	BW	WO	Sil
Triallate + PPI/ metribuzin PES	1.25 + .125	259.4	5.2	0	2.3	8.7	0.7	5.7	3.5
Triallate + PPI/ metribuzin PES	1.25 + .25	140.9	6.1	0	2.3	5.8	2.3	5.3	3.0
Triallate + PPI/ metribuzin PES	1.25 + .375	120.4	5.8	0	3.7	8.7	5.0	8.7	7.7
Triallate + PPI/ metribuzin PES	1.25 + .50	166.4	5.4	0	6.3	10.0	8.7	8.8	9.2
Triallate + PPI/ metribuzin POST	1.25 + .125	154.9	5.6	0	10.0	9.0	7.0	5.7	5.0
Triallate + PPI/ metribuzin POST	1.25 + .189	134.4	5.0	0	9.5	7.3	5.0	5.0	3.3
Triallate(check)PPI	-	203.6	6.3	0	0.0	0.0	0.0	7.2	0.0
$\bar{x}$		165.7	5.6						
F[3]		1.096NS	.933NS						
S.E.$\bar{x}$		40.405	.420						
L.S.D. (.05)		131.42	1.366						
C.V. %		34.381	7.458						

1/ Phyto = Phytotoxicity rating 0-10: 0 = no phyto; 10 = dead plants due to chemical injury

2/ Weed Control scale 0-10: 0 = no control; 10 = complete control
Weed Codes: LQ = lambsquarter (Chenopodium album)
FW = fanweed (Thlaspi arvense)
BW = wild buckwheat (Polygonum convolvulus)
WO = wild oats (Avena fatua)
Sil = silene (Silene noctiflora)

3/ F - value for treatment comparison

Application Data:

Application	Date	Temperature Air	Temperature Soil	Wind (mph)	Humidity
PPI or PES	May 5	48°F	45°F	0	32%
POST	June 11	78°F	80°F	0	12%

Soil pH = 7.7
Soil organic matter = 4.2%

Table 5. Evaluation of herbicides for wild oat control and the effect on lentil yields. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field No. R-13

Planting Date: May 13, 1982 Date Harvested: August 20, 1982
Size of Plot: 25 sq. ft.

Treatment		Rate lbs ai/a	Yield lbs/a	Weed Control 1/ Wild Oats	Weed Control 1/ Setaria
Metribuzin	PES	.125	130.6	2.0	7.3
Metribuzin	PES	.25	146.0	3.8	8.0
Metribuzin + difenzoquat	PES/POST	.125 + .75	102.8	2.9	9.5
Metribuzin + sethoxydim	PES/POST	.125 + .25	196.9	6.6	7.5
Metribuzin + sethoxydim	PES/POST	.125 + .50	158.5	10.0	7.5
Metribuzin + diclofop	PES/POST	.125 + .75	195.0	8.9	8.0
Metribuzin + barban	PES/POST	.125 + .375	138.3	9.1	9.6
Metribuzin + pendimethalin	PES/POST	.125 + 1.0	148.9	3.3	10.0
Metribuzin + triallate	POST/PPI	.125 + 1.25	166.1	7.3	5.0
Metribuzin + propham	POST/PPI	.125 + 3.0	147.9	3.8	2.5
Check		----	168.1	0.0	0.0
		$\bar{x}$ 4/	154.4		
		F 4/	1.029NS		
		S.E.$\bar{x}$	26.86		
		L.S.D. (.05)	61.54		
		C.V. %	17.395		

1/ Weed control 0-10 scale: 0 = no control; 10 = complete control
Weeds rated July 20, 1982:
Wild Oats (Avena fatua)
Setaria (Setaria viridis)

2/ F - value for treatment comparison

Application Data:

Application	Date	Temperature Air	Temperature Soil	Wind (mph)	Humidity
PPI or PES	5/13	68°F	77°F	3-5	17%
Wild oats 2 leaf	5/27	60°F	52°F	4	24%
Wild oats 3 leaf	6/1	65°F	65°F	0-2	4%
Metribuzin POST	6/11	78°F	80°F	0	12%

PPI treatments incorporated 1½-2 inches using a hand rake
Soil pH = 7.7
Soil organic matter = 4.2%

TITLE: Chemical Weed Control in Chickpeas

PROJECT: Weed Investigations MS 754

YEAR: 1982

LOCATION: Northwestern Agricultural Research Center

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - Weed Research Committee MAES
Chemical Company Research & Development Representatives

OBJECTIVES:
1. Evaluation of herbicides for effective weed control in chickpeas.
2. Evaluation of the effect of herbicides on yields.

MATERIALS AND METHODS:

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

RESULTS AND DISCUSSION:

Metribuzin + difenzoquat (.125 + .75 lb/a), ethalfluralin + EPTC (.75 + 1.5 lb/a), and pendimethalin (1.0 lb/a) treatments exceeded 800 lbs/a. Of these three combinations all but metribuzin + difenzoquat gave good overall weed control. Oxyflurorfen at 1.0 lb/a had good yields and weed control as did trifluralin + EPTC (.50 + 1.5 lb/a), and trifluralin (.50 lb/a).

This year the dinoseb (PES and PES/Post) reduced yields. This was due in part to the high air temperatures when it was applied. The dinoseb treatments last year resulted in good yields, which were applied at cooler air temperatures.

Oxyflurofen, dinoseb sequential and 2,4-DB applications caused significant reduction in stands. Table 2.

Table 1. Chemicals used in garbanzo bean herbicide study.

Common Name	Trade Name	Chemical Name	Company
bentazon	Basagran	3-isopropyl-1H-2,1,3-benzothiadiazin-4 (3H)-one 2,2-dioxide	BASF
bromoxynil + MCPA	Brominal+ or Bronate	3,5-dibromo-4-hydroxybenzonitrile + [(4-chloro-o-toly)oxy]acetic acid	Union Carbide Rhone-Poulenc
diclofop	Hoelon	2-[4-(2,4-dichlorophenoxy)phenoxy] propanoic acid	American Hoechst
difenzoquat	Avenge	1,2-dimethyl-3,5-diphenyl-1H pyrazolium	American Cyanamide
dinoseb	Premerge 3	2-sec-butyl-4,6-dinitrophenol	Dow
EPTC	Eptam	S-ethyl dipropylthiocarbamate	Stauffer
ethalfluralin	Sonalan	N-ethyl-N-(2 methyl-2-propenyl)-2, 6-dinitro-4-(trifluoromethyl)benzenamine	Elanco
metolachlor	Dual	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide	Ciba-Geigy
metribuzin	Sencor Lexone	4-amino-6-tert-butyl-3-(methylthio)-as-triazin-5(4H)-one	Mobay duPont
oryzalin	Surflan	3,5-dinitro-N^4,N^4-dipropyl sulfanilamide	Elanco
oxyflourfen	Goal	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene	Rhom & Haas
pendimethalin	Prowl	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitro-benzenamine	American Cyanamide
profluralin	Tolban	N-(cyclopropylmethyl)-α,α,α-trifluoro-2,6-dinitro-N-propyl-p-toluidine	Ciba Geigy
sethoxydim	Poast	2[1-ethoxyimino)butyl]-S-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	BASF
triallate	Fargo	S-(2,3,3-trichloroallyl)diisopropyl-thio-carbamate	Monsanto
trifluralin	Treflan	α,α,α-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine	Elanco
	2,4-DB	4-(2,4-dichlorophenoxy)butyric acid	Union Carbide

Table 2. Agronomic data from the chickpea herbicide study. Northwestern Agricultural Research Center, Kalispell, MT. 1982

Date planted: May 6, 1982 Date harvested: September 9, 1982

TREATMENT	APPLN	RATE AI/A	% STAND REDUCT.	PHYTO 1/	YIELD LBS/A	PLANTS/ SQ. FT.	WEED CONTROL 2/ GW	SET	BW
TRIALLATE	PPI	1.25	0	.2	306.0	3.1	9.7	10.0	.7
METRIBUZIN	PES	.125	6.7	.8	332.1	2.6	8.5	8.0	7.3
TRIALLATE +	PPI/	1.25							
METRIBUZIN	PES	.125	0	0	659.3	2.8	9.8	10.0	7.0
TRIALLATE +	PPI/	1.25							
METRIBUZIN	PES	.25	0	.3	371.3	3.4	9.7	10.0	9.2
METRIBUZIN	PES	.25	5.0	1.0	462.9	2.9	10.0	9.0	9.0
METRIBUZIN +	PES	.125							
SETHOXYDIM	POST	.50	0	0	294.6	2.4	7.2	10.0	6.7
METRIBUZIN +	PES	.125							
DIFENZOQUAT	POST	.75	0	.5	940.5	3.1	7.0	2.8	2.7
METRIBUZIN +	PES	.125							
DICLFOP	POST	.75	0	1.3	649.3	3.9	4.0	10.0	5.7
OXYFLUORFEN	PES	.375	0	.7	525.0	2.8	10.0	10.0	10.0
OXYFLUORFEN	PES	.50	8.5	.8	796.2	3.7	10.0	10.0	8.7
OXYFLUORFEN +	PES/	.375							
ORYZALIN	PES	.50	0	.8	655.9	2.9	10.0	8.7	10.0
ORYZALIN	PES	.50	0	1.7	313.2	2.7	9.0	7.8	7.0
ORYZALIN	PES	.75	0	.5	559.8	3.0	10.0	8.7	5.7
ORYZALIN +	PES/	.75							
METRIBUZIN	PES	.125	0	0	553.7	3.4	10.0	10.0	9.3
PENDIMETHALIN	PPI	1.0	0	0	824.2	2.9	6.0	9.0	9.5
PENDIMETHALIN+	PPI/	1.0							
EPTC	PPI	1.5	0	.2	561.7	3.2	10.0	10.0	10.0
ETHALFLURALIN	PPI	.75	0	.8	597.8	2.7	8.0	10.0	9.3
ETHALFLURALIN+	PPI/	.75							
EPTC	PPI	1.5	0	.8	953.3	3.5	10.0	10.0	9.3
TRIFLURALIN	PPI	.50	0	.2	754.1	3.1	9.7	9.5	10.0
TRIFLURALIN +	PPI/	.50							
EPTC	PPI	1.5	1.7	.8	740.1	2.9	10.0	10.0	10.0
EPTC	PPI	3.0	0	.5	667.9	3.1	6.0	10.0	6.7
METOLACHLOR	PPI	2.0	3.3	.8	393.4	2.6	5.7	9.8	5.0
PROFLURALIN	PPI	.5	0	0	615.7	2.5	8.3	8.0	6.7
DINOSEB	PES	8.9	0	.2	490.4	3.3	7.7	7.3	3.7
DINOSEB	PES/	8.9							
SEQUENTIAL	POST	2.0	11.7	3.7	614.6	2.9	10.0	8.5	6.1
BENTAZON	POST	.5	0	.3	560.5	2.8	3.0	6.7	2.3
2,4-DB	POST	.75	13.3	6.0	219.0	2.7	6.6	5.0	5.0
CHECK	---	---	0	0	473.5	3.1	0	0	0
				X	282.8	9.03			
				F 3/	1.637	1.653			
				SEX	148.62	.832			
				LSD(.05)	296.36	1.658			
				C.V.%	26.224	9.211			

Table 2. (con't)

FOOTNOTES FROM TABLE 1

1/ PHYTOTOXICITY RATINGS ARE ON A 0-10 SCALE; 0=NO PHYTO, 10=PLANTS DEAD DUE TO CHEMICAL INJURY

2/ WEED CONTROL RATINGS, 0-10 SCALE; 0=NO CONTROL, 10= COMPLETE CONTROL
WEED CODES: GW=GROMWELL(WHEAT THEIF) Lithospermum arvense
SET=SETARIA(FOXTAIL) Setaria viridis
BW=WILD BUCKWHEAT Polygonum convolvulus

3/ F VALUE FOR TREATMENT COMPARISONS: * INDICATES STATISTICAL SIGNIFICANCE AT THE .05 LEVEL.
a/ INDICATES VALUES SIGNIFICANTLY GREATER THAN THE CHECK(.05 LEVEL).
b/ INDICATES VALUES SIGNIFICANTLY LESS THAN THE CHECK(.05 LEVEL).

Size of plot: 32 sq. ft.

APPLICATION DATA

APPLN.	DATE	TEMP (F) AIR	TEMP (F) SOIL	WIND MPH	REL.HUM. %	CLOUD COVER
PPI	5-6-82	62	53	4-6	12	SUNNY
PES	5-6-82	52	52	6	66	SUNNY
POST	6-15-82	73	72	0-2	36	SUNNY & HOT

TITLE: Chemical Weed Control in a New Seeding of Alfalfa

PROJECT: Weed Investigations MS 754

YEAR: 1982

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - Weed Research Committee MAES
Chemical Company Research & Development Representatives

LOCATION: Northwestern Agricultural Research Center, Kalispell

OBJECTIVE: Evaluation of herbicides for effective weed control in a new legume seeding.

MATERIALS AND METHODS:

Several pre plant and post emergence herbicides were evaulated this year on a new seeding of Thor alfalfa. Pre plant treatments were applied to a prepared seedbed and then immediately incorporated three to six inches with a tandem disc. Alfalfa was then seeded and subsequent post emergence applications were applied according to crop or weed stages. All herbicides were applied using a research type tractor mounted sprayer. Plots were 10' x 24' or 240 sq. ft.

First cutting samples were harvested and yields determined from a 48 sq. ft. area within each plot using a Rehm forage harvester. From this a 500 gram subsample was secured in which to make weed composition counts of broadleaf and grassy weeds. These separated subsamples were then dried and percent composition of each plant component determined. The study was irrigated two times during the season.

RESULTS AND DISCUSSION:

First cutting yields were a little above average compared to a similar study done last year. All preplant applications, without sequential post applications, produced yields above the two ton mark. There were a few combination treatments (those treatments with post applications included) which yielded above two tons also. Bromoxynil, and in some cases 2,4-DB, post applications caused a decline in yields when combined with other chemicals. This phytotoxic response, was noted in the height of the alfalfa plants. Many of the treated plots which were stunted in growth at first grew out of that chemical reaction and were not detectable at harvest. This was especially true of some of the 2,4-DB treatments. The highest yield was taken from a plot that had been treated with sethoxydim alone. Only 84% of the hay was alfalfa however. The three treatments yielding above two tons per acre with greater than 95% alfalfa were; ethalfluralin (1.0 lb/a), EPTC + 2,4-DB (3.0 + 1.0 lb/a) and sethoxydim + 2,4-DB (.5 + .75 lb/a). Where bromoxynil or 2,4-DB was not used the alfalfa compostion dropped down to about 80%. The check had the highest forage yield and also the highest percentage of broadleaf weeds.

Results and Discussion (con't)

Broadleaf weed control was good in all treatment combinations that included bromoxynil or 2,4-DB. Setaria sp (green foxtail) control was weak in plots treated with ethalfluralin, bromoxynil and 2,4-DB alone or ethalfluralin plus 2,4-DB.

Table 1. Chemicals used in the alfalfa herbicide study.

Common Name	Trade Name	Chemical Name	Company
bromoxynil	Buctril Brominal	3,5-dibromo-4-hydroxybenzonitrile	Rhone-Poulenc Union Carbide
EPTC	Eptam	S-ethyl dipropylthiocarbamate	Stauffer
EPTC/R33865	Eptam + extender	Same chemical as above with extender	Stauffer
ethalfluralin	Sonalan	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl) benzenamine	Elanco
sethoxydim	Poast	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one	BASF
	2,4-DB	4-(2,4-dichlorophenoxy)butyric acid	Union Carbide

Table 2. Agronomic data from the alfalfa herbicide study, Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field No. Y-3.

Date Seeded: April 14, 1982 Date Harvested: August 5, 1982
Size of Plot: 48 sq. ft. (1 cut only)

Treatment	Rate lb ai/A	Yield Total Hay	Yield Alfalfa Ton/A	Percent Composition[3] Alfalfa	Grass	Broad-leaves
EPTC[1]	3.0	2.19a-c	1.76	80.9e	1.7	17.4ab
EPTC[1]	4.0	2.28a-b	1.77	78.3ef	.2	21.5ab
EPTC/R33865[1]	3.0	2.22a-c	1.93	87.0b-e	.2	12.8bc
EPTC/R33865[1]	4.0	2.14a-d	1.82	85.4c-e	.2	14.4bc
Ethalfluralin[1]	.75	2.14a-d	1.78	84.1d-e	.0	15.9ab
Ethalfluralin[1]	1.0	2.10a-d	2.00	95.6a-b	.2	4.2cd
Ethalfluralin[1]	1.5	2.18a-c	1.74	80.3e-f	.0	19.7ab
EPTC[1] + bromoxynil[2]	3.0+.25	1.97b-e	1.95	99.0a	.0	1.0d
EPTC[1] + bromoxynil[2]	3.0+.375	1.87c-f	1.86	99.6a	.4	0.0d
Bromoxynil[2]	.375	1.81d-f	1.78	98.4a	1.4	.2d
Ethalfluralin[1] + bromoxynil[2]	1.0+.25	1.88c-f	1.79	94.8a-c	4.1	1.1d
Ethalfluralin[1] + bromoxynil[2]	1.0+.375	1.58f	1.57	99.2a	.3	.5d
EPTC[1] + 2,4-DB[2]	3.0+.75	2.16a-d	2.08	95.9a-b	.0	4.1cd
EPTC[1] + 2,4-DB[2]	3.0+1.0	2.13a-d	2.11	99.2a	.2	.6d
2,4-DB[2]	1.0	2.07a-d	1.90	92.9a-d	3.5	3.6cd
Ethalfluralin[1] + 2,4-DB[2]	1.0+.75	1.89c-f	1.87	98.7a	.7	.6d
Ethalfluralin[1] + 2,4-DB[2]	1.0+1.0	1.66e-f	1.63	98.3a	.8	.9d
Sethoxydim[2]	.20	2.34a	1.96	84.0d-e	.0	16.0a
Sethoxydim[2] + 2,4-DB[2]	.20+.75	1.94b-e	1.92	98.9a	.2	.9d
Sethoxydim[2] + 2,4-DB[2]	.5+.75	2.04a-d	2.03	99.4a	.2	.4d
Check	-	2.28a-b	1.61	70.4f	5.0	24.6a
$\bar{x}$		2.04	1.849	91.4	.913	7.664
F[4]		2.602**	1.587NS	6.139**	1.452NS	6.629**
S.E.$\bar{x}$		.127	.118	3.586	1.209	3.325
L.S.D. (.05)		.250	.231	7.049	2.377	6.535
C.V. %		6.231	6.357	3.923	135.5	43.378

1/ Pre plant incorporated
2/ Post emergence to weed pressure
3/ Percent composition determined by weight
4/ F - value for treatment comparison
** Indicates statistical significance at .01 level.
Means within a column followed by the same letter are not significantly different at the 5% level.

Table 3. Weed control data from the alfalfa herbicide study, Northwestern Agricultural Research Center, Kalispell, Mt in 1982. Field No. Y-3.

Date seeded: April 14, 1982 Date harvested: August 5, 1982 Size of Plot: 48 sq. ft.

Treatment	Rate lb ai/A	6/25/82 Phyto	6/25/82 Height Inches	6/25/82 Weed Control[3] Fanweed	Lambsquarter	Pigweed	Setaria	7/21/82 Height Inches	7/21/82 Weed Control[4] Fanweed	Lambsquarter	Pigweed	Setaria
EPTC[1]	3.0	.1	9.0	0.0	7.5	7.5	7.5	18.0	.5	7.5	4.6	9.6
EPTC[1]	4.0	.4	9.0	1.5	8.8	9.8	10.0	17.8	.0	7.3	8.3	10.0
EPTC/R33865[1]	3.0	1.1	8.8	2.3	6.0	7.5	10.0	18.0	1.3	3.5	7.3	10.0
EPTC/R33865[1]	4.0	.6	8.5	4.0	8.8	9.3	10.0	17.8	1.5	3.3	7.9	10.0
Ethalfluralin[1]	.75	.6	6.1	1.0	10.0	10.0	10.0	18.0	.0	7.3	9.5	10.0
Ethalfluralin[1]	1.0	.3	8.5	2.0	10.0	10.0	10.0	18.0	2.0	10.0	10.0	9.5
Ethalfluralin[1]	1.5	.3	8.3	1.5	10.0	10.0	10.0	17.8	.0	10.0	9.9	7.4
EPTC[1] + bromoxynil[2]	3.0+.25	3.4	5.5	9.9	10.0	10.0	10.0	16.3	6.8	10.0	10.0	10.0
EPTC[1] + bromoxynil[2]	3.0+.375	4.3	5.0	10.0	10.0	10.0	10.0	16.0	9.8	10.0	10.0	10.0
Bromoxynil[2]	.375	3.5	4.9	9.9	10.0	10.0	10.0	17.1	9.8	9.8	10.0	5.1
Ethalfluralin[1] + bromoxynil[2]	1.0+.25	2.9	6.3	9.8	10.0	10.0	7.5	17.0	9.9	10.0	10.0	7.5
Ethalfluralin[1] + bromoxynil[2]	1.0+.375	4.4	4.4	10.0	10.0	10.0	10.0	16.0	6.9	10.0	10.0	9.3
EPTC[1] + 2,4-DB[2]	3.0+.75	1.8	7.5	7.0	10.0	10.0	10.0	18.0	7.1	10.0	10.0	10.0
EPTC[1] + 2,4-DB[2]	3.0+1.0	2.5	6.1	7.8	10.0	10.0	10.0	18.0	9.4	10.0	10.0	9.5
2,4-DB[2]	1.0	2.4	5.4	8.4	10.0	10.0	10.0	18.0	9.1	10.0	10.0	7.8
Ethalfluralin[1] + 2,4-DB[2]	1.0+.75	1.9	6.9	7.8	10.0	10.0	8.8	17.9	9.5	10.0	10.0	7.5
Ethalfluralin[1] + 2,4-DB[2]	1.0+1.0	2.1	6.3	7.9	10.0	10.0	10.0	17.8	8.5	10.0	10.0	10.0
Sethoxydim[2]	.20	0.0	8.8	0.0	6.8	7.5	10.0	18.0	.0	.0	5.0	10.0
Sethoxydim[2] + 2,4-DB[2]	.20+.75	1.9	6.8	8.0	10.0	10.0	10.0	17.9	6.0	6.0	6.0	9.9
Sethoxydim[2] + 2,4-DB[2]	.5+.75	2.0	7.1	7.5	10.0	10.0	10.0	17.8	9.9	10.0	10.0	10.0
Check	-	0.0	9.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0

1/ Preplant incorporated
2/ Post emergence to weed pressure
3/ Ratings taken 6/25/82
Phyto = phytotoxicity ratings: 0 = no phyto; 10 = plants dead due to chemical injury
Weed Score 0-10: 0 = no control; 10 = complete control
Fanweed (*Thlaspi arvense*)
Lambsquarter (*Chenopodium album*)
Pigweed (*Amaranthus rectroflexus*)
Setaria (*Setaria viridis*)
4/ Ratings taken 7/21/82 (see same weeds as above)

TITLE: Chemical Weed Control in Peppermint

PROJECT: Weed Investigations MS 754

YEAR: 1982

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - Weed Research Committee MAES
Chemical Company Research & Development Representatives

LOCATION: Henry Ficken Farm, Lower Valley, Somers, MT

OBJECTIVE: Evaluation of several herbicides for weed control and phytotoxicity on peppermint.

MATERIALS AND METHODS:

Pre emergent sprays were applied to a mint field severely infected with canada thistle when the weeds were 1½ - 2" tall and the crop had not yet emerged. Post emergence sprays were applied when the weeds were 12" (as tall as the mint), and sequential treatments were applied 10 days after that. All treatments were applied with a tractor mounted research type sprayer with boom heights being altered to accomodate crop or weed height. Weed and vigor scores were taken August 13, 1982. No yield samples were taken.

RESULTS AND DISCUSSION:

The mint stand and weed pressure varied dramatically in this study. The only weed present and rated was canada thistle. Many of the herbicides evaluated were injurious to the mint, however the crop seemed to grow out of these leaf burns as the season progressed (see Table 2 for vigor notes). The weed pressure from canada thistle was so great that no treatment provided total weed control. Two treatments that gave fair control were the Bentazon sequential treatments and 2,4-DB at 1.0 lb/a.

Table 1. Chemicals used in mint herbicide study.

Common Name	Trade Name	Chemical Name	Company
bentazon	Basagran	3-isopropyl-1H-2,1,3-benzothiadiazin-4(3H)-one 2,2 dioxide	BASF
bromoxynil	Brominal Buctril	3,5-dibromo-4-hydroxybenzonitrile	Rhone-Poulenc Union Carbide
diuron	Karmex	3-(3,4-dichlorophenyl)-1,1-dimethylurea	duPont
napropamide	Devrinol	2-(α-naphthoxy)-N,N-diethylpropionamide	Stauffer
oryzalin	Surflan	3,5-dinitro-N^4,N^4-dipropylsulfanilamide	Elanco
oxyflurorfen	Goal	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene	Rhom & Haas
paraquat	Paraquat	1,1'-dimethyl-4,4'-bipyridium ion	Chevron
sethoxydim	Poast	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one	BASF
terbacil	Sinbar	3-tert-butyl-5-chloro-6-methyluracil	duPont
trifluralin	Treflan	α,α,α-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine	Elanco
	2,4-DB	4-(2,4-dichlorophenoxy)butyric acid	Union Carbide

Table 2. Evaluation of herbicides on peppermint. Northwestern Agricultural Research Center and the Henry Ficken Farm, Somers, MT in 1982.

Treatment		Rate lbs ai/a	Mint 1/ Stand	Mint 1/ Vigor	Canada Thistle 2/ Frequency	Canada Thistle 2/ Vigor	Canada Thistle 2/ Control
Diuron	PRE	3.0	1.9	6.8	3.3	9.3	3.8
Paraquat + X-77*	PRE	.75	1.8	7.5	2.3	7.3	4.5
Napropamide	PRE	3.0	2.5	7.5	3.3	10.0	3.5
Napropamide + terbacil	PRE	3.0+1.5	2.0	7.5	4.0	10.0	0.8
Oryzalin	PRE	1.5	2.1	7.5	3.5	9.9	2.1
Oryzalin	PRE	3.0	2.3	10.0	2.0	6.3	6.6
Oryzalin + terbacil	PRE	1.5+1.5	3.0	10.0	2.8	10.0	4.8
Oryzalin + trifluralin	PRE	1.0+.75	1.8	10.0	4.3	9.5	2.3
Oryzalin + napropamide + terbacil	PRE	1.0+ 2.0+1.0	2.1	10.0	2.8	9.3	3.8
Oxfluorfen	PRE	1.0	3.0	8.1	4.0	10.0	0.8
Oxfluorfen	PRE	2.0	1.3	7.8	2.3	4.8	5.3
Oxfluorfen + oryzalin	PRE	1.0+1.5	1.5	10.0	3.3	7.5	2.5
Oxfluorfen + napropamide	PRE	1.0+3.0	1.3	9.8	4.0	8.8	1.8
Oxfluorfen + sethoxydim	PRE POST	1.0+ .5	1.5	10.0	3.5	8.9	3.0
Oxfluorfen + paraquat + X-77*	PRE PRE	1.0+ .25	1.3	9.0	4.0	8.0	2.6
Terbacil	PRE	1.5	1.6	10.0	2.0	4.3	6.3
Terbacil + sequential + X-77*	PRE POST	1.0+ 1.0	4.1	10.0	3.5	6.5	4.5
Terbacil + X-77*	POST	1.5	1.0	10.0	3.3	5.5	5.9
Sethoxydim + oil* +	POST SEQ.**	.25+ .50	1.8	10.0	3.5	8.8	4.3
Bromoxynil	POST	1.0	1.3	9.4	2.8	5.3	7.1
Bentazon + surf(1 qt/a)	Early POST	2.0	2.4	9.5	2.3	4.5	7.5
Bentazon + surf(1 qt/a)+	Early POST SEQ.**	1.0+ 1.0	2.4	9.1	2.0	2.8	8.9
2,4-DB	POST	1.0	1.0	8.1	2.8	1.4	9.4
Check	--	--	2.3	9.9	3.3	7.5	0.0

1/ Mint: Stand = Scale 0-5: 0 = none; 3 = fair; 5 = very good.
Vigor = Mint Vigor = Scale 0-10: 0 = dead plants; 10 = normal healthy plants

2/ Thistles: Frequency = denotes degree of weed pressure. Scale 0-5:
0 = none; 3 = moderate; 5 = very heavy
Vigor = vigor of thistle plants. Scale 0-10:
0 = dead plants in plots; 10 = normal healthy plants
Control = thistle control. Scale 0-10:
0 = no control; 10 = complete control

* Oil concentrate in sethoxydim 1 qt oc per 35 gals H_2O, X-77 with Paraquat and Terbacil .5% V/V

** Sequential application 10 days after post application

Thistle stages at certain applications:	PRE	POST	SEQ.
	1½-2" heavy in spots	12" heavy	14" bud stage

Table 2. (con't)

Application Data:

Application	Date	Temperature Air	Temperature Soil	Wind(mph)	Humidity
PRE	4/30/82	58°F	54°F	0-2	17%
POST	6/18/82	92°F	85°F	0	2%
SEQUENTIAL (10 day post)	6/28/82	78°F	71°F	0-3	43%

TITLE: Total Vegetation Control

PROJECT: Weed Investigations MS 754

YEAR: 1982

LOCATION: Northwestern Agricultural Research Center, Field P-3

OBJECTIVE: Evaluation of two herbicides at various rates to determine efficacy in total vegetation control.

MATERIALS AND METHODS:

Two experiments were conducted in a plot of ground that had been undisturbed for most of the season. A prolific and varied stand of weeds was established in this area at the time of application and are given below.

	Common Name	Scientific Name	Approx. Height
1.	Fanweed	Thlaspi arvense	14"
2.	Lambsquarter	Chenopodium album	14"
3.	Canada thistle	Cirsium arvense	10-12"
4.	Black medic	Medicago lupulina	10"
5.	Orchardgrass	Dactylis glomerata	12"
6.	Quackgrass	Agropyron repens	14"
7.	Common plantain	Plantago major	10"
8.	Wild buckwheat	Polygonum convolvulus	10-12"
9.	Smartweed	Polygonum pensylvanicum	10-12"
10.	Red clover	Trifolium pratense	12"
11.	Willow weed	Epilobium watsonii	10"
12.	Alfalfa	Medicago sativa	10"
13.	Sow thistle	Sonchus arvensis	12"

Predominent weed species were numbered 1-8, while other species were less frequent or spotty in distribution.

One experiment was an evaluation of Stauffer's SC-0224 and Monsanto's glyphosate in rope wick applications. After 10'x10' plots had been staked out applications were made using a hand held 'walk-a-wick®' apparatus. Solutions of 1:3 and 1:6 dilutions were applied to existing plants traveling across each plot twice, in perpendicular directions. Applications were made July 7, 1982 and control observations taken on July 21, 1982.

A second experiment was designed to evaluate the above mentioned chemicals as spray applications. Various rates were evaluated as well as a combination treatment with a surfactant. Herbicides in this experiment were applied to 10' x 20' plots using a research type, tractor-mounted sprayer. The spray boom was raised to accomodate the weed canopy height (see Table 1 for spray data).

RESULTS AND DISCUSSION:

Walk-a-wick® Study - Only the top canopy of weeds, those contacting the herbicide wand, were controlled. The low growing or prostrate weeds were not effected at all. Effective control of the target weeds (taller vegetation) was achieved in all treatments. Some partial control of fanweed was seen in the plots treated with SC-0224 at the 1:3 dilution. Total control was demonstrated on almost all weeds concerned. There were a few areas in which only partial kill was observed on sow thistle with 1:3 dilutions of SC-0224, and buckwheat at both dilutions of SC-0224. From visual observations made in July no treatment or rate provided better weed control than another. Dilution rates given are chemical to water.

Spray Application Study - All treatments in this study performed equally well in total vegetation control. The orchardgrass/quackgrass complex was only partially controlled in the glyphosate plots as well as one SC-0224 plot. Weed control in those plots however, was very good. No single treatment, rate, or combination with surfactant performed better than any other treatment (Table 1).

Table 1. Agronomic data from the total vegetation control studies performed on the Northwestern Agricultural Research Center, Kalispell, MT in 1982.

Treatment	Dilution	Weed Control[1/] LQ	ST	OG/QG[2/]	FW	BW	PT	BM
		Walk-a-Wick® Study						
SC-0224	1:3	C	C/P[3/]	C	C/P	C	C	C/P
SC-0224	1:6	C	C	C	C	C	C	C/P
Glyphosate	1:3	C	C	C	C	C	C	C
Glyphosate	1:6	C	C	C	C	C	C	C
Check	---	0	0	0	0	0	0	0
		Spray Application Study						
Treatment	Rate AI/A	Weed Control[1/] LG	ST	OG/QG[2/]	FW	BW	PT	BM
		Spray Application Study						
SC-0224	1.0	C	C	C/P[3/]	C	C	C	C
SC-0224	2.0	C	C	C	C	C	C	C
SC-0224	3.0	C	C	C	C	C	C	C
Glyphosate	1.0	C	C	C/P	C	C	C	C
Glyphosate	2.0	C	C	C/P	C	C	C	C
Glyphosate	3.0	C	C	C/P	C	C	C	C
SC-0224 + S[4/]	1.0	C	C	C	C	C	C	C
Glyphosate + S[4/]	1.0	C	C	C	C	C	C	C

1/ Weed control rating: C = complete, P = partial, C/P = in the plots rated some plants were completely controlled whereas others were only partially burnt back or stunted.
Weed Codes: LQ = lambsquarter, ST = sow thistle, OG/QG = orchardgrass/quackgrass, FW = fanweed, BW = wild buckwheat, PT = common plantain, BM = black medic.

2/ OG/QG = orchardgrass/quackgrass rated together.

3/ C/P = partial weed control of some species within plot.

4/ S = surfactant (X-77) added .5% v/v.

APPLICATION DATA:

Date:	7/7/82
Air temperature:	68°F
Soil temperature:	65°F
Volume:	26.86 gpa
Nozzles:	8003
Weather:	partly cloudy - warm

TITLE: Alfalfa Harvest Management Study

OBJECTIVES:

1. Determine effect of early spring cutting on yield, quality stand persistance and later harvest dates of alfalfa.

2. Determine effect of multiple cutting on yield, quality and stand persistance of alfalfa.

3. Determine effect of fall management on yield, quality and stand persistance of alfalfa.

PERSONNEL: Leon E. Welty
Ray Ditterline
Pete Moss
Gil Stallknecht

PROCEDURES:

An irrigated 'Apollo' alfalfa stand established in 1980 was subjected to early spring cutting, multiple cutting and different fall harvest managements in 1981 and 1982. Harvest area in both years was 26 ft^2. Subsamples, 500 grams in size, were taken for shrink determinations and quality analyses. On May 28, 1981 the nursery was fertilized with 180 lbs/a of P_2O_5 and 45 lbs/a of SO_2. The nursery was sprinkler irrigated (1.8"/irrigation) four times in 1981 and five times in 1982. Number of frost free days were 142 in 1981 and 108 in 1982.

RESULTS AND DISCUSSION:

In 1981, yields were depressed when the alfalfa was cut four times at the prebud stage (Table 1). Yields were greatest when the alfalfa was harvested on the 10% or 50% blossum schedule. Two cuttings at about 50% bloom yielded more protein per acre than the two major cuttings of any other harvest schedule. Delaying harvest until after several hard frosts resulted in lower protein levels.

In 1982, harvesting four times at prebud reduced yields (Table 2). Harvesting early (vegetation = 15 inches) on May 25 and then maintaining a 10% harvest schedule resulted in higher yields. Greatest yields for two major cuttings were obtained when alfalfa was harvested at 90% and then 70% bloom.

Yields were greater in 1982 than in 1981 (Table 3). Harvesting early in 1981 did not hurt stands or depress yields in 1982. Harvesting on the early, 10%, 10% bloom schedule may be an alternative harvesting method to allow farmers to delay the first major harvest until late July and avoid late June and early July rains.

At Huntley in 1982, the entire nursery was cut early to eliminate variability throughout the study. Yields were maximized when alfalfa was harvested on August 11 and then on November 4 (Table 4).

Table 1. Effect of harvest management on yield and quality of Apollo alfalfa at Kalispell, MT in 1981.

Harvest Schedule	Harvest	Yield	Height	Protein	In Vitro Digestion
	-date-	-tons/a-	-inches-	-percentage-	-percentage-
Early, 10% bloom, 10% bloom	5/20	1.06	16.3	-	-
	7/23	1.58	29.8	-	-
	9/9	1.76	28.8	17.3	62.5
	Total	4.40bcd[1/]			
Early, 10% bloom, After Frost(AF)	5/20	1.15	17.0	22.5	75.0
	7/23	1.52	29.8	16.8	61.0
	10/13	1.56	31.3	14.1	57.0
	Total	4.23abcd			
Prebud, Prebud, Prebud, Prebud	6/5	1.48	28.5	-	-
	7/15	0.67	19.3	-	-
	8/19	1.21	23.5	-	-
	9/22	0.68	13.8	26.8	72.3
	Total	4.04abc			
Prebud, Prebud, Prebud, AF	6/5	1.57	28.3	17.3	66.5
	7/15	0.71	19.3	22.8	71.0
	8/19	1.11	23.0	22.7	59.0
	10/13	0.49	14.0	21.7	68.3
	Total	3.88ab			
Prebloom, Prebloom, Prebloom	6/24	1.73	34.5	-	-
	7/24	0.97	24.0	-	-
	9/19	1.56	26.3	17.6	55.8
	Total	4.26bcd			
Prebloom, Prebloom, AF	6/24	1.74	33.5	15.6	62.3
	7/24	0.99	24.3	21.8	71.5
	10/13	1.27	28.0	14.2	57.0
	Total	4.00ab			
10% bloom, 10% bloom, 10% bloom	6/30	1.77	35.8	-	-
	8/12	1.57	30.0	-	-
	10/1	1.04	24.3	20.5	65.5
	Total	4.38bcd			
10% bloom, 10% bloom, AF	6/30	1.79	34.5	16.8	61.0
	8/12	1.69	28.5	20.0	60.8
	10/13	1.06	23.0	16.7	64.3
	Total	4.54cd			
50% bloom, 60% bloom	7/8	2.21	38.8	-	-
	9/9	2.49	40.5	16.3	58.5
	Total	4.70d			
50% bloom, AF	7/8	2.04	37.0	14.2	56.3
	10/13	1.99	38.0	12.0	53.0
	Total	4.03abc			

Table 1. (con't)

Harvest Schedule	Harvest	Yield	Height	Protein	In Vitro Digestion
	-date-	-tons/a-	-inches-	-percentage-	-percentage-
90% bloom, 75% bloom	7/20	2.11	42.8	-	-
	10/1	2.04	35.0	15.0	56.5
	Total	4.15abc			
90% bloom, AF	7/20	1.98	43.0	14.2	55.3
	10/13	1.75	38.5	13.0	52.3
	Total	3.73a			
10% bloom, Stockpile till AF	7/8	1.96	38.3	15.8	58.8
	10/13	2.04	40.8	11.9	49.5
	Total	4.00ab			

1/ Means not followed by the same letter are significantly different at the .05 level.

Table 2. Effect of harvest management on yield of Apollo alfalfa at Kalispell, Mt in 1982.

Harvest Schedule	Harvest	Yield	Height
	-date-	-tons/a-	-inches-
Early, 10% bloom, 10% bloom	5/25	1.17	15.3
	7/27	2.05	29.5
	9/7	1.72	29.3
	Total	4.94abcd[1/]	
Early, 10% bloom, After Frost(AF)	5/25	1.34	17.0
	7/27	2.23	30.3
	10/19	1.15	24.5
	Total	4.72abcd	
Prebud, Prebud, Prebud, Prebud	6/8	1.54	20.0
	7/12	1.21	20.8
	8/10	0.99	22.8
	10/1	0.75	13.8
	Total	4.49a	
Prebud, Prebud, Prebud, AF	6/8	1.75	21.5
	7/12	1.21	21.3
	8/10	0.96	21.5
	10/19	0.42	11.5
	Total	4.34a	
Prebloom, Prebloom, Prebloom	6/21	2.22	35.0
	8/2	1.59	26.8
	9/14	1.42	19.0
	Total	5.23cd	
Prebloom, Prebloom, AF	6/21	2.05	32.0
	8/2	1.59	27.5
	10/19	1.06	20.0
	Total	4.70abcd	
15% bloom, 10% bloom, 1% bloom	6/28	2.33	40.3
	8/10	1.55	31.3
	10/1	1.26	18.3
	Total	5.14bcd	
15% bloom, 10% bloom, AF	6/28	2.16	39.8
	8/10	1.55	29.0
	10/19	0.89	15.5
	Total	4.60abc	
50% bloom, 50% bloom, Vegetative	7/6	2.71	40.5
	8/25	2.10	36.3
	10/1	0.38	9.8
	Total	5.19bcd	
50% bloom, 50% bloom, AF	7/6	2.87	43.0
	8/25	1.93	33.5
	10/19	0.11	5.8
	Total	4.91abcd	

Table 2. (con't)

Harvest Schedule	Harvest	Yield	Height
	-date-	-tons/a-	-inches-
90% bloom, 70% bloom	7/19	3.36	46.0
	10/1	1.97	31.5
	Total	5.33d	
90% bloom, AF	7/19	3.17	47.8
	10/19	1.51	32.5
	Total	4.68abc	
15% bloom, Stockpile till AF	6/29	2.65	41.3
	10/19	1.90	37.0
	Total	4.55ab	

1/ Means not followed by the same letter are significantly different at the .05 level.

Table 3. Effect of harvest management on yield of Apollo alfalfa in 1981 and 1982 at Kalispell, MT.

Harvest	Yield 1981	Harvest	Yield 1982
-date-	-tons/a-	-date-	-tons/a-
5/20	1.06	5/25	1.17
7/23	1.58	7/27	2.05
9/9	1.76	9/7	1.72
Total	4.40bcd	Total	4.94abcd
5/20	1.15	5/25	1.34
7/23	1.52	7/27	2.23
10/13	1.56	10/19	1.15
Total	4.23abcd	Total	4.72abcd
6/5	1.48	6/8	1.54
7/15	0.67	7/12	1.21
8/19	1.21	8/10	0.99
9/22	0.68	10/1	0.75
Total	4.04abc	Total	4.49a
6/5	1.57	6/8	1.75
7/15	0.71	7/12	1.21
8/19	1.11	8/10	0.96
10/13	0.49	10/19	0.42
Total	3.88ab	Total	4.34a
6/24	1.73	6/21	2.22
7/24	0.97	8/2	1.59
9/19	1.56	9/14	1.42
Total	4.26bcd	Total	5.23cd
6/24	1.74	6/21	2.05
7/24	0.99	8/2	1.59
10/13	1.27	10/19	1.06
Total	4.00ab	Total	4.70abcd
6/30	1.77	6/28	2.33
8/12	1.57	8/10	1.55
10/1	1.04	10/1	1.26
Total	4.38bcd	Total	5.14bcd
6/30	1.79	6/28	2.16
8/12	1.69	8/10	1.55
10/13	1.06	10/19	0.89
Total	4.54cd	Total	4.60abc
7/8	2.21	7/6	2.71
9/9	2.49	8/25	2.10
		10/1	0.38
Total	4.70d	Total	5.19bcd
7/8	2.04	7/6	2.87
10/13	1.99	8/25	1.93
		10/19	0.11
Total	4.03abc	Total	4.91abcd

Table 3. (con't)

Harvest	Yield 1981	Harvest	Yield 1982
-date-	-tons/a-	-date-	-tons/a-
7/20	2.11	7/19	3.36
10/1	2.04	10/1	1.97
Total	4.15abc	Total	5.33d
7/20	1.98	7/19	3.17
10/13	1.75	10/19	1.51
Total	3.73a	Total	4.68abc
7/8	1.96	6/29	2.65
10/13	2.04	10/19	1.90
Total	4.00ab	Total	4.55ab

1/ Means not followed by the same letter are significantly different at the .05 level.

Table 4. Effect of harvest management on yield of Apollo alfalfa at Huntley in 1982.

Harvest	Yield
-date-	-tons/a-
8/3	0.82
10/7	1.46
Total	2.28ab 1/
8/3	0.89
11/4	1.22
Total	2.11a
8/6	1.12
10/7	1.60
Total	2.72cd
8/6	1.22
11/4	1.44
Total	2.66cd
8/11	1.32
10/7	1.65
Total	2.97de
8/11	1.77
11/4	1.37
Total	3.14e
8/13	1.20
10/7	1.62
Total	2.82cde
8/13	1.30
11/4	1.40
Total	2.70cd
8/16	1.42
11/4	1.37
Total	2.79cd
8/16	1.66
11/4	1.17
Total	2.83cde
8/18	1.58
11/4	1.01
Total	2.59bc
8/18	1.55
11/4	1.22
Total	2.77cd
11/4	2.56bc

1/ Means not followed by the same letter are significantly different at the .05 level.

PROGRESS REPORT
RESEARCH AGREEMENT BETWEEN
MONTANA AGRICULTURAL EXPERIMENT STATION
AND
MONTANA WHEAT RESEARCH AND MARKETING COMMITTEE

DATE: 13 JANUARY 1983

TITLE: Statewide Cooperative Study to Develop Annual Legume/Cereal Grain Rotations for Montana

MAJOR PROJECT OBJECTIVES:

A. Develop cereal-legume rotations for restoring the fertility and productivity of Montana soils.

B. Compare annual legume-small grain rotations with small grain-small grain and fallow-small grain rotations.

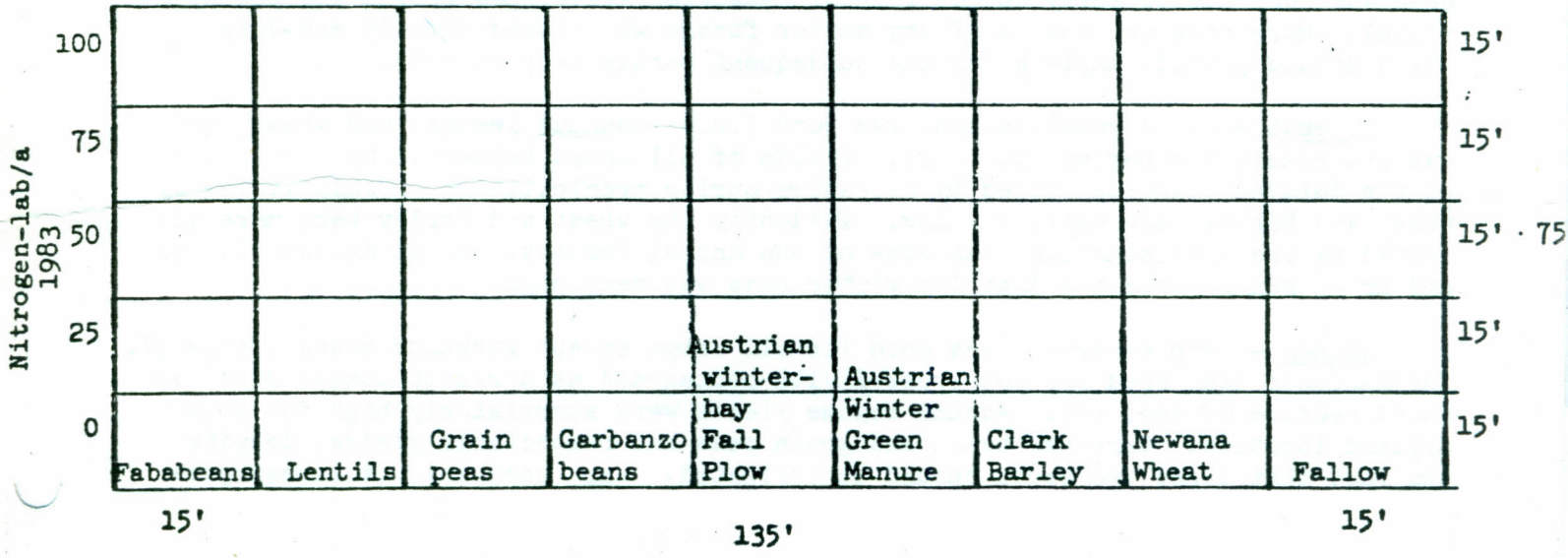
PERSONNEL:

Leon E. Welty - Kalispell, MT) Co-chairman
James R. Sims - Bozeman, MT)
Ronald Lockerman - Bozeman, MT
Gregory Kushnak - Conrad, MT
Jerald Bergman - Sidney, MT
Patrick Rardon - Moccasin, MT
Ronald Larson - Huntley, MT

MATERIALS AND METHODS:

Selected food and forage legumes were grown in large whole plots at six locations (Kalispell - dryland, Sidney - dryland, Bozeman - dryland, Conrad - dryland, Moccasin - dryland, Huntley - irrigated) in 1982, along with whole plots of barley, wheat and fallow. In 1983, the entire plot area will be uniform cropped to Clark barley and nitrogen rates will be stripped across whole plots.

An example of replication one at Kalispell is as follows:



In 1983, by comparing grain yields on barley whole plots to 0 nitrogen rates for each annual legume, residual N for each annual legume may be measured.

In 1982, all annual legumes and cereals were seeded in 12 inch rows at the following seeding rates: faba beans = 150-180 lbs/a, lentils = 50-60 lbs/a, grain peas = 150-175 lbs/a, garbanzo beans = 150-200 lbs/a, Austrian winter peas = 100-120 lbs/a, soybeans = 70-80 lbs/a, pink beans = 50-60 lbs/a, safflower = 20 lbs/a, wheat = 60 lbs/a and barley = 60 lbs/a. All annual legumes were treated with the proper rhizobia prior to seeding. Lentils and grain peas were treated with a mixture of captan and lindane to control seed rot and seedling diseases. Garbanzo beans were treated with captan for control of Pythium ultimum (seed rot disease) at Kalispell and Bozeman, but not at the other locations.

Parameters measured in 1982 varied somewhat with location, but generally consisted of grain and forage yield, straw yield, stand establishment, seed weight, height, test weight, emergence date, bloom date and harvest date.

Grain, hay and straw samples from each whole plot at each location were sent to Dr. James Sims for nitrate analyses. Analyses on approximately 360 total samples are being conducted and will be completed shortly. In addition, soil samples were taken in each whole plot at each location in spring (2 per replication) and in fall (1 per whole plot) at three depths (0"-9", 9"-24", 24"-48"). Approximately 864 total samples are currently being analyzed by Dr. Sims.

RESULTS AND DISCUSSION:

Contribution of the annual legumes to the cereal grain rotation, of course, cannot be determined until 1983. However, agronomic performances of the various annual legumes were measured in 1982 at each location (Tables 1-6).

Kalispell - Stand establishment for all annual legumes and cereal grains was adequate (Table 1). Of all the annual legumes, grain peas and lentils performed the best. Garbanzo bean yields were low (About 50% of yields obtained in 1981), probably due to moisture stress occurring at different times throughout the growing season. Soil type for this experiment was a sandy loam so plants underwent moisture stress when precipitation was not timely. Faba beans were severely stunted by a moisture stress in late May from which they never recovered. Although garbanzo bean seed was obtained, quality, color and conformation of the seed was poor due to early autumn frosts. Austrian winter pea growth was exceptional. More than two tons/a of dry matter forage was plowed down in mid-July which should provide ample N for the subsequent barley crop in 1983.

Bozeman - Stand establishment was good for all annual legumes and wheat, but was inadequate for barley (Table 2). Yields of all crops tended to be low because of the delayed planting caused by excessive spring precipitation. Grain yields of wheat and barley were extremely low. Evidently the wheat and barley were more affected by the late planting than some of the annual legumes. As at Kalispell, hay and green manure from the Austrian winter peas was very high.

Sidney - Crop emergence was good for all crops except garbanzo beans (Table 3). The garbanzo bean seed was not treated with captan and as a result stands were reduced because of seed rot. Annual legume yields were surprisingly high for this dryland location. Garbanzo beans and grain peas had respectable yields, despite the fact that these two crops should be irrigated. Faba bean was the lowest pro-

ducing crop indicating its sensitivity to drought. Most surprising was the forage yield of the Austrian winter peas, equalling yields at Kalispell and Bozeman which had more than 18 inches of crop year precipitation as compared to that at Sidney of 13.4 inches. Soybeans did not mature at Sidney in 1982 so forage yields were obtained rather than grain yields.

Moccasin - Seedling establishment was excellent for all crops except garbanzo beans which had only a 30% stand (Table 4). Again stand loss in this crop was due to lack of Pythium ultimum seed rot control because the seed was not treated with a fungicide. In spite of the poor stands, garbanzo bean yields were comparable to faba bean yields. Generally, crop yields were lower than we would expect at a location receiving 18.5 inches of crop year precipitation. Evidently precipitation timing was a critical factor. At this location Austrian winter peas were allowed to mature and grain yields were obtained. However, plow down of the Austrian winter peas was done on schedule at about the seventh flowering node.

Conrad - Emergence was good for all species, except garbanzo beans (Table 5). Stand failure was due to not treating the seed. Annual legume yields were respectable at this location indicating the possibility for commercial production. Dry matter forage yield of the Austrian winter peas was about 50% of the other locations. Cereal grain yields were low due to hail damage incurred on August 10. Interestingly, the garbanzo beans and faba beans were not damaged by the hail. The lentils and grain peas were harvested before the hail storm.

Huntley - Stands were good for all crops except garbanzo beans (Table 6). As at other locatins, the garbanzo beans were not treated with a fungicide. The emergence of 1.5 seeds/ft^2 was surprisingly high because Pythium ultimum infection is usually higher under heavy soil conditions prevalant at Huntley. Garbanzo and faba bean yields were the highest of all locations within the state. In excess of two tons/a of dry matter forage was plowed down for green manure in late July.

Table 1. Yield and agronomic data of annual legumes and cereal grains grown at Kalispell in 1982.

Crop	Grain Yield	Straw Yield	Seed Weight	Test Weight	Emergence	Emergence Date	Height	Harvest Date
	-lbs/a-	-lbs/a-	-No./lb-	-lbs/bu-	-plants/ft^2-		-inches-	
'UC-5' Garbanzo Bean	912	1021	1101		2.3	5/9	17	9/8
'Chilean-78' Lentil	1908	2375	8731		11.3	5/2	22	8/23
'Garfield' Grain Pea	2814	2084	2122		6.3	5/3	41	8/16
'Ackerperle' Faba Bean	1116	698	1802		4.0	5/7	26	9/3
'Melrose' Austrian[1/] Winter Pea (Hay)	4400				8.7	5/4	55	7/21
'Melrose' Austrian Winter Pea (Green Manure)					8.9	5/4	55	7/20[2/]
'Clark' Barley[3/]	3283	1277	9870	50.6	14.3	4/29	26	8/25
'Newana' Wheat	2562	1910	10810	62.5	20.3	4/30	28	8/25

1/ Hay harvest taken when majority of plants had 6 to 8 flowering nodes.
2/ Date of plow down
3/ Percent plump = 90.5

AGRONOMIC NOTES:

Planting Date: April 21 on barley recrop

Fertilization in 1982: Annual Legume - 0 lbs N/a; 50 lbs P_2O_5/a; 50 lbs K_2O/a; 30 lbs SO_2/a
Cereal Grains - 75 lbs N/a; 50 lbs P_2O_5/a; 50 lbs K_2O/a; 30 lbs SO_2/a

Herbicides in 1982: Hand Weeded

Crop Year Precipitation (September 1981 thru August 1982): 18.3 inches

Annual Legume Nodulation: Lentils, Grain peas and Austrian peas = good nodulation
Faba bean and Garbanzo bean = poor nodulation

Table 2. Yield and agronomic data of annual legumes and cereal grains grown at Bozeman in 1982.

Crop	Grain Yield	Emergence	Emergence Date	Heading or Bloom Date	Harvest Date	Height
	-lbs/a-	-plants/ft^2-				-inches-
UC-5 Garbanzo Bean	1533	2.6	6/18	7/26	10/12	20
Chilean-78 Lentil	778	9.3	6/17	7/25	8/31	16
Garfield Grain Pea	1633	7.2	6/17	7/26	8/26	29
Ackerperle Faba Bean	1146	3.0	6/17	8/4	10/11	32
'Viva Pink' Dry Bean	1095	3.4	6/19	7/26	9/17	12
Melrose Austrian Winter Pea (Hay)[1]	4508	6.6	6/17	8/9	9/1	48
Clark Barley	919	4.1	6/17	8/9	10/13	21
Newana Wheat	854	9.4	6/17	8/4	10/13	23

1/ Hay harvest taken when majority of plants had 6-8 flowering nodes. Austrian green manure plow down was 8/9/82.

AGRONOMIC NOTES

Planting Date: May 11
Fertilization in 1982: None
Herbicides in 1982: Hand Weeded
Nodulation: All annual legumes were nodulated
Crop Year Precipitation: 18.55 inches

Table 3. Yield and agronomic data of annual legumes and cereal grains grown at Sidney in 1982.

Crop	Grain Yield	Seed Weight	Test Weight	Emergence	Height	Harvest Date
	-lbs/a-	-No./lb-	-lbs/bu-	-plants/ft^2-	-inches-	
UC-5 Garbanzo Bean	935	1017	59.0	2.0	15	9/15
Chilean-78 Lentil	1237	8789	59.0	5.7	12	8/17
Garfield Grain Pea	1920	2179	63.5	4.1	24	8/17
Ackerperle Faba Bean	634	1698	65.9	4.1	24	9/3
Viva Pink Dry Bean	957	2578	60.0	2.5	10	9/3
'McCall' Soy Bean 1/	1878			5.0	16	9/16
'Hartman' Safflower	1188	16172	39.5	100%	23	11/3
Melrose Austrian 1/2/ Winter Pea (Hay)	4355			4.5	28	8/9
Clark Barley	2641	14247	46.0	100%	23	8/17
Newana Wheat	1367	19486	56.5	100%	26	8/17

1/ Forage dry matter/a
2/ Austrian hay harvested and green manure plowed down when majority of peas had 6-8 flowering nodes.

AGRONOMIC NOTES:

Planting Date: May 27 - June 2 on fallow
Fertilizer: None
Herbicides: Hand Weeded
Nodulation: Poor for all annual legumes
Crop Year Precipitation: 13.4 inches
Barley Plumpness: 95.8%
Safflower Oil Content: 43.3% on dry weight basis

Table 4. Yield and agronomic data of annual legumes and cereal grains grown at Moccasin in 1982.

Crop	Grain Yield	Straw Yield	Seed Weight	Test Weight	Emergence	Emergence Date	Height	Bloom or Heading Date	Harvest Date
	-lbs/a-	-lbs/a-	-No./lb-	-lbs/bu-	-plants/ft^2-		-inches-		
UC-5 Garbanzo Bean	651	1235	1167	55.5	0.8	5/17	14	7/14	9/25
Chilean-78 Lentil	943	1137	9399	60.7	12.1	5/12	12	7/2	9/5
Garfield Grain Pea	1282	1310	2113	63.4	6.8	5/13	22	6/20	9/5
Ackerperle Faba Bean	640	1299	1468	57.7	7.0	5/15	20	6/22	8/27
Melrose Austrian Winter Pea	1231	1678	4299	64.3	11.8	5/13	23	6/18	9/5
Melrose Austrian Winter Pea (Green Manure)					11.3	5/13	22	6/18	7/27 1/
Clark Barley 2/	2141	4544	13353	48.1	11.9	5/8	22	7/1	9/18
Newana Wheat	1716	2899	15819	61.1	12.4	5/9	25	7/5	9/18

1/ Date of plow down.
2/ Percent plump = 86.1

AGRONOMIC NOTES:

Planting Date: April 26
Fertilizer: All crops - 6 lbs N/a; 30 lbs P_2O_5/a.
Cereal grains - 20 lbs N/a before seeding
Herbicides: Treflan (0.5 lbs AI/a) on 4/23 on annual legumes
Cereal grains - hand weeded
Nodulation: All annual legumes were nodulated
Crop Year Precipitation: 18.5 inches

Table 5. Yield and agronomic data of annual legumes and cereal grains grown at Conrad in 1982.

Crop	Grain Yield	Straw Yield	Seed Weight	Test Weight	Emergence	Emergence Date	Height	Bloom or Heading Date	Harvest Date
	-lbs/a-	-lbs/a-	-No./lb-	-lbs/bu-	-plants/ft^2-		-inches-		
UC-5 Garbanzo Bean	765	897	1016	57.7	1.5		15		8/27
Chilean-78 Lentil	1691	1869	9342	59.1	8.5	5/16	15	7/3	8/5
Garfield Grain Pea	2323	2097	2143	65.2	5.9	5/17	37	7/3	8/5
Ackerperle Faba Bean	1631	1910	1432	65.7	2.9	5/17	33	7/1	8/17
Melrose Austrian Winter Pea (Hay)[1/]	2280				5.2	5/17	30	7/8	7/20
Melrose Austrian Winter Pea (Green Manure)						5/17	30	7/8	7/20[2/]
Clark Barley[3/]	1906	774		51.2	100%	5/14	25	7/3	8/16
Newana Wheat	1884	547		61.8	100%	5/15	27	7/7	8/18

1/ Hay harvest taken when majority of plants had 6-8 flowering nodes.
2/ Date of plow down.
3/ Percent plump = 82.8%

AGRONOMIC NOTES:

Planting Date: April 30 on barley recrop - soil temperature ($2\frac{1}{2}$") = 47° F
stubble burned and cultivated prior to seeding

Fertilizer: All crops - 11 lbs N/a; 51 lbs P_2O_5/a with seed
Cereal grains - 54 lbs N/a

Herbicides: Annual legumes - hand weeded
Cereal grains - Bronate and Hoelon

Nodulation: Faba bean, lentil, garbanzo bean - adequate
Grain pea, Austrian pea - not noted

Crop Damage: Hail on 8/10 reduced barley yield by 20-25%, wheat yield by 5-10%, but did not effect annual legumes.
- barley was affected by Net-Spot-Blotch
- garbanzo bean emergence was poor - also, plants were grazed by rabbits, whereas other crops were not.

Table 6. Yield and agronomic data of annual legumes and cereal grains grown at Huntley in 1982.

Crop	Grain Yield	Straw Yield	Seed Weight	Test Weight	Emergence	Height	Harvest Date
	-lbs/a-	-lbs/a-	-No./lb-	-lbs/bu-	-plants/ft^2-	-inches-	
UC-5 Garbanzo	1945	3573	945	57.8	1.5	30	9/8
Chilean-78 Lentil	1413	2307	8902	58.6	7.8	18	9/2
Garfield Grain Pea	2615	2425	1965	64.2	4.7	39	8/10
Ackerperle Faba Bean	2383	4884	1431		5.1	54	8/20
McCall Soy Bean	2356	2924	2870	56.6	4.8	27	9/20
Melrose Austrian[1/] Winter Pea (Hay)	4720				4.6	56	7/26-27
Melrose Austrian Winter Pea (Green manure)					4.4	58	7/28[2/]
Clark Barley	4166	6354	9478	51.6	16.6	33	8/10

1/ Hay harvest taken when majority of plants had 8-9 flowering nodes.
2/ Date of plow down.

AGRONOMIC NOTES:

Planting Date: May 3-4
Fertilizer: None
Herbicides: Annual legumes - Treflan at 0.75 lbs AI/a
Barley - hand weeded
Irrigation: Two inches applied (flood) on 7/8, 8/10 and 9/3
Crop Year Precipitation: 14.37 inches
Nodulation: All annual legumes were nodulated

TITLE: Garbanzo Bean Seed Treatment Trial

OBJECTIVES: 1. Determine effect of fungicide seed treatment on control of Pythium ultimum seed rot, and on emergence, yield, seed weight and nodulation of garbanzo bean. 2. Determine effect of timing of Rhizobia inoculation on establishment, yield and nodulation of garbanzo bean.

PROCEDURES: 'UC-5' garbanzo bean treated with nine fungicides were seeded at Kalispell, Montana on April 29, 1982 at a seeding rate of 200 lbs/a. Each fungicide treatment (whole plot) was split into three sub-plots which consisted of inoculating UC-5 seed with Rhizobia 48, 24 and 3 hours before planting.

RESULTS AND DISCUSSION:

Inoculation timing main effect responses and the interaction between fungicide treatment and inoculation timing were not significant. The effects of fungicide treatment on stand, nodule weight, yield and seed weight of UC-5 garbanzo bean are presented in Table 1.

Table 1. Garbanzo Bean Seed Treatment Trial

Fungicide	Stand pl/ft[2]	Nodule Wt gr/pl	Yield lbs/a	Seed Wt No./lb
Ridomil	2.6a[1/]	4.04a[1/]	928a[1/]	917a[1/]
Vitavax	2.3a	3.10b	851ab	948ab
Thiram	2.4a	3.34ab	833ab	956abc
Captan	2.4a	1.14c	735bc	985bcd
Maneb	1.3b	1.58c	637cd	1007cde
Demosan	1.3b	1.24c	565de	1032de
PCNB	0.8b	1.02c	501def	1036de
Campogran	1.1b	1.38c	475def	1016de
Control[2/]	1.0b	1.80c	411ef	1068e
Terra-Coat	1.0b	0.92c	363f	1063e
Check[3/]	1.5b	0.32d	297f	1046de

1/ $P \leq 0.05$ by SNK
2/ No fungicide
3/ No fungicide or Rhizobia

Ridomil, Vitavax, Thiram and Captan all controlled Pythium ultimum and resulted in adequate stands. Ridomil, Vitavax and Thiram did not have an adverse effect on nodulation, whereas the other fungicides did. Stand, nodule weight and yield were all positively related. Seed weight was negatively associated with the other three parameters.

PERSONNEL:

L. E. Welty, Montana Agric. Exp. Stn., Kalispell, MT
J. A. Hall, Plant and Soil Science, MSU, Bozeman, MT
D. E. Mathre, Plant Pathology, MSU, Bozeman, MT
R. H. Lockerman, Plant and Soil Science, MSU, Bozeman, MT

78

TITLE: Spring Barley

PROJECT: Small Grains Investigation MS 756

YEAR: 1982

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperating Agencies - Montana Agric. Exp. Stn. MSU
USDA-SEA-AR
Cooperative Extension Service

LOCATION: Northwestern Agricultural Research Center and off station locations.

OBJECTIVES:

1. To determine the adaptability of new and introduced barley varieties in western Montana.

2. To assist in the state breeding program for the development of varieties with increased straw strength and disease resistance.

1982 EXPERIMENTS:

1. Dryland Intrastate Yield Nursery
2. Stiff Straw Nursery
3. Off Station Yield Nurseries located in -
   a) Lake County - Art Mangles Farm - Polson
   b) Missoula County - Rodney Vannoy Farm - Greenough
   c) Ravalli County - Bob Bailey Farm - Stevensville
4. Bonneville 2-6 Row Near Isogenic
5. Nuja Erectoides Yield Trial

(Experiments 4 and 5 are not discussed in this report, but were conducted as a cooperative effort with E. A. Hockett and R. F. Eslick)

RESULTS AND DISCUSSION:

Dryland Intrastate Spring Yield Nursery

Yields from the Intrastate Nursery were good yet were not as high as last year. The low yields may be a result of below normal rainfall in the months of May, June and August. There were no varieties which yielded significantly higher than the check variety (Purcell) although five varieties were significantly lower (Table 1).

Test weights were normal with about half of the varieties having a significantly higher test weight than Purcell.

Percent plumps were a little higher than normal. Several varieties produced grains with a plump count exceeding 94%.

The mean heading date was one day earlier than the preceeding year for this nursery.

Spring Barley (con't)

Lodging was light to moderate throughout the nursery. More than one-third of the nursery showed susceptibility to lodging. There were two hard driving rains this summer which also contributed to increased lodging pressure.

Scald (Rynchosporium secalis) was detected in all barley varities except Westbred 501. Scald severity was high in some varities and no doubt effected yields in many cases.

Stiff Straw Nursery

All varieties within the stiff straw nursery showed severe lodging. Two rain storms during the summer plus irrigation provided severe lodging pressure.

A high yield of 105 bu/a was recorded from ELT 15. The average yield for the test was 82 bu/a. Test weights were quite low with the majority of the varieties being below 46 lbs/bu. The low percent plump ratings could be due in part to the severe lodging. The moist environment provided by lodged grains provided a perfect environment for barley scald (Rynchosporium secalis). All varieties were found to be susceptible to the disease.

Off Station Yield Nurseries

a) Lake County - Good yields were obtained from the Lake County location although lodging was prevalent. Lodging may have been a factor in yield reduction and some effect on test weights. Karla, a tall 6-row barley, was the only variety in this nursery which showed complete resistance to lodging. This factor may have contributed to the high yield of Karla. As can be imagined percent plump numbers were lower than recording from previous years.

b) Missoula County - Stands were light in the nursery at the Vannoy farm. Summit was the highest yielding entry (59.9 bu/a), and had a test weight of 52.6 lbs/a. Yields were a little light for this location, whereas percent plump figures this year averaged about 8% better than last year. Test weights were normal for this location.

c) Ravalli County - Excellent yields were obtained in this location. Hector had the highest yield at 129.2 bu/a. The mean for the test was 116.2 bu/a. These are some of the highest nursery yields from this location in five years. Test weights were also very good ranging from 50.5 lbs/bu (Glenn) to 51.2 lbs/bu (Hector and Piroline). Percent plumps were good in this study (Table 6). Hector, Summit, Piroline and Menuet all had high yields and excellent test weights.

A four location summary of off station nurseries is shown in Tables 7 and 8. Karla was the highest in yield for all locations. Menuet and Summit had the highest test weights when averaging four locations. Height and percent plump averages are provided in Table 8.

SPRING BARLEY VARIETIES

SPRING BARLEY VARIETIES RECOMMENDED FOR WESTERN MONTANA

Six-row Type

1. Unitan - dryland and irrigated
2. Steptoe - dryland and irrigated
3. Horsford - dryland
4. Stafford - dryland and irrigated
5. Karla - irrigated or high moisture

Two-row Type

1. Piroline - dryland and irrigated
2. Purcell - dryland
3. Summit - dryland and irrigated
4. Georgie - irrigated and high rainfall
5. Ingrid - irrigated
6. Lud - irrigated
7. Shabet - irrigated or high rainfall
8. Ershabet - dryland or irrigated
9. Menuet - high rainfall or irrigated
10. Ridawn - dryland or irrigated
11. Clark - dryland feed barley with malting potential under irrigation
12. Bridger 82 - irrigated or high moisture

CHARACTERISTICS OF RECOMMENDED VARIETIES

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

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

Recommended barley (con't)

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

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

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

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

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

Recommended Spring Barley Varieties (cont'd)

8. Summit

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

9. Georgie

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

10. Ingrid

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

11. Lud

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

12. Shabet

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

Recommended Spring Barley Varieties (cont'd)

13. Ershabet

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

14. Menuet

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

15. Ridawn

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

16. Clark

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

17. Bridger-82

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

Table 1. Agronomic date from the Dryland Intrastate Barley Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT. in 1982. Field No. A-3, randomized block design, four replications. Size of harvested plot: 32 sq. ft.

Date seeded: April 9, 1982 Date harvested: August 31, 1982

VARIETY	YIELD BU/A	TEST WT LB/BU	% PLUMP	HEADING DATE	HEIGTH INCHES	LODGING ANGLE	LODGING %	SCALD2/ PREV.	SCALD2/ SEVER.
MT 38223 HECTOR/KLAGES	99.25	52.77a	93.50a	176.00a	23.92b	.00b	.00b	47.50b	8.75b
CI 15229 STEPTOE	94.58	46.80b	94.75a	170.75b	25.30	2.00	43.75	27.50b	3.00b
NA 9 TETON	94.25	46.15b	91.00	171.50b	25.79	2.50	62.25	30.00b	4.00b
MT853287 HPN/UIT //FLD	93.89	50.85	94.75a	175.50	28.35	.75b	1.25b	31.25b	5.00b
MT547123 HECTOR/KLAGES	93.67	52.10a	91.00	176.75a	26.38	.00b	.00b	42.50b	7.75b
FM 1 TRIUMPH	93.14	51.43a	95.75a	176.50a	24.11b	.00b	.00b	20.00b	5.50b
WA969175 KLAGES/ZEPHYR	91.41	51.48a	91.50	176.00a	25.89	.00b	.00b	86.25	32.50
MT 38212 HECTOR/KLAGES	91.33	51.97a	90.50	173.25	24.80	.00b	.00b	26.25b	5.25b
MT 73708 SCASHABET	91.30	49.85	84.00	175.75a	27.26	3.25	32.50	12.50b	1.75b
WP 1020 MONT BLEND 1020	89.42	47.05b	94.50a	172.75	23.13b	.50b	20.00	26.25b	4.00b
MT312620 SUMMIT/HECTOR	89.02	51.75a	87.75	173.25	25.49	.00b	.00b	58.75	13.75b
MT 41279 KIMBERLY/MT547143	88.97	51.68a	94.50a	175.00	23.72b	.00b	.00b	56.25	11.25b
MT853231 HPN/UIT // HCR	88.86	51.20a	95.00a	172.25	28.15	.75b	2.50b	60.00	15.00
CI 15514 HECTOR	88.09	51.92a	89.50	174.50	26.57	1.00	18.75	40.00b	12.50b
CI 10083 INGRID	87.63	52.20a	94.25a	178.50a	25.89	.00b	.00b	90.75	43.75
MT313104 SUMMIT/HECTOR	87.47	52.08a	90.25	173.25	24.21b	.00b	.00b	75.00	17.50
CI 15478 KLAGES	87.16	51.10a	87.75	178.75a	25.00	.00b	.00b	62.25	22.50
CI 15857 CLARK	86.86	51.58a	94.00a	175.00	26.38	.75b	3.75b	68.50	32.50
MT311031 KLAGES/SUMMIT	86.53	51.85a	93.00a	175.25	25.20	.50b	22.50	65.00	17.50
MB731540 NORBERT,TR206	86.08	51.20a	93.25a	177.00a	25.79	.00b	.00b	83.75	23.75
CI 16181 PURCELL 1/	85.81	50.15	86.50	173.75	27.07	2.75	43.75	84.75	36.25
MT 729 SUMMIT	85.80	51.63a	89.00	175.50	25.49	.00b	.00b	78.50	53.75
MT311576 KLAGES/SUMMIT	85.41	51.18a	89.50	174.25	27.17	.25b	20.00	77.25	30.00
MT 31972 KLAGES/SUMMIT	85.13	51.43a	90.50	177.00a	25.49	.00b	.00b	83.50	30.00
VD 13078 CANOVA/MENUET	84.95	52.10a	93.25a	174.50	26.18	.00b	.00b	88.25	55.00
CI 15860 KARLA	84.81	48.35b	89.75	173.75	27.56	.00b	.00b	76.25	32.50
CI 13827 SHABET	83.73	50.45	89.50	177.00a	27.36	.50b	20.00	47.50b	26.25
CI 15773 MOREX	83.55	49.85	96.25a	171.75b	31.40a	.50b	6.25b	28.75b	7.75b
WP 501 WESTBRED 501	83.52	49.10b	93.25a	174.00	17.72b	.00b	.00b	.00b	.00b
CI 15865 AZURE	82.97	47.30b	94.75a	173.00	28.44	.50b	5.00b	85.75	48.75
NA 12 NA 12	82.94	50.95	92.00	176.50a	25.39	.00b	.00b	72.50	35.00

Table 1. (con't)

	YIELD BU/A	TEST WT LB/BU	% PLUMP	HEADING DATE	HEIGTH INCHES	LOD. ANG.	LOD. %	SCALD PREV.	SCALD SEVER.
ES 7 LG SEEDED BZ	82.72	50.60	88.00	175.75a	27.85	2.00	28.75	83.75	38.75
CI 15861 KRIS	82.48	51.23a	91.50	175.50	26.28	.00b	.00b	68.75	25.00
MT657399 STEPTOE/KLAGES F6	82.23	49.02b	93.50a	176.75a	27.26	.00b	.00b	17.50b	4.00b
MT853183 BZ AWN BYT/KGS	81.30	49.50	85.25	177.25a	19.00b	.00b	.00b	81.00	23.75
MT853320 HPN/UIT //UNION/B	81.20	49.47	95.75a	175.00	27.56	.00b	.00b	28.75b	3.00b
MT853284 HPN/UIT //FLD	80.02	50.45	92.75	172.00	25.59	.75b	10.00	35.00b	4.00b
VD 3 MENUET	79.73	52.45a	96.00a	176.75a	24.21	.00b	.00b	69.75	37.50
WP 63 GUS	79.56	47.02b	90.75	173.50	18.80b	.00b	.00b	40.00b	13.75b
VD 22872 PISTON	79.13	51.55a	94.50a	177.00a	24.02b	.00b	.00b	47.50b	18.75
MT853242 HPN/UIT // HCR	78.61	50.23	93.00a	172.75	30.31a	1.00	7.50b	47.50b	11.25b
VD 21778 BTT/ARAMIR//UNIVE	78.02	51.12	96.50a	177.75a	24.31b	.00b	.00b	79.75	28.75
VD 23878 ANDANTE	76.98	52.12a	95.50a	177.50a	24.90	.00b	.00b	45.00b	15.00
ES 10 LG SEEDED BZ	74.64	50.18a	83.00	176.50a	25.39	.75b	18.75	70.00	22.50
MT853260 HPN/UIT // HCR	72.81	49.50	94.00a	172.50	26.28	.00b	.00b	40.00b	7.75b
VD 8477 VDH 084-77	71.50	51.23a	93.75a	178.50a	24.61b	.00b	.00b	57.50	15.00
MT853345 HPN/UIT//SMT	70.05	48.85b	84.75	170.25b	24.61b	1.00	23.75	35.00b	6.50b
CI 10421 UNITAN	66.55b	46.70b	93.50a	171.75b	29.92a	1.50	35.00	16.25b	3.00b
CI 9558 PIROLINE	64.83b	48.52b	89.75	177.75a	24.31b	4.00	25.00	95.50	52.50
WP 777 BFP 77-7	64.72b	50.70	54.75b	177.25a	27.66	6.50a	50.00	69.75	23.75
CI 5438 COMPANA	64.62b	48.25b	89.00	176.25a	25.10	2.75	27.50	93.00	63.75
MT853333 HPN/UIT//SMT	64.08b	50.33	85.7 5	169.75	24.61b	.00b	.00b	57.50	21.25
$\bar{X}$	82.95	50.36	90.88	174.93	25.64	.71	10.16	56.00	20.81
F 3/	2.10**	26.61**	7.51**	10.08**	8.22**	3.28**	2.16**	5.26**	4.00**
S.E.X.	5.80	.33	2.24	.71	.86	.70	10.66	10.80	8.02
L.S.D.(.05)	16.21	.92	6.26	2.00	2.41	1.95	29.77	30.18	22.40
C.V.%	6.99	.65	92.46	.41	3.36	8.86	104.85	19.29	38.51

1/ Check variety
2/ Scald prevalence = % plot infested with barley scald (Rynchosporium secalis)
Scald severity = % flag leaf area infected with barley scald
3/ F value for variety comparison
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level
** Indicates statistical significance at the .01 level

Table 2. Ten year summary of yields for the spring dryland intrastate barley nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT 1972-1982 (no data for 1980).

C.I. or State No	Variety	1972	1973	1974	1975	1976	1977	1978	1979	1981	1982	Ave.	Sta Yrs	% Piroline
CI 10421	Unitan	88.9	62.1	75.2	62.9	101.9	55.6	94.5	73.4	90.0	66.6	77.1	10	109
CI 9558	Piroline	57.1	61.8	87.1	61.2	80.8	61.9	88.1	67.5	75.4	64.8	70.6	10	100
CI 5438	Compana	44.2	50.3	76.8	49.7	72.7	55.8	82.9	52.9	83.1	64.6	63.3	10	90
CI 13827	Shabet	62.6	61.4	84.2	43.7	87.2	56.3	88.7	80.4	84.2	83.7	73.2	10	104
CI 15514	Hector	68.1	59.4	80.8	52.1	78.5	57.1	91.4	64.9	90.4	88.1	65.8	10	93
CI 15229	Steptoe	75.9	69.1	83.2	69.0	105.8	68.1	96.6	74.7	131.0	94.6	84.1	10	119
MT 729	Summit	70.0	62.9	77.8	44.6	93.3	67.6	86.3	78.5	76.9	85.8	74.4	10	105
CI 15478	Klages		62.1	82.2	51.0	96.0	63.1	93.4	71.5	83.1	87.2	76.6	9	106
CI 10083	Ingrid		53.6	82.0	45.4	83.5	62.3	86.6	65.2	79.1	87.6	71.7	9	99
CI 16181	Purcell	83.2	-	-	-	82.0	65.4	88.9	76.9	87.7	85.8	81.4	7	115
VD 3	Menuet						64.3	87.4	63.5	85.5	79.7	76.1	5	106
VD 22872	Piston							89.8	71.8	88.0	79.1	82.2	4	111
CI 15773	Morex							83.8	64.8	79.8	83.6	78.0	4	105
MT547123	Hector/Klages								69.7	92.1	93.7	85.2	3	123
CI 15857	Clark								65.7	82.7	86.9	78.4	3	113
NA 9	Teton									123.0	94.3	108.7	2	155
MT853320	HPN/UIT//Union/BZ									97.0	81.2	89.1	2	127
MT312620	Summit/Hector									92.1	89.9	90.6	2	129
NA 12	NA 12									91.2	82.9	87.1	2	124
MT657399	Steptoe/Klages F6									89.2	82.2	85.7	2	122
MT311031	Klages/Summit									88.5	86.5	87.5	2	125
ES 7	LG seed Betzes									86.3	82.7	84.5	2	121
CI 15861	Kelly (ID 72 3633)Kris									85.9	82.5	84.2	2	120
MT313104	Summit/Hector									84.9	87.5	86.2	2	123
MT 73708	Scashabet									83.0	91.3	87.2	2	124
MT 31972	Klages/Summit									82.7	85.1	83.9	2	120
MT853183	BZ AWN BYT/KGS									81.0	81.3	81.2	2	116
VD 8477	VDH 084-77									80.9	71.5	76.2	2	109
ES 10	LG Seeded BZ									80.9	74.6	77.8	2	111
CI 15860	Karla (ID 72 4302)									78.7	84.8	81.8	2	117
WA969175	Klages/Zephyr									76.3	91.4	83.9	2	120
MT311576	Klages/Summit									75.3	85.4	80.4	2	115
MB731540	Norbert, TR 206									72.2	86.1	79.2	2	113
MT 38223	Hector/Klages										99.3	99.3	1	153
MT583287	HPN/UIT//FLD										93.9	93.9	1	145
FM 1	Triumph										93.1	93.1	1	144
MT 38212	Hector/Klages										91.3	91.3	1	141
WP 1020	Mont Blend 1020										89.4	89.4	1	138
MT 41279	Kimberly/MT547143										89.0	89.0	1	137
MT853231	HPN/UIT//HCR										88.9	88.9	1	137
MT311031	Klages/Summit										86.5	86.5	1	133
VD 13078	Canova/Menuet										85.0	85.0	1	131
WP 501	WP 501										83.5	83.5	1	129
CI 15865	Azure										83.0	83.0	1	128
MT853284	HPN/UIT//FLD										80.0	80.0	1	123
WP 63	Gus										79.6	79.6	1	122
MT853242	HPN/UIT//HCR										78.6	78.6	1	121
VD 21778	BTT/Aramir//UNIVE										78.0	78.0	1	120
VD 23878	Andante										77.0	77.0	1	119
MT853260	HPN/UIT//HCR										72.8	72.8	1	112
MT853345	HPN/UIT//SMT										70.5	70.5	1	109
WP 777	BFP 77-7										64.7	64.7	1	99
MT 85333	HPN/UIT//SMT										64.1	64.1	1	99

Table 3. Agronomic data from the irrigated stiff straw nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field No. Y-4.

Planting Date: April 22, 1982 Harvest Date: September 9, 1982 Size of Plot: 32 sq. ft.

C.I. or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	% Plump	Heading Date	Height (cm)	Lodging Angle	Lodging %	Scald[2] Prev	Scald[2] Sev.
CI 10083	Ingrid[1]	63.58	48.62	70.00	182.5	89.5	8.5	80.8	15.3	7.8
VD 3	Menuet	86.72a	50.17a	77.00a	179.0b	80.5b	6.8	58.5	53.8	17.5
VD 22872	Piston	94.03a	49.37	66.00	180.0b	79.8b	7.8	99.0	22.8	9.0
81-48-63	BZ*5/Mountcalm T5-7c	65.77	47.73	63.50b	184.0a	85.8	8.0	82.3	40.3	10.3
81-48-67	BZ*5/Mountcalm T5-7c	48.39	45.80b	67.75	186.5a	85.8	7.8	55.0	41.5	12.8
ELT 5	M22/Blazer	69.71	46.25b	69.50	180.5b	70.5b	7.8	98.0	35.0	10.0
ELT 6	M22/Blazer	88.78a	45.58b	68.25	179.5b	58.0b	6.5	72.0	37.8	9.0
ELT 7	M22/Blazer	92.53a	46.52b	71.50	180.5b	72.5b	6.3	76.8	17.5	6.3
ELT 10	Cambrrinus/Hassan//OSB73188-1CB	90.03a	48.27	35.25b	178.8b	64.0b	8.5	99.0	68.8	16.3
ELT 13	Fb741204/Short Wocus	83.59a	40.58b	70.00	184.7a	75.3b	5.8	85.8	21.5	4.0
ELT 14	Fb741204/Short Wocus	81.65a	40.83b	77.50a	181.7	72.8b	7.5	92.0	22.5	6.5
ELT 15	FB741204/Short Wocus	104.91a	43.35b	66.25	181.7	71.5b	4.5	86.8	11.3	3.8
ELT 21	Iris/M907//Api/CM97	68.34	43.70b	66.50	180.8b	78.5b	8.5	85.0	28.8	6.3
ELT 22	Wish37-7-2-1/Wocus//Jotun Der.	85.09a	44.20b	68.25	179.5b	75.3b	8.3	98.0	23.8	5.3
WP 501	Westbred 501	97.59a	47.00b	80.00a	177.5b	65.3b	8.3	99.0	28.8	6.3
	Michigan/Diamant	57.47	44.20b	55.00b	182.5	74.8b	8.8	93.0	56.3	13.8
WP 1020	1020 - Blend	94.09a	43.30b	77.75a	173.0b	70.0b	6.8	85.8	16.5	5.3
	BFC 78-40	66.65	42.20b	77.25a	177.7b	78.0b	8.5	99.0	21.3	10.0
	BFB 79-22	85.22a	44.08b	73.50	179.0b	58.3b	8.8	98.0	72.5	21.3
	BFP 78-77	99.60a	46.12b	74.50	178.8b	75.8b	8.0	83.3	23.8	8.8
	BFP 78-63	94.22a	45.33b	85.50a	180.5b	69.5b	6.8	81.0	30.0	7.5
WP 63	Gus	92.03a	44.55b	76.00	177.7b	69.5b	8.8	99.0	17.8	4.0
	$\bar{x}$	82.28	45.35	69.85	180.3	73.67	7.6	86.7	32.1	9.15
	F[3]	3.189**	16.19**	10.77**	29.32**	9.05**				
	S.E.$\bar{x}$	135.23	.6399	3.089	.525	2.709				
	L.S.D. (.05)	16.495	1.249	6.027	1.025	5.287				
	C.V. %	10.276	1.411	4.442	.291	3.678				

1/ Check vareity
2/ Scald ratings - Prev = prevalence w/i plot 0-99%
Sev = severity of flag leaf infection (% flag leaf covered)
3/ F-value for variety comparison
a/ Values significantly greater than check at the .05 level
b/ Values significantly less than the check at the .05 level
**. Indicates statistical significance at .01 level

Table 4. Agronomic data from the off station spring barley nursery grown on the Bill Hocker and Sons farm, Ronan, MT in 1982. Random block design, four replications.

Planting Date: 4/25/82 Harvest Date: 9/8/82 Size of Plot: 32 sq. ft.

****** VARIETY MEANS ******

	VARIETY	YIELD BU/A	TEST WT LB/BU	% PLUMP	HEIGTH INCHES	LODGING ANGLE	LODGING %
CI 15860	KARLA	125.17 a	46.93b	73.50 b	35.93	.00	.00
CI 15769	GLENN	110.00	49.18b	88.75	32.78	1.50	52.25
CI 15773	MOREX	107.16	49.77b	86.25	36.42	3.75	66.00
CI 15478	0221KLAGES	103.08	49.72b	64.50 b	36.02	5.25a	98.00 a
CI 16181	0221PURCELL	100.03	49.30b	64.00b	33.17	5.75a	97.00 a
VD 3	022 MENUET 1/	98.94	51.97	82.00	36.02	2.25	45.00
MB731540	NORBERT,TR206	96.33	50.40b	73.25b	37.30	4.00	77.00
VD 22872	PISTON	95.87	51.85	79.50	35.93	3.50	83.25 a
MT 73708	SCASHABET	92.98	48.18b	59.75b	36.52	5.25a	99.00 a
SK 76333	KLAGES/S72114 (TR 441	92.16	49.85b	76.00	32.97	4.25	99.00 a
CI 9558	0221PIROLINE	91.72	50.48b	70.75b	35.04	4.75a	99.00 a
MT 729	0221SUMMIT	91.22	51.15	63.50b	34.74	3.25	76.75
CI 15514	0221HECTOR	89.30	50.42b	68.50b	37.99	5.50a	99.00 a
CI 15857	0221 Clark	79.84 b	49.70b	67.25b	36.32	5.75a	99.00 a
$\bar{x}$		98.13	49.92	72.68	35.51	3.91	77.88
F 2/		5.03**	14.36**	12.10**	.95NS	5.90**	6.11**
S.E.$\bar{x}$		4.87	.35	2.56	1.63	.71	11.76
L.S.D. (.05)		13.94	1.01	7.33	4.67	2.02	33.63
C.V. %		4.97	.71	3.52	4.60	18.05	15.10

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

Table 5. Agronomic data from the off station spring barley nursery grown on the Rodney Vannoy farm, Greenough, MT. in 1982. Random block design, four replications, size of plot:32 sq.ft.

Planting date: May 10,1982 Harvest date: September 22,1982

VARIETY	YIELD BU/A	TEST WT LB/BU	% PLUMP	HEIGTH INCHES
MT 729 SUMMIT	59.92	50.40a	93.50	24.02
CI 15514 HECTOR	58.91	48.65	94.75	25.59a
CI 16181 PURCELL	55.50	48.62	95.25	22.05
VD 3 MENUET	55.28	48.37	97.25	21.16
CI 15478 KLAGES	55.16	47.43	94.50	25.00a
CI 9558 PIROLINE	54.33	49.80a	95.25	26.18a
MT 73708 SCASHABET	52.42	48.65	90.25b	27.66a
VD 22872 PISTON	52.37	48.05	96.25	20.77
SK 76333 KLAGES/S72114 (TR 441	51.81	47.85	96.00	23.43
MB731540 NORBERT,TR206	51.36	47.73	95.75	26.28a
CI 15857 CLARK	49.53	48.00	93.50	22.74
CI 15860 KARLA	48.30	46.55b	93.25b	24.51
CI 15773 MOREX	46.47	47.50	94.50	27.07a
CI 15769 GLENN	45.47	45.70b	91.00b	25.89a
$\bar{X}$	52.63	48.09	94.36	24.45
F 2/	.60	9.44*	*2.07*	3.13**
S.E.X.	5.49	.39	1.35	1.23
L.S.D.	15.72	1.11	3.87	3.52
C.V. %	10.44	.80	1.43	5.03

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

Table 6. Agronomic data from the off station barley nursery grown on the Robert Bailey farm, Corvallis, MT in 1982. Random block design, four replications.

Planting Date: 4/23/82 Harvest Date: 8/26/82
Size of Plot: 32 sq. ft.

	VARIETY	HEIGTH INCHES		% PLUMP		YIELD BU/A		TEST WT LB/BU		LODGING ANGLE		LODGING %	
CI 15514	0221HECTOR	35.33	a	94.50		129.16		55.15		1.00		20.00	
MT 729	0221SUMMIT	34.15	a	93.00	b	127.17		55.00		.00		.00	
CI 15860	KARLA	37.89	a	93.75		123.45		51.20	b	.00		.00	
CI 15478	0221KLAGES	37.30	a	96.75		121.38		54.47		1.75		24.75	
CI 16181	0221PURCELL	31.99		95.00		119.67		54.05		1.75		49.50	a
SK 76333	KLAGES/S72114 (TR 441	33.07		95.50		119.22		54.60		.50		10.00	
CI 9558	0221PIROLINE	33.96	a	95.50		117.89		55.15		1.75		48.50	a
VD 3	022 MENUET 1/	31.20		97.25		117.63		55.05		.00		.00	
VD 22872	PISTON	32.18		95.75		116.28		54.23		.00		.00	
MB731540	NORBERT,TR206	37.40	a	96.25		113.67		54.15		.00		.00	
CI 15769	GLENN	36.91	a	95.50		112.00		50.50	b	.00		.00	
MT 73708	SCASHABET	37.70	a	91.50	b	111.08		53.00	b	4.00	a	81.00	a
CI 15857	0221CLARK	36.52	a	91.75	b	99.23	b	53.60	b	3.00	a	57.00	a
CI 15773	MOREX	38.48	a	96.25		98.83	b	52.33	b	.25		24.75	
$\bar{x}$		35.29		94.87		116.19		53.75		1.00		22.54	
F 2/		7.72**		2.07*		2.98**		13.05**		2.31*		2.61*	
S.E.$\bar{x}$		.90		1.23		5.17		.41		.85		16.49	
L.S.D. (.05)		2.56		3.53		14.78		1.17		2.42		47.17	
C.V. %		2.54		1.30		4.45		.76		84.57		73.17	

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

Table 7. Summary of yield and test weight from irrigated spring barley nurseries in Lake, Missoula, Ravalli and Flathead Counties in 1982.

CI. or State No.	Variety	Yield Bu/A 1/	2/	3/	4/	Ave.	Test Weight 1/	2/	3/	4/	Ave.
CI 15860	Karla	125.2	48.3	123.5	84.8	95.5	46.9	46.6	51.2	48.4	48.3
CI 15769	Glenn	110.0	45.5	112.0	-	89.2	49.2	45.7	50.5	-	48.5
CI 15773	Morex	107.2	46.5	98.8	83.6	84.0	49.8	47.5	52.3	49.9	49.9
CI 15478	Klages	103.1	55.2	121.4	87.2	91.7	49.7	47.4	54.5	51.1	50.7
CI 16181	Purcell	100.0	55.5	119.7	85.8	90.3	49.3	48.6	54.1	50.2	50.6
VD 3	Menuet	98.9	55.3	117.6	79.7	87.9	52.0	48.4	55.1	52.5	52.0
MB 73154	Norbert, TR206	96.3	51.4	113.7	93.3	88.7	50.4	47.7	54.2	51.2	50.9
VD 22872	Piston	95.9	52.4	116.3	79.1	85.9	51.9	48.1	54.2	51.6	51.5
MT 73708	Seashabet	93.0	52.4	111.1	91.3	87.0	48.2	48.7	53.0	49.9	50.0
SK 76333	Klages/S72114	92.2	51.8	119.2	-	87.7	49.9	47.9	54.6	-	50.8
CI 9558	Piroline	91.7	54.3	117.9	-	88.0	50.5	49.8	55.2	-	51.8
MT 729	Summit	91.2	59.9	127.2	85.8	91.0	51.2	50.4	55.0	51.6	52.1
CI 15514	Hector	89.3	58.9	129.2	88.1	91.4	50.4	48.7	55.2	51.9	51.6
CI 15857	Clark	79.8	49.5	99.2	86.9	78.9	49.7	48.0	53.6	51.6	50.7
	$\bar{x}$	98.1	52.6	116.2	86.0	88.2	49.9	48.1	53.8	50.9	50.7
	F 5/	5.03**	.60	2.98**	2.10**		14.36**	9.44**	13.05**	26.61**	
	S.E.$\bar{x}$	4.87	5.49	5.17	5.80		.35	.39	.41	.33	
	L.S.D.(.05)	13.94	15.72	14.78	16.21		1.01	1.11	1.17	.92	
	C.V.%	4.97	10.44	4.45	6.99		.71	.80	.76	.65	

1/ Lake County
2/ Missoula County
3/ Ravalli County
4/ Flathead County
5/ F - value for variety comparisons
** Indicates statistical significance at the .01 level

Table 8. Summary of height and percent plump from irrigated spring barley nurseries in Lake, Missoula, Ravalli and Flathead Counties in 1982.

CI or State No.	Variety	Height (inches) 1/	2/	3/	4/	Ave.	% Plump 1/	2/	3/	4/	Ave.
CI 15860	Karla	35.9	24.5	37.9	26.6	31.5	73.5	93.3	93.8	89.8	87.6
CI 15769	Glenn	32.8	25.9	36.9	-	31.9	88.8	91.0	95.5	-	91.8
CI 15773	Morex	36.4	27.1	38.5	31.4	33.4	86.3	94.5	96.3	96.3	93.4
CI 15478	Klages	36.0	25.0	37.3	25.0	30.8	64.5	94.5	96.8	87.8	85.9
CI 16181	Purcell	33.2	22.1	32.0	27.1	28.6	64.0	95.3	95.0	86.5	85.2
VD 3	Menuet	36.0	21.2	31.2	24.2	28.2	82.0	97.3	97.3	96.0	93.2
MB 73154	Norbert,TR206	37.3	26.3	37.4	25.8	31.7	73.3	95.6	96.3	93.3	89.6
VD 22872	Piston	35.9	20.8	32.2	24.0	28.2	79.5	96.3	95.8	94.5	91.5
MT 73708	Scashabet	36.5	27.7	37.7	27.3	32.3	59.8	90.3	91.5	84.0	81.4
SK 76333	Klages/S72114	33.0	23.4	33.1	-	29.8	76.0	96.0	95.5	-	89.2
CI 9558	Piroline	35.0	26.2	34.0	25.5	30.2	70.8	95.3	95.5	89.0	87.7
MT 729	Summit	34.7	24.0	34.2	-	31.0	63.5	93.5	93.0	-	83.3
CI 15514	Hector	38.0	25.6	35.3	26.6	31.4	68.5	94.8	94.5	89.5	86.8
CI 15857	Clark	36.3	22.7	36.5	26.4	30.5	67.3	93.5	91.8	94.0	86.7
	$\bar{x}$	35.5	24.5	35.3	25.6	30.2	72.7	94.4	94.9	90.9	88.2
	F^{5}	.95	3.13**	7.72**	8.22**		12.10**	2.07	2.07**	7.51**	
	S.E.$\bar{x}$	1.63	1.23	.90	.86		2.56	1.35	1.23	2.24	
	L.S.D. (.05)	4.67	3.52	2.56	2.41		7.33	3.87	3.53	6.26	
	C.V.%	4.60	5.03	2.54	3.36		3.52	1.43	1.30	2.46	

1/ Lake County
2/ Missoula County
3/ Ravalli County
4/ Flathead County
5/ F - Value for variety comparison
** Indicates statistical significance at the .01 level

TITLE: Spring Oats

PROJECT: Small Grains Ivestigations MS 756

YEAR: 1982

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - Feed Crops Committee MAES, MSU
USDA-AR

LOCATION: Northwestern Agricultural Research Center

OBJECTIVE: To determine the adaptability of new or introduced oat varieties in Montana.

SUMMARY OF 1982 RESULTS:

Due to severe lodging resulting from heavy summer rains yields could not be taken from the 1982 oat nursery. The varieties Ogle and CI 9409 showed the least lodging tendency within the nursery.

Heading dates were approximately four days ahead of last year.

Height for all varieties was normal this year and varied according to variety differences.

SPRING OAT VARIETIES

SPRING OAT VARIETIES RECOMMENDED FOR WESTERN MONTANA

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

CHARACTERISTICS OF RECOMMENDED VARIETIES

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

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

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

Recommended Oat Varieties (cont'd)

4. Otana

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

5. Border

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

Table 1. Agronomic data from the Uniform Northwestern States Oats nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT. in 1982. Field No. Y-4.

Date seeded: April 22,1982 (No harvest taken)
Size of plot: 32 sq. ft.

	VARIETY	HEADING DATE	HEIGHT INCHES	LODGING ANGLE	LODGING %
WA 6159	CI2874/CAYUSE	186.33	48.23	7.00	50.00
CI 9297	WA 6014	186.33	45.08	6.00	73.33
WA 6394	MINN.II-22-220/CAYUSE	185.67	46.26	6.00	75.00
ID742608	CAYUSE/OTANA	185.33	48.03	5.33	45.00
ID784122	CAYUSE/71AB670	185.00	44.49	7.00	66.67
CI 9252	OTANA 1/	184.67	48.23	6.00	68.33
ID742300	OTANA//COKERX848-1-1-	184.67	45.67	5.67	53.33
ID 75861	CAYUSE/OTANA	184.67	49.80	6.67	61.67
CI 6611	PARK	184.33	44.49	7.33	70.00
OT 307	S 7884 (GEMINI/CLINTF	184.33	50.00	5.33	40.00
OT 308	S 7886 (GEMINI/CLINTF	184.00	48.03	5.67	46.67
P 70408E	STOUT/P623	184.00	48.62	5.00	66.33
CI 9266	CAYUSE/ORBIT	184.00	47.05	5.00	45.00
ID751170	CAYUSE/OTANA	183.67	48.82	6.67	63.33
OT 726	CASCADE (RANDON/FORWA	183.67	50.98	4.33	41.67
CI 9263	MENOMINEE	183.00	47.44	7.67	78.33
CI 9409	SEL NY COMPOSITE 1	182.67	43.50	3.00	66.33
CI 8263	CAYUSE	182.67	42.13	6.33	80.00
CI 9408	ORBIT//CI6936/CLINTLA	182.33b	46.65	5.33	65.00
CI 2053	MARKTON	181.00b	52.76	7.00	80.00
ID766843	K71299/3/OTANA/2/COKE	179.67b	42.52	6.33	71.67
CI 9401	OGLE	179.00b	45.87	4.33	25.00
CI 9081	RANDOM	179.00b	46.46	7.67	83.33
	X	183.48	47.00	5.94	61.57
	F 2/	5.00**	9.33**	.73	.62
	S.E.X.	.75	31.22	.99	14.20
	L.S.D.	2.15	91.56	2.82	40.49
	C.V.%	.41	66.41	16.64	23.07

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

TITLE: Spring Wheat

PROJECT: Small Grains Investigations MS 756

YEAR: 1982

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - Wheat Research Committee MAES
USDA-SEA-AR
Montana Wheat Research & Marketing Comm.

OBJECTIVES:

1. To determine the adaptability of new and introduced spring wheat varieties and selections.

2. To aid in basic genetic research programs in spring wheat.

EXPERIMENTS FOR 1982:

1. Private Variety Nursery
2. Western Regional Spring Wheat Nursery

RESULTS AND DISCUSSION:

Good yields were recorded from the Private Variety Nursery with five varieties yielding significantly higher than the check variety, Newana. Seven other varieties tested produced above the 100 bu/a mark. Thirteen varieties yielded significantly less than the check variety, eleven of those due to severe lodging problems. Test weights were above normal throughout the study and only three varied significantly from the check variety. Heading dates were about equal to last year with those dates and heights varying because of variety differences. The majority of the taller varieties (over 39.5 inches) were susceptible to lodging. All varieties were reported to have some level of tan spot (Pyrenophora trichostonia) with seven varieties having significantly less infection than Newana (15%).

Western Regional Spring Wheat Nursery - Excellent yields were harvested from the Western Regional Spring Wheat Nursery. Of the seven varieties producing yields significantly higher than the check (Owens) six were white. The Washington Potam 7/WA6021 K790 crosses were all significantly high yielders in this study. Almost three-fourths of this nursery yielded above 103 bu/a.

Test weights were slightly above normal (last 3 years average) with the average being 55.86 lbs/bu.

Tan spot was recorded in all varieties, but did not get above a 15% infection level as was reported in WA6826 and UT541777.

Lodging was most prevalent in those varieites which produced significantly less than the check. Two Idaho varieties (ID246 and ID172) were susceptible to lodging, yet still yielded satisfactorily.

SPRING WHEAT VARIETIES

SPRING WHEAT VARIETIES RECOMMENDED FOR WESTERN MONTANA

Hard Red Varieties

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

Soft White Variety

1. Owens - dryland and irrigated

CHARACTERISTICS OF RECOMMENED VARIETIES

Hard Red Varieties

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

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

Recommended Spring Wheat Varieties (cont'd)

3. Newana

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

4. Fondera

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

5. Marbera

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

Soft White Varieties

1. Owens

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

TABLE ___1___. Agronomic data from the Private Variety Spring Wheat Nursery grown on the the Northwestern Agricultural Research Center, Kalispell,MT. in 1982. Field no. Y-4. Random block design, four replications.

Date seeded: April 22,1982 Date harvested: September 22,1982
Size of plot: 32 sq. ft.

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGTH INCHES	LODGING ANGLE	LODGING %	% TAN 3/ SPOT
CI 17903	0122MCKAY	117.26a	57.27	181.75	37.89a	.00	.00	3.00b
MN 70170	0122WALDRON/ERA	115.41a	57.68	180.00b	36.22	.00	.00	23.75
CI 17911	WAVERLY	114.21a	54.08b	182.50	36.02	.00	.00	10.50
NK 2631	0122755 2631	114.19a	57.50	182.50	40.75a	.00	.00	2.00b
NA 79561	NA 79561	110.79a	56.15	180.25b	35.93	.00	.00	10.50
CI 17904	01200WENS	109.77	56.52	181.00	37.50a	2.00	28.75	5.75
NA 18374	0122NHS 183-74	108.30	55.58	177.00b	34.35	.00	.00	12.50
CI 17691	0122WAMPUM (WA6105)	106.40	55.03b	181.25	41.63a	.00	.00	7.75
WB 1	0122AIM (WPB)	105.21	57.67	179.75b	35.73	.00	.00	23.75
AG 1	SOLAR	104.50	57.27	182.75a	37.70a	.00	.00	3.25b
NK 55114	755 5511-4	104.00	58.22	181.00	38.48a	.00	.00	6.75
WS 4194	WS 4194	103.79	56.20	179.00b	39.17a	.50	2.50	2.25b
CI 17438	0124CANDO (DURUM)	99.51	55.77	181.50	33.17	.00	.00	14.25
CI 17430	0122NEWANA,MT 7156	98.02	56.73	181.50	34.45	.00	.00	15.00
AG 2634	0122WALERA	95.39	56.83	182.25	35.43	.00	.00	10.00
CI 17407	0122PRODAX/MT 34	90.71	53.80b	180.50	36.81	.75	5.00	12.50
CI 17789	0124VIC(DURUM)	90.71	57.18	180.75	44.09a	1.50	21.25	9.00
CI 15892	0124WARD (DURUM)	89.36	57.50	179.50b	42.32a	1.25	20.00	4.25b
CI 17829	0122MARBERG	88.17	56.25	177.75b	36.12	.50	18.75	25.00
CI 17790	0122LEN (ND543)	85.14b	56.40	179.00b	35.53	.00	.00	28.75a
CI 15930	0122OLAF	84.71b	55.65	178.50b	35.53	1.00	18.75	25.00
CI 17282	0124CROSBY	83.97b	56.40	179.75b	41.73a	2.50a	36.25a	4.00b
WS 4093	WS MP 4093	79.04b	54.18b	178.50b	34.15	4.00a	85.00a	32.50a
CI 17286	0122TIOGA	79.00b	57.48	181.00	42.32a	5.50a	95.75a	5.50
CI 10003	0122THATCHER	78.05b	55.75	179.75b	44.29a	6.00a	87.25a	6.75
CI 17910	0122ALEX (ND 550)	76.35b	56.30	180.50	42.13a	4.00a	72.25a	5.50
CI 17681	0122BUTTE	74.82b	57.10	178.50b	39.57a	4.25a	58.75a	10.50
RL 4352	COLUMBUS	73.30b	55.90	182.50	44.98a	6.25a	72.50a	11.50
SD 2868	CENTA	70.71b	55.58	177.25b	39.57a	6.75a	91.25a	3.25b
CANADA	LEADER	70.50b	55.23	180.75	39.57a	5.25a	72.25a	9.00
CI 13596	0122FORTUNA	66.81b	54.12	180.25b	40.85a	7.00a	93.25a	7.75
I 17429	0122LEW,MT 711	66.46b	.52	181.75	42.72a	6.50a	89.75a	5.50

Table 1. (con't)

	X	92.33	56.31	180.33	38.65	2.05	30.29	11.16
	F 3/	14.35**	3.88**	15.68**	17.45**	11.65**	12.67**	5.02**
	S.E.X	4.20	.55	.39	.80	.75	10.41	3.71
	L.S.D. (.05)	11.79	1.54	1.11	2.24	2.10	29.25	10.43
	C.V. %	4.55	.98	.22	2.07	36.52	34.38	33.27

1/ Check variety
2/ Tan spot (Pyrenophora trichostoma) Ocular rating, % flag leaf infected.
3/ F value for variety comparison
a/ Values significantly greater than the check at the .05 level
b/ Values significantly less than the check at the .05 level
** Indicates statistical significance at the .01 level
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Table 2. Agronomic data from the Western Regional Spring Wheat Nursery grown on the Northwestern Agricultural Research Center, Kalispell, MT. in 1982. Field No. Y-4. Random block design, four replications.

Date seeded: April 22, 1982 Date harvested: September 16,1982 Plot size: 32 ft^2

		VARIETY		YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGTH INCHES	% TAN SPOT	LODGING ANGLE	LODGING %
ID	236	0120FLR/5/BBII/4/7*SFL/3/	3/	131.31a	57.80	182.75a	42.72a	4.25	.00	.00
ID	247	COMPLEX PEDIGREE	2/	129.76a	57.08	181.75a	39.17a	2.00	.00	.00
WA	6919	POTAM 70/WA 6021,K790	3/	128.95a	58.02a	180.00	37.40	5.00	.00	.00
WA	6920	POTAM 70/WA 6021,K790	3/	127.59a	57.90	180.75	37.50	5.25	.00	.00
WA	6918	POTAM 70/WA 6021,K790	3/	127.02a	57.73	180.00	36.12	7.50	.75	6.25
WA	6917	POTAM 70/WA 6021,K790	3/	126.62a	58.58a	181.00	37.60	7.50	.00	.00
WA	6916	POTAM 70/WA 6021,K790	3/	126.57a	57.60	179.00b	36.52	6.25	.00	.00
ID	234	0120FLR/5/BBII/4/7*SFL/3/	3/	122.50	56.77	182.50a	42.42a	4.00	1.25	7.50
ID	235	0120FLR/5/BBII/4/7*SFL/3/	3/	122.10	56.75	183.75a	40.16a	4.00	.00	.00
ID	172	0120HYSLOP/FIELDER	3/	119.68	56.67	182.00a	37.60	5.00	.75	22.50
ID	224	0120FIELDER/5/BB II/4/7*S	3/	119.00	55.43b	182.75a	38.39a	6.25	.00	.00
ID	233	0120FLR/5/BBII/4/7*SFL/3/	3/	116.35	56.68	183.00a	42.13a	4.00	.00	.00
UT	209	UTAH W498-259/PROSPUR	2/	116.04	56.50	179.50	41.93a	5.50	.75	18.75
CI	17904	01200WENS 1/	3/	114.72	56.83	180.50	36.32	7.75	.00	.00
ID	246	COMPLEX PEDIGREE	3/	112.91	53.12b	178.75b	37.40	11.25	2.75a	36.25a
WA	6830	0120POTAM 70/WA6021	2/	112.30	55.38b	180.25	37.70	12.50	.00	.00
CI	17903	0122MCKAY	2/	112.01	57.45	180.75	37.70	9.00	.00	.00
WA	6826	0120POTAM 70/WA6021	2/	111.90	56.70	180.75	38.88a	15.00a	.00	.00
UT	541774	0122BANNOCK/738-274-1	2/	111.28	56.95	179.25b	38.29a	15.00a	.00	.00
WA	6831	0120POTAM 70/WA6021	2/	109.12	55.10b	180.75	37.30	11.25	.00	.00
UT	541777	0122BANNOCK/738-274-1	2/	107.72	56.00	178.75b	37.80	12.50	.00	.00
CI	17911	WAVERLY	3/	106.67	52.55b	181.00	35.73	7.75	.00	.00
ID	190	0120ID0046/7/ID0045/6/	3/	103.64b	55.35b	181.25	39.07a	12.50	.00	.00
UT	1655	UTAH W498-165/PRODAX	2/	99.91b	53.05b	180.75	38.48a	8.75	.75	24.75
ID	227	COMPLEX PEDIGREE	3/	99.65b	52.00b	181.25	36.61	11.25	.00	.00
UT	391	UTAH W498-165/PEAK 72	2/	98.79b	57.83	180.75	39.96a	4.00	2.00a	15.00
WA	6921	LIFN*2-N1220/POTAM 70	3/	98.29b	55.83	178.50b	37.11	12.50	3.00a	61.00a
ID	232	0120ID0118/OASIS/3/5*TWIN	3/	94.42b	51.52b	180.25	37.80	12.50	1.25	7.50
UT	2746	UTAH W498-165/BORAH	2/	89.51b	55.38b	180.50	36.42	6.50	2.50a	43.50a
ID	238	COMPLEX PEDIGREE	2/	85.34b	54.93b	177.25b	34.94	5.00	.75	24.75
SD	8015	JAMES/DAWN	2/	80.11b	57.90	176.75b	37.11	8.75	1.50	31.25
CI	4734	0120FEDERATION	3/	59.26b	50.25b	179.75	38.19	7.75	2.25a	48.50a

Table 2. (con't)

	YIELD	T.W.	HEADING	HT.	TAN SPOT	L.A.	LOD.%
-							
X	110.03	55.86	180.52	38.20	8.06	.63	10.86
F 5/	17.48**	28.78**	16.25**	7.73**	2.25**	1.92**	1.88*
S.E.X.	3.90	.39	.39	.70	2.39	.68	12.40
L.S.D.(.05)	10.94	1.11	1.10	1.96	6.71	1.90	34.82
C.V. %	3.58	.71	.22	1.82	29.62	106.98	114.17

1/ Check variety
2/ Hard red spring wheat variety
3/ Soft white spring wheat variety
4/ Tan spot (Pyrenophora trichostoma) Ocular rating, % flag leaf infected
5/ F value for variety comparison
* Indicates statistical significance at the .05 level
** Indicates statistical significance at the .01 level
a/ Values significantly greater than the check (.05 level)
b/ Values significantly less than the check (.05 level)

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Table 3. Summary of the Western Regional Spring Wheat Nursery yields grown at t[illegible] Northwestern Agricultural Research Center, Kalispell, MT 1979-1982.

C.I. or State No.	Variety	1979	1980	1981	1982	Ave.	Sta. Yrs.	% Owens
CI 4734	Federation	78.2	45.2	42.4	59.3	56.3	4	57
CI 17904	Owens (ID 0185)	114.8	93.9	73.5	114.7	99.2	4	100
CI 17903	Mckay (ID 0167)		98.1	93.9	112.0	101.3	3	108
UT 541774	Bannock/738-274-1		92.2	65.1	111.3	89.5	3	95
UT 541777	Bannock/738-274-1		83.7	65.5	107.7	85.6	3	91
ID 172	Hyslop/Fielder		69.5	51.6	119.7	80.3	3	85
WA 6831	Potam 70/WA 6021			95.0	109.1	102.1	2	108
WA 6830	Potam 70/WA 6021			94.1	112.3	103.2	2	110
WA 6826	Potam 70/WA 6021			92.0	111.9	102.0	2	108
ID 232	ID0118/Oasis/3/5*Twin/ID			83.7	94.4	89.1	2	95
ID 236	FLR/5/BBII/4/7*SFL/3/AS			74.2	131.3	102.8	2	109
ID 235	FLR/5/BBII/4/7*SFL/3/AS			73.4	122.1	97.8	2	104
ID 190	ID 0046/7/ID 0045/6/			70.6	103.6	87.1	2	93
ID 224	Fielder/5/BBII/4/7			66.5	119.0	92.8	2	99
ID 233	FLR/5/BBII/4/7*SFL			65.9	116.4	91.2	2	97
ID 234	FLR/5/BBII/4/7*SFL			61.3	122.5	91.9	2	98
ID 247	Complex Pedigree				129.8	129.8	1	113
WA 6919	Potam 70/WA 6021, K790				129.0	129.0	1	112
WA 6920	Potam 70/WA 6021, K790				127.6	127.6	1	11[illegible]
WA 6918	Potam 70/WA 6021, K790				127.0	127.0	1	1[illegible]
WA 6917	Potam 70/WA 6021, K790				126.6	126.6	1	110
WA 6916	Potam 70/WA 6021, K790				126.6	126.6	1	110
UT 209	Utah WA498-259/Prospur				116.0	116.0	1	101
ID 246	Complex Pedigree				112.9	112.9	1	98
CI 17911	Waverly				106.7	106.7	1	93
UT 1655	Utah W498-165/Prodax				99.9	99.9	1	87
ID 227	Complex Pedigree				99.7	99.7	1	87
UT 391	Utah W498-165/Peak 72				98.8	98.8	1	86
WA 6921	LIFN*2-N1220/Potam 70				98.3	98.3	1	86
UT 2746	Utah W498-165/Borah				89.5	89.5	1	78
ID 238	Complex Pedigree				85.3	85.3	1	74
SD 8015	James/Dawn				80.1	80.1	1	70

TITLE: Winter Wheat

PROJECT: Small Grain Investigations MS 756

YEAR: 1982

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - G. A. Taylor, Plant and Soil Science, MSU
J. A. Hoffman, USDA-ARS, Logan, UT
Cooperating Agencies - Montana Wheat Research Committee
Montana Agricultural Experiment Station
Montana Wheat Research & Marketing Committee
Montana Cooperative Extension Service

LOCATIONS: Northwestern Agricultural Research Center
Lance Claridge Farm, Kalispell
Ross McInyre Farm, Stevensville
Joe Holland Farm, Plains
Arthur Mangles Farm, Polson
Bill Lucier Farm, Missoula

OBJECTIVES:

1. To obtain information necessary to make varietal recommendations and evaluate new varieties and selections.

2. To obtain from a cooperative program with the USDA-ARS in the Pacific Northwest wheat germ plasm or varieties that have resistance to dwarf smut (Tilletia controversa Kuhn) and stripe rust (Puccinia striiformis West.)

INTRODUCTION:

The winter of 1982 was near normal for temperature, however precipitation levels were higher than normal in December, January and February. Because this precipitation came mainly as snow we did have relatively good snow cover during the winter season, and during the period when dwarf smut infections would be developing. With this snow cover we did not have the level of dwarf smut that I would have anticipated in the Stillwater area.

Precipitation levels were below normal in May and June and quite low in August. Somewhat higher in July, however the pattern was such that we did not have a high level of stripe rust or other foliar diseases developing in winter wheat.

In September and October of 1982 we established a new study to evaluate the effects of tillage on the levels of dwarf smut over a long period of time. In this study we will be evaluating three tillage types in our dwarf smut field laboratory located on the Lance Claridge farm northwest of Kalispell. This study is planned to run a minimum of five years, but we would prefer a 10 year period to determine the effect of tillage methods on dwarf smut inoculum levels.

1982 EXPERIMENTS:

1. Western Regional Hard Red Winter Wheat Nursery
   (a) Kalispell
   (b) Stillwater

2. Western Regional White Winter Wheat Nursery
   (a) Kalispell
   (b) Stillwater

3. USDA-ARS Cooperative Studies - Stillwater
   (a) Fungicide Evaluations
   (b) Breeding Lines Tested for Smut Resistance
   (c) Cooperative Dwarf Bunt Study with the Peoples Republic of China

4. Off Station Variety Nurseries
   (a) Ross McIntyre Farm, Stevensville, Ravalli County
   (b) Bill Lucier Farm, Missoula, Missoula County
   (c) Art Mangles Farm, Polson, Lake County

5. Preliminary Evaluations of Hard Red Winter Wheat
   (a) Kalispell

1982 RESULTS:

Western Regional Hard Red Winter Wheat Nursery - Kalispell

In 1982 the yields were considerably higher than in 1981. This is in part due to timeliness of rain, and a less foliar disease problem than we had in 1981. The highest yielding variety in the test was OR7921 (115.3 bu/a) which was significantly higher than the variety Crest used as a check. It was not statistically higher than Winridge, a newly released variety. The Oregon variety did have 1.12% smut factor which could be a little high for a light smut year, when compared to Karkof 5.5%. The variety has good straw strength and has an earlier heading date than Winridge, but somewhat later than Crest. There were 10 entries that exceeded 100 bu/a in this test, but only one of those showed fair smut resistance (OR 7930 - .62%). MT77066 yielded 100 bu/a, shows good smut resistance, but has a very weak straw. Weston, an Idaho variety, shows good smut resistance as does UT125327. These varieties yielded 98 plus bu/a.

The evaluation for smut resistance is just fair in this test. The smut level of Karkof, a very susceptible variety, was only 5.5% and a variety having 1% would be suspect as far as being smut susceptible under a heavy infestation. UT125327, ID0243, ID002616 and UT125512 had zero dwarf smut readings. Table 1

Test weights were somewhat below the standard 61 lbs/bu. Only ORCR8107 exceeded the standard weight.

Lodging was quite severe. There are a few varieties that have sufficient straw strength for this location. WA6816 and OR7921 had fair straw strength. Most of the Idaho and Montana lines are very susceptible to lodging.

Western Regional Hard Red Winter Wheat Nursery - Stillwater

Yields continue to increase each year in this location. The mean for this year was 83 bu/a with a range of 94.1 to 64.79 bu/a. UT125327 is the highest yielding entry in the nursery and has good smut resistance in this test. In the Kalispell location it showed no smut, whereas in the Stillwater location it showed .12% smut. Winridge, a new release yielded 92.5 bu/a which is not significantly higher than Crest, and shows a fair degree of smut resistance. ID0215 and ID0216 are the only two varieties that show no smut in this location.

Winridge had a test weight of 62.5 lbs/bu which is about the mean level of the entire experiment.

Dwarf smut at this location was light to moderate and Karkof, a very susceptible variety only had 2.25% whereas Wanser, probably equal in susceptibility, is 3.5%. MT 77002 was 5% which indicates to the author that this variety is even more susceptible than Karkof. With the snow cover at this location, we would have anticipated higher levels of dwarf smut than we found, however this is due in part because snow cover did not come early in the fall of 1981.

Six varieties showed a degree of lodging, from moderate to severe, in this study. This is in contrast to the Kalispell location where lodging was severe in most entries in the test. Table 2

Western Regional White Wheat Nursery - Kalispell

Luke was the high yielding entry in this nursery with 140.9 bu/a which is 23 bu/a greater than the mean. Lewjain, a newly released variety, was approximately 10 bu/a less in yield, however this difference was not statistically significant. There were 10 varieties or lines that exceeded 130 bu/a in this study. Yields ranged from 59.7 bu/a to 140.5 bu/a.

Test weight mean was 58.56 lbs/bu. The variety Daws had the highest test weight at 62.37 lbs/bu. Luke reached the standard of 60 lbs/bu and Lewjain was 59.4 lbs/bu.

Smut levels were moderate at this location. The susceptible variety Karkof had a reading of 5.25%. WA6696 was close behind (4.75%), Luke and Lewjain both had 1% plus dwarf smut levels. It should be noted that not a variety in this test was 100% smut free.

Lodging evaluation are significant. We have differential lodging in this experiment between varieties. Moro, Elgin and Karkof were severely lodged, Luke was lightly lodged, about 12%, whereas Lewjain showed no indication of lodging in this location. Table 3

Western Regional White Wheat Nursery - Stillwater

Yields at this location are quite high for the white wheats. Using Luke as the check (101.11 bu/a) we only find four varieties that are significantly higher in yield than Luke. The mean for the nursery was 91.73 bu/a. This illustrates a rather high productive level of these varieties in this test.

Test weights are lighter than we would have anticipated for this location.

Karkof had a smut level of 4.75% which is relatively light. It is interesting to note that Nugaines had approximately the same level of dwarf smut (4%) as we found in Karkof. Table 4

Off Station Nurseries

Four off station nurseries were planted in the fall of 1981. These were located in Missoula, Ravalli, Lake and Sanders Counties. Of the four planted only two were harvested in the fall of 1982.

Missoula County - In this location the nursery was seeded in a field that had been prepared for winter wheat. The operator then seeded the remaining part of the field and seeded through the nursery. In my 30 years of experience, I do not think this has ever occurred in my cooperative work.

Ravalli County - This was located on the Ross McIntyre Farm in Ravalli County. A grower we have worked with for many years. The nursery was located in a fallowed area with no crops seeded around it. Wild game found the seeding and selectively grazed varieties, thus destroying any possibility of obtaining data.

Sanders County - This nursery was located on the Joe Holland farm near Plains, MT. Luke was the high yielding variety in the nursery with 114.3 bu/a. Crest was the lowest with 58.62 bu/a. Winridge, a newly released hard red variety yielded 75.2 bu/a and was significantly lower in yield than the variety Luke.

No variety was entirely free of dwarf smut, however the level was not high, 4% reading. Lewjain and Winridge had the lowest smut readings in the test. Luke was somewhat higher than Lewjain with 1.8%.

Test weights varied from about 61 lbs/bu to 56 lbs/bu with a mean of 58.7 lbs/bu. Luke and Lewjain came close to meeting the 60 lbs/bu standard.

Lodging was quite high in the hard red winter varieties with no real severe problem in the soft whites except Luke had 24% lodging compared to Lewjain with 12%. Table 5

Lake County - This nursery was grown on the Art Mangles farm near Polson, MT. Yields were quite low, but understandably so in this rather light sandy soil. The mean was 43.46 bu/a. Luke was the high yielding variety in the test. Test weights were quite good in this location with a mean of 60.2 lbs/bu, with a range of 61.75 lbs/bu down to 57.8 lbs/bu. All the varieties were quite short. Table 6

Preliminary Yield Evaluation Nursery - Kalispell

This nursery contains preliminary lines developed by Dr. Allan Taylor, Montana State University winter wheat breeder. We evaluated these lines for yield and smut resistance primarily. The mean yield of this nursery was 67.6 bu/a. The test weights were quite good, with a mean of 61 lbs/bu. Lodging was light to moderate with some varieties lodging severely, particularly those with Yogo background.

Smut was light to moderate throughout the nursery and it should be noted there was not a variety that was free of dwarf smut in this study. Considering the parentage of the material in the test we would not have anticipated any degree of smut resistance. Table 7

WINTER WHEAT VARIETIES

WINTER WHEAT VARIETIES RECOMMENDED FOR WESTERN MONTANA

Hard Red Varieties

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

Soft White Varieties

1. Luke - Dryland or irrigated

CHARACTERISTICS OF RECOMMENDED VARIETIES

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

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

Recommended Winter Wheat Varieties (cont'd)

3. Cheyenne

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

4. Winridge

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

Soft White Variety

1. Luke

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

Table 1. Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Northwestern Agricultural Research Center at Kalispell, MT. in 1982. Random block design, four replications. Field No. E-2, F-3

Date seeded: September 22, 1981 Date harvested: september 1,1982
Size of plot: 32 sq.ft.

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGTH INCHES	SMUT % 2/	LODGING ANGLE	LODGING %
OR 7921	0112BEZ/SPRAGUE SEL18-24	115.32a	59.18	168.25a	36.22	1.12	.50b	1.25b
OR 7925	0112CLAR/FEN/WA5836 SEL27	111.21	56.40b	168.25a	30.71b	1.12	1.75b	12.50b
WA 6913	0112CERCO/CI17271,N780240	110.12	60.25a	168.75a	43.41a	2.50	3.00b	15.00b
CI 17902	0112 WINRIDGE	109.57	59.52	171.25a	38.58	1.00	7.25b	95.50
WA 6816	0112ID5012/WA5866	105.86	56.68b	170.50a	35.33	1.25	.00b	.00b
OR 7930	0112BEZOSTAJA/REW	103.44	58.90	170.25a	35.63	.62	5.75b	61.00b
ORCR8107	0112ALBA/GNS//FN/SONORA64	101.70	61.75a	166.25a	33.76b	2.50	3.50b	13.75b
ID 3518	0112WA4765/3/BZ//BURT/178	101.25	56.73b	174.25a	33.17b	1.12	.75b	6.25b
WA 6817	0112WA5840/CERCO	100.78	57.58	170.00a	33.76b	3.12	2.50b	7.50b
MT 77066	0112C61-9/WLT//CRT	100.60	59.65	171.75a	41.34a	.25	7.25	77.25
CI 17727	0112 WESTON	98.96	60.62a	166.25	43.11a	.12	6.00	80.75
UT125327	0112DLM/PI173438//CLM/3/D	98.74	57.60	168.75a	34.45	.00	9.00	99.00
OR 792	0112TRIUMPH/LCR SEL126	98.07	56.58b	168.25a	38.88	1.75	5.75b	85.75
WA 6815	0112LIND SEL.	96.44	59.25	169.75a	40.55	2.75	6.00	89.50
MT 77002	0112FRD/BEZO	95.96	58.55	167.00	41.83a	.75	7.25	98.00
CI 13880	0112 CREST 1/	94.74	58.37	166.75	37.40	.12	9.00	93.00
UT125911	0112NAJAH/HNL//BGR/CI1383	90.17	58.45	165.75	42.72a	.25	9.00	99.00
ID 0244	0112JEFF//COULEE/ID0033	86.89	58.85	168.50a	35.53	.62	8.50	80.75
ID 0217	0112A667W-46/RANGER	85.30	59.25	170.00a	43.50a	.25	8.75	86.75
ID 0243	0112CI14106/CLM//MC/3/RGR	84.32	55.70b	170.50a	44.49a	.00	9.00	99.00
ID 51021	0112BEZO//BURT/178383/3/A	83.07	59.10	165.50	41.24a	.25	6.00	99.00
ID 0242	0112SM4/TD//3*IT/178383	81.55	57.67	170.75a	46.16a	.12	9.00	99.00
ID 0215	0112CNN*2/178383/3/WRR//K	80.14	57.77	171.25a	42.13a	.00	9.00	99.00
ID 51022	0112BEZO//BURT/178383/3/A	79.37	58.12	165.75	46.46a	.50	5.75b	90.50
CI 13844	0112 WANSER	76.57	57.45	167.75	42.13a	2.63	7.50	95.50
ID 0245	0112II60-155/CI14106//MC/	73.99b	55.62b	169.75a	41.54a	.25	9.00	99.00
ID 0216	0112SM4/TD//3*IT/178383	72.44b	56.85b	170.50a	44.78a	.00	6.75	74.25
CI 1442	0112 KHARKOF	67.42b	56.70b	171.00a	46.06a	5.50a	8.25	95.50
UT125512	0112DLM/PI173438//CLM/3/D	65.72b	58.83	168.00	43.60a	.00	7.50	99.00

Table 1 . (con't)

	Yield	T.W.	Heading	Ht.	%Smut	Lod<	Lod %
$\bar{X}$	92.06	58.21	196.01	39.95	1.05	6.18	70.77
F 3/	3.86**	9.68**	18.08**	15.41**	1.37	6.82**	19.01**
S.E.X.	6.96	.47	.50	1.14	1.10	1.10	8.54
L.S.D.(.05)	19.58	1.34	1.40	3.20	3.09	3.09	24.01
C.V. %	7.56	.82	.30	2.85	104.43	17.76	12.06

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

Table 2. Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Lance Claridge farm at Kalispell, MT. in 1982. Random block design , four replications. Size of plot harvested: 32 sq. ft.

Date seeded: September 22,1981 Date harvested: September 1, 1982

	VARIETY	HEIGTH INCHES	YIELD BU/A	TEST WT LB/BU	SMUT % 2/	LODGING ANGLE	LODGING %
UT125327	0112DLM/PI173438//CLM/3/D	35.04	94.11	60.97	.12	.00b	.00b
WA 6816	0112ID5012/WA5866	32.87	93.47	55.97b	1.50	.00b	.00b
ID 0244	0112JEFF//COULEE/ID0033	35.43	92.91	61.35	1.12	.00b	.00b
CI 17902	0112 WINRIDGE	38.78a	92.51	60.25	.87	.00b	.00b
MT 77066	0112C61-9/WLT//CRT	40.45a	90.75	60.10	.50	.00b	.00b
OR 7921	0112BEZ/SPRAGUE SEL18-24	29.92b	90.12	59.70b	2.75	.00b	.00b
WA 6913	0112CERCO/CI17271,N780240	41.14a	89.89	60.45	4.50a	.00b	.00b
OR 7930	0112BEZOSTAJA/REW	35.53	89.76	59.40b	2.37	.00b	.00b
ID 0243	0112CI14106/CLM//MC/3/RGR	43.11a	89.07	60.45	1.38	.00b	.00b
ID 0245	0112II60-155/CI14106//MC/	37.80	87.05	62.00a	.50	.00b	.00b
CI 17727	0112 WESTON	42.03a	86.81	63.00a	1.62	.00b	.00b
OR 792	0112TRIUMPH/LCR SEL126	36.81	86.81	60.68	1.00	.00b	.00b
CI 13880	0112 CREST 1/	35.14	86.65	60.80	1.00	3.50	83.25
ID 0217	0112A667W-46/RANGER	39.37a	86.15	62.75a	.50	.75b	25.00b
CI 13844	0112 WANSER	40.45a	82.80	61.97a	3.50	.00b	.00b
WA 6817	0112WA5840/CERCO	30.41	82.72	58.33b	3.50	.00b	.00b
ID 0215	0112CNN*2/178383/3/WRR//K	46.56a	82.15	60.35	.00	3.00	73.25
ID 3518	0112WA4765/3/BZ//BURT/178	30.61	81.77	56.80b	.25	.00b	.00b
OR 7925	0112CLAR/FEN/WA5836 SEL27	27.76b	81.45	57.60b	3.37	.00b	.00b
MT 77002	0112FRD/BEZO	39.17a	81.35	61.25	5.00a	.00b	.00b
ID 0216	0112SM4/TD//3*IT/178383	40.45a	80.56	60.65	.00	1.75b	42.50b
UT125911	0112NAJAH/HNL//BGR/CI1383	39.27a	80.06	61.95a	.37	.00b	.00b
ID 51021	0112BEZO//BURT/178383/3/A	35.93	79.77	61.43	.37	.00b	.00b
UT125512	0112DLM/PI173438//CLM/3/D	41.63a	78.74	61.33	.25	.00b	.00b
WA 6815	0112LIND SEL.	39.17a	78.67	60.70	1.12	.00b	.00b
ID 0242	0112SM4/TD//3*IT/178383	41.83a	76.19	61.12	.12a	2.25b	52.50b
ORCR8107	0112ALBA/GNS//FN/SONORA64	27.26b	71.76b	60.60	5.75	.00b	.00b
CI 1442	0112 KHARKOF	46.56a	69.67b	59.00b	2.25	.50b	24.75b
ID 51022	0112BEZO//BURT/178383/3/A	39.27a	64.79b	60.25	.75	.00b	.00b

Table 2 . (con't)

	Ht.	Yield	T.W.	%Smut	Lod <	Lod %
$\bar{X}$	37.58	83.74	60.39	1.60	.41	10.39
F 3/	26.41**	2.03**	30.98**	1.86*	12.45**	8.16**
S.E.X.	.98	5.08	.29	1.18	.27	8.10
L.S.D. (.05)	2.75	14.30	.81	3.31	.76	22.77

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

Table 3. Agronomic data from the Western Regional White Winter Wheat Nursery sr on the Northwestern Agricultural Research Center, Kalispell,MT. in 1982. Random block design, four replications. Field No.E-2, harvested plot size: 32 sq.ft

Date seeded: September 22, 1981 Date harvested: August 24, 1982

VARIETY	YIELD BU/A	TEST WT LB/BU	HEIGTH INCHES	% 2/ SMUT	LOD. ANGLE	LOD. %	HEADING DATE
CI 14586 LUKE 1/	140.49	60.17	33.66	1.00	2.00	12.50	173.50
ORCW8113 SPN//63189-66-71/BEZ	138.54	59.83	32.48	4.25a	.00	.00	169.50b
WA 6912 BUR/CI15923/NGS,VH074	137.14	59.95	33.07	2.87	2.00	7.50	172.75
OR 68007 YAMHILL/HYSLOP	133.34	59.47	36.02	2.37	.00	.00	172.50
WA 6696 DAWS/WA 5829, VH07914	132.60	61.63a	33.27	4.75a	.00	.00	173.00
ID745318 WA476511 BURT/PI 1783	132.22	58.83	33.66	2.12	.00	.00	170.25b
OR 7996 HYS/YAYLA//WA 4995/3/	131.07	58.37b	35.14	1.87	2.00	15.00	173.75
CI 13968 NUGAINES	130.85	61.25	32.68	2.75	.00	.00	171.25b
CI 17419 DAWS	130.76	62.37a	32.58	1.12	.00	.00	172.50
CI 17909 LEWJAIN	130.48	59.40	32.18	1.25	.00	.00	174.00
OR 794 YAYLA/YMH//RBS/YMH/3/	127.28	59.00	37.40a	4.75a	1.00	6.25	172.00b
WA 6914 SCT/101//3469/178383/	127.20	61.02	34.25	1.50	.00	.00	170.50b
ORCW8114 SPN//AURORA/YMH	126.31	56.00b	32.09	1.50	.00	.00	170.50b
OR 7956 DRC/68,OWW68109-IM6,R	125.41	56.45b	35.24	1.00	.00	.00	174.25
WA 6911 WA6240/NORCO,VJ080 12	124.87	59.20	33.66	.25	.00	.00	173.25
CI 17590 FARO	124.86	55.50b	34.25	2.87	2.00	12.50	169.50
WA 6915 SPRAUGE/LUKE//498,B77	124.86	57.65b	32.09	2.00	3.50	40.00a	17[illegible]
CI 17773 TYEE	124.15	56.90b	34.35	3.00	.00	.00	172.00
WA 6698 SW92/6*0/3/TSP/CT L11	122.27	59.87	36.32a	3.25	.00	.00	173.00
OR 835 1523 DRC/RBS	119.51b	58.98	32.58	2.75	.00	.00	174.75
CI 17596 STEPHENS	119.01b	59.43	32.48	1.62	.00	.00	169.00b
WA 6910 MARIS HUNTMAN/VH74521	118.89b	57.98b	34.25	4.50a	.00	.00	172.75
CI 17951 CREW	118.20b	57.63b	34.35	1.62	1.00	6.25	172.50
OR CP04 1523 DRC/RBS	117.88b	58.22b	30.91b	3.00	.00	.00	175.75a
OR 7794 REW/LUKE SEL 305	112.02b	59.85	37.89a	1.25	4.75	42.50a	169.75b
WA 6813 LUKE/VH76375	108.48b	59.10	37.50a	4.75a	3.50	25.00	172.00b
OR 797 CI14482/MORO SEL E109	107.21b	58.62b	35.04	1.12	1.25	12.50	169.00b
ORCW8110 1523 DRC DWT/YMH	99.51b	56.30b	32.78	1.50	1.25	6.25	173.00
OR 7792 PAHA/OR6857 SEL 204	98.70b	56.50b	39.07a	.87	6.50a	90.75a	173.00
WA 6819 CJ CLUB/SPRAGUE	93.84b	58.58b	32.38	1.87	3.75	47.25a	171.50b
CI 13740 MORO	84.80b	54.70b	40.85a	.62	7.75a	92.00a	171.00b
CI 11755 ELGIN	63.22b	55.50b	38.39a	2.75	8.50a	90.75a	172.75
CI 1442 KHARKOF	59.69b	58.37b	49.21a	5.25a	8.50a	99.00a	172.00b
$\bar{X}$	117.75	58.56	34.91	2.36	1.80	18.36	172.08
F 3/	7.82**	14.51**	14.15**	1.99**	6.96**	14.23**	9.98*
S.E.X.	6.96	.48	.89	.96	1.00	8.21	.53
L.S.D.(.05)	19.55	1.36	2.50	2.70	2.81	23.06	1.48
C.V.%	5.91	.83	2.55	40.75	55.68	44.73	.31

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

Table 3a. Ten year summary of yields for the Western Regional White Winter Wheat Nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT 1973-1982.

CI. or State No.	Variety	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	Ave.	Sta. Yrs.	% Nugaines
CI 1442	Kharkof	45.3	27.7	37.4	61.1	50.7	16.9	78.1	55.5	40.7	59.7	47.3	10	64
CI 11755	Elgin	50.9	59.2	42.3	67.6	57.8	21.3	94.1	68.5	42.5	63.2	56.7	10	76
CI 13740	Moro	65.6	60.3	44.0	69.8	57.0	27.8	96.3	67.4	62.5	84.8	63.6	10	86
CI 13968	Nugaines	68.5	77.9	51.8	80.2	66.0	18.9	93.7	75.3	79.1	130.9	74.2	10	100
CI 17596	Stephens	61.6	81.2	52.3	82.1	60.6	23.4	100.2	99.3	79.8	119.0	76.0	10	102
CI 17590	Faro		85.4	53.5	74.9	65.2	25.4	94.2	80.6	66.5	124.9	74.5	9	99
CI 17419	Daws		89.0	56.3	92.8	68.7	22.9	-	-	90.9	130.8	78.8	7	109
OR 68007	Yamhill/Hyslop				92.1	75.5	25.1	94.4	100.4	84.0	133.3	86.4	7	111
CI 17909	Lewjain					70.2	34.2	104.8	109.7	85.3	130.5	89.1	6	115
ID 745318	WA4765//Burt/PI178383						25.3	99.4	105.9	75.9	132.2	87.7	5	110
CI 17951	Crew						30.1	102.9	93.1	72.6	118.2	83.4	5	105
CI 14586	Luke						30.0	114.2	-	83.1	140.5	92.0	4	114
CI 17773	Tyee							114.6	82.2	91.1	124.1	103.0	4	109
WA 6698	Allan Sel. A7815								107.7	54.0	122.3	94.7	3	100
OR 797	CI14482/Moro, Sel. E109								100.3	82.6	107.2	96.7	3	102
WA 6696	Daws/WA5829/VH078141								96.3	81.4	132.6	103.4	3	109
OR 7794	Rew/Luke/Sel., 305								91.9	79.8	112.0	94.6	3	99
WA 6813	Luke/VH76375									84.7	108.5	96.6	2	92
OR 7792	Paha/OR6857,Sel.,204									77.9	98.7	88.3	2	84
OR 794	Yayla/YMH//Rieb/YMH/3/RE									74.9	127.3	101.1	2	96
OR CW8113	SPN//63189-66-71/BEZ										138.5	138.5	1	106
WA 6912	BUR/CI15923/NGS,VH074										137.4	137.4	1	105
OR 7996	HYS/YAYLA//WA4995/3/										131.7	131.7	1	101
WA 6914	SCT/101//3469/178383										127.2	127.2	1	97
OR CW8114	SPN//AURORA/YMH										126.3	126.3	1	96
OR 7956	DRC/68,OWW68109-IM6,R										125.4	125.4	1	96
WA 6911	WA6240/NORCO,VJ08012										124.9	124.9	1	95
WA 6915	Sprauge/Luke//498,B77										124.9	124.9	1	95
OR 835	1523 DRC/RBS										119.5	119.5	1	91
WA 6910	Maris Huntman/VH74521										118.9	118.9	1	91
OR CP04	1523 DRC/RBS										117.9	117.9	1	90
OR CW8110	1523 DRC DWT/YMH										99.5	99.5	1	76
WA 6819	CJ Club/Sprague										93.8	93.8	1	72

Table 9. Agronomic data from the Western Regional White Winter Wheat Nursery grown on the Lance Claridge farm at Kalispell, MT. in 2 1982. Random block design, four replications. Plot size 32 ft .

Date seeded: September 22, 1981 Date harvested: September 2, 1982

VARIETY	YIELD BU/A	TEST WT# LB/BU	HEIGTH INCHES	SMUT % 2/
WA 6915 SPRAUGE/LUKE//498,B77	104.66	58.60a	30.22	.25
CI 14586 LUKE	101.11	56.52	32.48	.12
WA 6914 SCT/101//3469/178383/	100.88	61.25a	30.51	1.87
OR 794 YAYLA/YMH//RBS/YMH/3/	99.19	57.20	34.84a	.87
OR 68007 YAMHILL/HYSLOP	98.34	58.62a	31.79	1.87
CI 17590 FARO	97.77	57.33	28.44b	1.62
ORCW8113 SPN//63189-66-71/BEZ	96.55	58.22	30.71	1.87
CI 17951 CREW	96.00	57.90	29.43b	1.25
CI 17773 TYEE	95.30	56.60	30.41	2.63a
WA 6910 MARIS HUNTMAN/VH74521	94.26	57.52	31.10	.62
OR 7996 HYS/YAYLA//WA 4995/3/	94.07	55.90	32.28	1.12
OR 7794 REW/LUKE SEL 305	94.02	60.97a	34.35	1.50
OR 835 1523 DRC/RBS	93.09	56.58	30.61	1.38
WA 6912 BUR/CI15923/NGS,VH074	92.56	57.70	29.04b	1.00
CI 13968 NUGAINES	92.42	61.48a	27.46b	4.00a
WA 6911 WA6240/NORCO,VJ080 12	92.17	58.45a	30.41	.75
WA 6819 CJ CLUB/SPRAGUE	92.16	58.50a	30.91	.87
WA 6813 LUKE/VH76375	92.15	57.55	34.55	1.25
CI 13740 MORO	92.12	58.02	35.24a	2.12
ID745318 WA476511 BURT/PI 1783	92.03	59.03a	30.41	.37
OR 7792 PAHA/OR6857 SEL 204	91.47	59.27a	36.12a	.87
CI 17596 STEPHENS	91.07	57.85	29.43b	1.87
OR 7956 DRC/68,OWW68109-IM6,R	90.20	53.35b	32.38	1.50
OR 797 CI14482/MORO SEL E109	89.61	58.88a	30.22	.50
WA 6696 DAWS/WA 5829, VH07914	88.94	61.63a	28.84b	1.12
OR CP04 1523 DRC/RBS	88.84	55.70	28.74b	1.75
CI 17419 DAWS	87.67	60.40a	28.74b	1.62
WA 6698 SW92/6*0/3/TSP/CT L11	86.87	59.43a	28.35b	1.50
CI 17909 LEWJAIN	86.72	55.85	30.31	.37
ORCW8114 SPN//AURORA/YMH	85.07b	54.05b	27.95b	1.50
ORCW8110 1523 DRC DWT/YMH	82.67b	55.77	29.13b	2.00
CI 11755 ELGIN	80.36b	58.75a	34.55	3.75a
CI 1442 KHARKOF	66.77b	58.75a	49.61a	4.75a
$\bar{X}$	91.73	57.99	31.50	1.53
F 3/	1.62*	9.72**	24.31**	1.89*
S.E.X	5.42	.64	.81	.76
L.S.D. (.05)	15.21	1.80	2.26	2.12
C.V. %	5.91	1.11	2.56	49.43

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

Table 5. Agronomic data from the off station winter wheat nursery grown on the Joe Holland farm, Plains, MT in 1981-82. Radom block design. Four replications.

Planting Date: 9/23/81 Harvest Date: 8/10/82
Size of Plot: 32 sq. ft.

C.I. or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Height Inches	Lodging Angle	Lodging %	%[2] Smut
CI 14586	Luke[1]	114.3	59.60	38.1	2.3	24.8	1.8
OR 68007	Yamhill-Hyslop 3M6	109.9	59.37	38.6	0.0b	0.0b	2.0
WA 6696	Daws/WA5829,VH079141	108.1	60.08	36.1	0.0b	0.0b	1.4
CI 17596	Stephen	107.0	58.40b	36.3	0.0b	0.0b	1.1
OR 680073	Yamhill/Hyslop 3M6	106.7	59.10	38.3	0.0b	0.0b	1.5
CI 17419	Daws	106.3	58.98	37.0	0.0b	0.0b	2.4
CI 17909	Lewjain "WA6363"	105.7	59.85b	36.7	1.8	12.5	0.4
ID 745318	WA4765//Burt/PI178383	101.3b	57.70b	37.3	3.5	15.0	1.0
CI 17730	WA4765//Burt/PI178383	98.67b	56.43b	36.0b	6.0a	62.3a	0.1
CI 17590	Faro	96.80b	56.75b	38.3	2.8	33.8	2.8
CI 17773	Tyee	96.57b	56.85b	39.6	0.8	1.3b	3.0
MT 77066	C61-a/WLT/CRT	92.00b	59.50	46.3a	6.5a	86.8a	1.1
OR 7930	Boz/Ren Sel 42-31	89.45b	58.43b	42.3a	1.3	2.5b	4.4
CI 17727	Weston	87.92b	61.38a	45.9a	6.3a	89.8a	0.5
MT 77077	Winridge	75.20b	59.93	42.8a	6.5a	96.8a	0.4
CI 13880	Crest	58.62b	56.85b	42.5a	7.8a	99.0a	4.0
	$\bar{x}$	97.17	58.70	39.5	2.828	32.77	
	F[3]	6.880**	14.64**	10.92**	6.618**	13.99**	
	S.E.$\bar{x}$	119.5	.565	27.58	1.107	10.599	
	L.S.D. (.05)	10.98	.733	2.018	2.161	20.685	
	C.V. %	5.625	.640	2.615	39.15	32.345	

1/ Check variety
2/ Smut readings = % smut heads per plot
3/ F-value for variety comparison
a/ Values significantly greater than the check .05 level
b/ Values significantly less than the check .05 level
** Indicates statistical significance at the .01 level

Table 6. Agronomic data from the off station winter wheat nursery grown on the Art Mangle farm, Polson, MT in 1981-82. Random block design. Four replications.

Planting Date: 9/24/81 Harvest Date: 9/8/82
Size of Plot: 32 sq. ft.

C.I. or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu	Height Inches
CI 14586	Luke[1/]	59.45	60.93	24.23
CI 17909	Lewjain	57.35	60.95	25.30
OR 7930	Boz/Ren Sel 42-31	51.40	60.10b	28.65a
OR 68007	Yamhill/Hyslop 3M6	46.95b	59.43b	26.77a
OR 680073	Yamhill/Hyslop 3M6	46.60b	59.05b	26.40a
ID 745318	WA4765//Burt/PI178383	46.55b	59.15b	26.58a
CI 17773	Tyee	44.87b	58.75b	22.15b
MT 77066	C61-9/WLT/CRT	43.35b	60.80	29.02a
CI 17730	WA4765//Burt/PI178383	40.83b	59.00b	26.10a
WA 6696	Daws/WA5829,VH079141	40.50b	61.75	25.30
MT 77077	Winridge	39.02b	61.12	28.35a
CI 17727	Weston	37.98b	63.03a	33.88a
CI 17596	Stephen	37.08b	59.00b	25.20
CI 17419	Daws	35.80b	62.48a	25.62
CI 17590	Faro	34.72b	57.80b	21.45b
CI 13880	Crest	32.92b	60.20	29.10a
	$\bar{x}$	43.46	60.22	26.51
	F[2/]	2.797**	58.96**	10.95**
	S.E.$\bar{x}$	4.625	.1891	.8921
	L.S.D. .05	9.027	.369	1.741
	C.V. %	10.642	.314	3.365

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

Table 6a. Summary of agronomic data from off-station winter wheat nurseries grown in Sanders, Lake and Flathead Counties in 1982.

C.I. or State No	Variety	Yield (bu/a) 2/	3/	4/	5/	Ave.	Test Wt. (lbs/bu) 2/	3/	4/	5/	Ave.	Height (inches) 2/	3/	4/	5/	Ave.	% Smut 2/	3/	4/	5/	Ave.
CI 14586	Luke[1/]	114.3	59.5	140.5	101.1	103.9	59.6	60.9	60.2	56.5	59.3	38.1	24.2	33.7	32.5	32.1	1.8	--	1.0	.1	1.0
OR 68007	Yamhill-Hyslop 3M6	109.9	47.0	133.3	98.3	97.1	59.4	59.4	59.5	58.6	59.2	38.6	26.8	36.0	31.8	33.3	2.0	--	2.4	1.9	2.1
WA 6696	Daws/WA5829, VH079141	108.1	40.5	132.6	88.9	92.5	60.1	61.8	61.6	61.6	61.3	36.1	25.3	33.3	28.8	30.9	1.4	--	4.8	1.1	2.4
CI 17596	Stephens	107.0	37.1	119.0	91.1	88.6	58.4	59.0	59.4	57.9	58.7	36.3	25.2	32.5	29.4	30.9	1.1	--	1.6	1.9	1.5
OR680073	Yamhill/Hyslop 3M6	106.7	46.6	--	--	76.7	59.1	59.1	--	--	59.1	38.3	26.4	--	--	32.4	1.5	--	--	--	1.5
CI 17419	Daws	106.3	35.8	130.8	87.7	90.2	59.0	62.5	62.4	60.4	61.1	37.0	25.6	32.6	28.7	31.0	2.4	--	1.1	1.6	1.7
CI 17909	Lewjain	105.7	57.4	130.5	86.7	95.1	59.9	61.0	59.4	55.9	59.1	36.7	25.3	32.2	30.3	31.1	.4	--	1.3	.4	.7
ID745318	WA4765//Burt/ PI178383	101.3	46.6	132.2	92.0	93.0	57.7	59.2	58.8	59.0	58.7	37.3	26.6	33.7	30.4	32.0	1.0	--	2.1	.4	1.2
CI 17730	WA4765//Burt/ PI178383	98.7	40.8	--	--	69.8	56.4	59.0	--	--	57.7	36.0	26.1	--	--	31.1	.1	--	--	--	.1
CI 17590	Faro	96.8	34.7	124.9	97.8	88.6	56.8	57.8	55.5	57.3	56.9	38.3	21.5	34.3	28.4	30.6	2.8	--	2.9	1.6	2.4
CI 17773	Tyee	96.6	44.9	124.2	95.3	90.3	56.9	58.8	56.9	56.6	57.3	39.6	22.2	34.4	30.4	31.7	3.0	--	3.0	2.6	2.9
MT 77066	C61-a/WLT/CRT	92.0	43.4	100.6	90.8	81.7	59.5	60.8	59.7	60.1	60.0	46.3	29.0	41.3	40.5	39.3	1.1	--	.3	.5	.6
OR 7930	Boz/Ren Sel 42-31	89.5	51.4	103.4	89.7	83.5	58.4	60.1	58.9	59.4	59.2	42.3	28.7	35.6	35.5	35.5	4.4	--	.6	2.4	2.5
CI 17727	Weston	87.9	38.0	99.0	86.8	77.9	61.4	63.0	60.6	63.0	62.0	45.9	33.9	43.1	42.0	41.2	.5	--	.1	1.6	.7
MT 77077	Winridge	75.2	39.0	109.6	92.5	79.1	59.9	61.1	59.5	60.3	60.2	42.8	28.4	38.6	38.8	37.2	.4	--	1.0	.9	.8
CI 13880	Crest	58.6	32.9	94.7	86.7	68.2	56.9	60.2	58.4	60.8	59.1	42.5	29.1	37.4	35.1	36.0	4.0	--	.1	1.0	1.7
	$\bar{x}$	97.2	43.5	117.8	91.7		58.7	60.2	58.6	58.0		39.5	26.5	34.9	31.5		1.7	--	2.4	1.5	
	F[6/]	6.88**		7.8**	1.62**		14.6**		14.5**	9.7**		10.9**		14.2**							
		2.8**					59.0**					10.9**		24.3**							
	S.E.$\bar{x}$	120.0	4.6	7.0	5.4		.57	.19	.5	.6		27.6	.89	.9	.8						
	L.S.D.(.05)	10.9	9.0	20.6	15.2		.73	.37	1.4	1.8		2.02	1.7	2.5	2.3						
	C.V. %	5.6	10.6	5.9	5.9		.64	.31	.8	1.1		2.6	3.4	2.6	2.6						

1/ Check variety 2/ Joe Holland farm - Plains, MT - Sanders Co. 3/ Art Magles farm - Polson, MT - Lake Co.
4/ Kalispell - Western Regional White Winter Wheat Nursery 5/ Stillwater - Western Regional White Winter Wheat Nursery
6/ F - Value for treatment comparison ** Indicates statistical significance at the .01 level

Table 7. Agronomic data from the Preliminary Evaluation Hard Red Winter Wheat Nursery grown at the Northwestern Agricultural Research Center, Kalispell,MT. in 1982. Field No. R3A, randomized complete block, four replications. Plot size: 32 sq ft.

Date seeded: September 22, 1981 Date harvested: August 20,1982

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGTHT INCHES	LOD. ANGLE	LOD. %	% DWARF SMUT 2/
MT 8039	LCO/FRD/NE69559/WNK	84.82a	60.60	164.75	37.11	.00	.00	8.25
MT 80179	ID5006/5*CNN	84.80a	61.30	168.75a	34.65b	.00	.00	5.50
MT 80181	ID5006/5*CNN	84.53a	61.00	168.00a	35.33b	.00	.00	5.50
MT 80145	YG1231/6*CNN	82.47a	60.00	167.75a	30.91b	.00	.00	5.50
MT 80171	ID5006/5*CNN	80.27a	60.20	169.75a	30.81b	.00	.00	3.75b
MT 80152	YG1231/6*CNN	77.63a	60.30	167.25a	30.81b	.00	.00	8.50
WS775201	CNOS/INIAS//HNVII	77.40a	59.60	166.50a	31.00b	.00	.00	3.00b
MT 80276	REDWIN SEL 104	75.53a	62.60	167.75a	39.27	1.25	2.50	6.50
MT 76144	FRD/OLESEN	74.92	61.50	167.00a	41.14a	3.00	36.25	3.50b
MT 80122	SS63283/6*CNN	74.82	62.00	167.75a	34.15b	.00	.00	6.75
MT 80169	ID5006/5*CNN	74.13	60.10	170.75a	30.12b	.00	.00	4.87
MT 7956	LANCOTA/WNK//NE68510/	74.02	63.20	162.00b	29.43b	.00	.00	4.75
MT 80172	ID5006/5*CNN	73.77	62.00	170.25a	30.71b	.00	.00	3.25b
MT 80123	SS63283/6*CNN	73.75	60.60	167.25a	35.33b	.00	.00	9.75
MT 7929	CNN/FRD//SND/3/CTK	73.60	61.00	166.25a	40.55a	1.25	20.00	4.75
MT 80147	YG1231/6*CNN	73.10	59.50	167.25a	28.74b	.00	.00	6.00
MT 80119	SS63283/6*CNN	73.17	61.40	167.50a	35.33b	.00	.00	5.50
MT 80277	REDWIN SEL 121	73.00	63.40	167.75a	36.81	.00	.00	5.50
MT 8056	CNN/FRD//SNK/3/CTK	72.85	61.40	167.50a	38.78	.75	2.50	3.50b
MT 80165	ID5006/5*CNN	72.47	59.50	168.50a	28.74b	.00	.00	7.25
MT 80129	SS63283/6*CNN	72.32	61.50	167.50a	35.83	1.00	1.25	6.00
MT 8062	YT0117-20/CTK//TX65A1	72.25	63.50	165.50	37.60	.00	.00	8.50
MT 80280	REDWIN SEL 268	72.17	63.70	165.75a	40.16	1.25	1.25	4.00
MT 80124	SS63283/6*CNN	71.65	60.90	167.00a	33.76b	.00	.00	3.75b
MT 80148	YG1231/6*CNN	71.35	59.90	168.25a	29.13b	.00	.00	4.50
MT 80153	YG1231/6*CNN	71.35	58.10	169.25a	29.04b	.00	.00	5.25
MT 80120	SS63283/6*CNN	71.30	60.10	166.75a	34.74b	.00	.00	7.50
MT 80132	SS63283/6*CNN	70.82	61.90	166.75a	35.43	.00	.00	5.25
MT 8095	TX65A1268/PARKER//FRD	70.62	61.50	165.75a	37.01	.00	.00	7.75
MT 80127	SS63283/6*CNN	70.60	60.90	167.25a	32.58b	.00	.00	6.00
MT 80177	ID5006/5*CNN	70.60	59.60	168.00a	30.71b	.00	.00	6.75

Table_I__. (cont'd)

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGTHT INCHES	LOD. ANGLE	LOD. %	% DWARF SMUT 2/
MT 80174	ID5006/5*CNN	70.25	61.00	169.00a	30.71b	.00	.00	4.75
MT 80185	ID5006/5*CNN	69.97	60.00	167.75a	35.24b	.00	.00	14.00
MT 7976	CTK/MARIAS	69.77	61.10	165.75a	37.30	.75	1.25	11.00
MT 80168	ID5006/5*CNN	69.70	58.20	171.00a	30.61b	.00	.00	8.50
MT 80125	SS63283/6*CNN	69.42	61.60	167.50a	34.94b	.00	.00	4.50
MT 80156	YG1231/6*CNN	69.42	62.40	167.25a	39.07	.00	.00	4.00
MT 80223	YGSS2458/3*YG	69.20	60.50	170.50a	26.48b	.00	.00	.62b
MT 8046	LCO/FRD/NE69559/WNK	68.97	61.90	165.50	34.55b	.00	.00	8.25
MT 79125	UT755079/CST56//TX65A	68.62	60.50	166.00a	29.33b	.00	.00	1.25b
MT 80203	YGSS2458/6*WN	68.35	61.10	167.75a	34.94b	1.75	30.00	8.25
MT 79148	UT775099/CST56//TX65A	67.88	60.00	166.00a	33.07b	.00	.00	1.62b
MT 8030	TX65A268/FRD//YTO-117	67.47	63.00	164.75	32.18b	.00	.00	5.00
MT 8097	TX65A1268/PARKER//FRD	66.90	60.50	161.50b	28.44b	.00	.00	5.25
CI 17844	REDWIN	66.55	63.60	169.75a	39.47	.00	.00	3.37b
MT 80194	YGSS2458/6*WN	66.52	61.90	168.25a	34.25b	.00	.00	5.25
MT 8009	JMK 77-462	66.27	63.00	170.00a	39.17	1.50	12.50	2.63b
MT 80198	YGSS2458/6*WN	65.25	62.10	166.50a	34.35b	.00	.00	4.50
MT 80187	ID5006/5*CNN	64.82	59.50	168.25a	33.96b	.00	.00	6.00
MT 80207	YGSS2458/6*WN	63.68	62.20	167.75a	37.01	1.50	21.25	4.25
MT 8064	YTO117-20/CTK//TX65A1	63.30	61.40	169.50a	25.39b	.00	.00	1.62b
MT 80134	SS63283/6*CNN	63.22	60.30	167.50a	36.81	.00	.00	9.75
MT 80278	REDWIN SEL 127	63.12	62.00	166.25a	43.60a	3.25	7.50	7.50
MT 80217	YGSS2458/3*YG	62.38	59.50	169.25a	25.79b	.00	.00	.75b
MT 80121	SS63283/6*CNN	62.25	61.00	167.50a	32.97b	.00	.00	8.25
MT789564	GUNDERSON BULK SEL 56	62.18	60.10	164.75	38.78	5.25a	38.75	8.50
MT 79132	UT755079/CST56//TX65A	61.75	60.00	163.25	31.40b	.00	.00	1.50b
MT 80252	YGSS1231/3*YG	61.53	61.00	170.25a	25.79b	.00	.00	7.00
MT 80279	REDWIN SEL 185	61.18	63.10	166.25a	37.20	.75	3.75	8.50
MT 80213	YGSS2458/6*WN	61.00	62.00	167.75a	40.55a	.00	.00	6.75
CI 15075	CENTURK 1/	60.68	62.90	164.25	37.89	1.50	13.75	8.50
CI 8885	CHEYENNE	60.68	58.90	167.25a	42.22a	5.00a	28.50	4.25
MT693009	NB176/Y18181//YTO-117	59.75	60.60	169.75a	42.72a	3.00	31.00	1.75b
CI 13670	WINALTA	58.93	63.00	168.00a	42.42a	2.00	15.00	5.50
MT693016	NB176/Y18181//YTO-117	57.88	60.60	168.50a	44.59a	5.00a	86.00a	1.25b
MT 80268	YGSS1231/3*YG	56.68	62.80	169.25a	46.36a	5.75a	94.50a	4.00

Table 7. (cont'd)

	VARIETY	YIELD BU/A	TEST WT LB/BU	HEADING DATE	HEIGTHT INCHES	LOD. ANGLE	LOD. %	% DWARF SMUT 2/
MT 8045	LCO/FRD/NE69559/WNK	54.85	61.50	167.75a	39.47	2.75	25.00	2.50b
MT 80209	YGSS2458/6*WN	54.68	61.50	169.00a	36.52	3.75a	42.50a	6.50
MT693012	NB176/Y18181//YTO-117	53.33	60.50	168.00a	42.62a	4.25a	47.50a	4.75
MT693010	NB176/Y18181//YTO-117	52.18	63.40	169.00a	44.00a	3.25	48.75a	2.50b
MT 80258	YGSS1231/3*YG	50.83	62.50	169.75a	32.18b	1.00	2.50	5.37
MT 80272	YGSS1231/3*YG	48.75	62.00	169.25a	46.36a	5.50a	88.75a	4.25
MT693017	NB176/Y18181//YTO-117	38.22b	61.00	169.00a	42.72a	5.50a	72.25a	3.50b
	$\bar{X}$	167.53	35.33	67.60	61.21	.98	10.61	5.41
	F 3/	14.12**	31.84**	2.71**	.99	4.74**	6.66**	2.46**
	S.E.X.	.50	.91	5.17	43.58	.77	8.57	1.63
	L.S.D.	1.39	2.52	14.41	122.87	2.14	23.90	4.54
	C.V.	.30	2.56	7.64	71.20	78.56	80.79	30.08

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

TITLE: Evaluation of growth regulator ethephon (Ethrel) on spring barley varieties under irrigated conditions.

PROJECT: Small Grains Investigations MS 756

YEAR: 1982

LOCATION: Northwestern Agricultural Research Center, Field No. Y-4

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperators - Union Carbide Agric. Chem. Division
Research & Development Representatives

OBJECTIVE: To determine the effect of ethephon on yield and yield components of small grains.

MATERIALS AND METHODS:

Four spring barley varieties were planted under irrigated conditions using a research type cone seeder. Plots were four rows spaced 1 ft., 15 ft. long. Application of the growth regulator was made when the barley was 10-14" in the flag leaf stage of growth. The applications were made with a research type tractor mounted sprayer. Observations were taken throughout the season and are listed in Table 1.

Plots were harvested with a Hege 125B plot harvester. Kernel counts were taken from ten heads per plot just prior to harvest.

RESULTS AND DISCUSSION:

Yields throughout the study were uniform except for ethephon at .5 lbs/a on Ingrid. The yields in checks for Unitan were noticeably lower.

Test weights were slightly higher in the treated plots of Unitan as compared to the check. All other test weights did not vary within varieties.

Percent plump figures dropped off at the higher rates of ethephon for each vareity except Menuet.

Height increased at the higher rates of ethephon in all the varieties.

Lodging was even throughout the study. Two severe rainstorms during the growing season provided heavy lodging pressure in this experiment.

Kernel counts and stem lengths were taken just prior to harvest. Stem elongation was prevalent in most of the varieties tested from those plots which had been treated with ethephon.

Table 1. Evaluation of ethephon applications to four spring barley varieties under irrigated conditions. Northwestern Agricultural Research Center, Kalispell, MT in 1982. Field No. Y-4.

Date seeded: April 26, 1982 Date harvested: September 14, 1982 Size of Plot: 32 sq. ft.

Treatment	Rate Lb ai/A	Yield (bu/a) Ingrid	Purcell	Menuet	Unitan	$\bar{x}$	Test Weight (lbs/bu) Ingrid	Purcell	Menuet	Unitan	$\bar{x}$	% Plump Ingrid	Purcell	Menuet	Unitan	$\bar{x}$
Ethephon	.25	114.5	128.3	143.8	138.1	131.2	47.1	44.5	48.4	44.6	46.2	62.8	52.3	71.8	70.5	64.4
Ethephon	.50	94.6	131.0	143.2	139.7	127.1	46.0	43.7	48.9	44.4	45.8	57.5	43.8	71.8	65.0	59.5
Check	-	113.3	128.3	140.2	127.9	127.4	46.7	44.9	48.9	42.8	45.8	65.0	49.3	69.8	65.3	62.4
	$\bar{x}$	107.5	129.2	142.4	134.6		46.6	44.4	48.7	43.9		61.8	48.5	71.1	66.9	

Treatment	Rate Lb ai/A	Height (inches) Ingrid	Purcell	Menuet	Unitan	$\bar{x}$	Lodging Prevalence[1] Ingrid	Purcell	Menuet	Unitan	$\bar{x}$	Lodging Severity[1] Ingrid	Purcell	Menuet	Unitan	$\bar{x}$
Ethephon	.25	32.0	31.5	31.0	33.0	31.9	8.0	6.5	5.3	7.5	6.8	58.8	48.8	28.8	50.0	46.6
Ethephon	.50	35.3	32.3	31.5	35.3	33.6	8.5	6.3	4.5	7.5	6.7	55.0	43.8	25.0	61.3	46.3
Check	-	30.8	29.5	30.3	33.3	31.0	8.5	8.3	6.8	8.0	7.9	58.8	51.3	40.0	63.8	39.2
	$\bar{x}$	32.7	31.1	30.9	33.9		8.3	7.0	5.5	7.7		57.5	48.0	31.3	58.4	

Treatment	Rate Lb ai/A	Number Kernels/Head[2] Ingrid	Purcell	Menuet	Unitan	$\bar{x}$	Stem Length[3] Ingrid	Purcell	Menuet	Unitan	$\bar{x}$
Ethephon	.25	20.4	20.7	22.8	34.3	24.6	3.91	3.01	5.80	5.74	4.62
Ethephon	.50	20.5	20.8	22.1	34.2	24.4	3.96	2.72	6.83	7.65	5.29
Check	-	21.2	21.2	22.6	34.1	24.8	3.21	2.91	5.49	6.05	4.42
	$\bar{x}$	20.7	20.9	22.5	34.2		3.69	2.88	6.04	6.48	

1/ Lodging Prevalence = % plot lodged
Lodging Severity = severity of lodging score 0-9: 0 = no lodging; 9 = lodged to ground

2/ Number kernels/head = average number of kernels from counting 10 heads

3/ Length (cm) between flag leaf and base of head

APPLICATION DATA:
Date: 6/15/82 Air Temperature: 71°F Soil Temperature: 75°F Humidity: 41%
Wind velocity: 2 mph Volume: 26.86 gpa Nozzles: 8003 Pressure: 32 psi