TWENTY-THIRD ANNUAL REPORT

1971

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

Route 4
Kalispell, Montana

Prepared By

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PUBLICATIONS and TALKS 1971

1. Jarvi, A. J. 1971 Talk given at Creston School (January 6)

2. Jarvi, A. J. 1971 Talk at the Western Montana County Agents Up-Dating Meeting in Missoula (February 8)

3. Jarvi, A. J. 1971 Talk, 7th Grade Conservation Day Tours (May 10,11 & 12)

4. Jarvi, A. J. & R. F. Eslick, 1971 Linkage Studies of Shrunken Endosperm Mutants, (Barley Genetics Newsletter. Volume 1, pp 22-24)

5. Jarvi, A. J. & R. F. Eslick 1971 Shrunken Endosperm Mutants in Barley (Abstracts Western Society of Crop Science 1971 Annual Meeting pp 8)

6. McNeal, F. H., V. R. Stewart, M. A. Berg and C. F. McGuire, Agronomic and quality characteristics of some glabrous and pubescent glumed spring wheat populations. (Can. J. Plant Sci 51:25-28, 1971)

7. McNeal, F. H., M. A. Berg, V. R. Stewart, & D. E. Baldridge, Agronomic Response of Three Height Levels of Spring Wheat, Triticum aestivum L., Compared at Different Levels, (Agronomy Journal)

8. Stewart, Vern R. 1971 Weed Control in Sugar Beets (Talk given at the Sugar Beet Conference, Billings, January 19)

9. Stewart, Vern R. 1971 Performance Data on Cereal Crops (Talk at the Western Montana County Agents Up-Dating Meeting, Missoula, February 8)

10. Stewart, Vern R. 1971 Effect of ethrel, chemical growth regulator on the agronomic characteristics of spring wheat and barley, (Talk given for the Inter-regional Wheat Workers Conference, Stillwater, Okla., February 9-11)

11. Stewart, Vern R. 1971 Recommended Varieties of Cereal Grains (KGVO-TV, Missoula, Montana, April 13)

12. Stewart, Vern R. 1971 Ways to control various pollution factors, (7th Grade Conservation Day Tour, May 10,11 & 12)

FISCAL PROJECT REPORT FOR 1971

ADMINISTRATION - 750

The primary purpose of the administration project is to provide general overseeing of research projects.

1971 was a legislative year and much confusion rained from the beginning of the year until the legislative budgets were finally settled, the end of June. It made planning a program very difficult for the crop year. We did lay out and establish a research program without the known facts of financing. Contracts for the staff were finally received the first part of July. Raises and incurrments for merit and cost of living were non-existant or nominal.

Personnel: Dr. Alvin Jarvi who joined the staff in 1970 submitted his resignation as a member of the staff on October 5, 1971. Dr. Jarvi will be going to work for the Ram Bar Seed Company, a division of Cargill, Phoenix, Arizona. We hope to see some of Al this coming summer when he will be returning to Montana to work on barley (hybrid barley) for this company. He will have some research plots located in Western Montana.

The two permanent employees we have, Mr. Paul Boss, the farm foreman and Mrs. Jeanette Calbick, secretary, continue to preform in their usual manner, being efficient and doing a creditable job.

We had five part time employees during the cropping season. Mr. Sig Jonasen, retired farmer from Eastern Montana, gave great help to our general overall program. He began April 12 and continued until October 8. Funds were budgeted for four Work Study students in 1971. Four students were hired. They were: Dale Mahugh, who is in his third year with us; Julie Ann Ruff, her first year; Donna Bennett, her first year; Sandy Taylor, also her first year. All these young people are students at Montana State University. Dale is majoring in Agri-business; Donna and Julie majoring in Chemistry and Sandy a major in elementry education. It would enhance the staff and work considerably if a full time technician was added to the present permanent staff. As long as we can secure the type of college students that we have secured the last three or four years, this does provide adequate summer staffing.

ACTIVITIES:

DATE	ACTIVITY	STAFF	LOCATION
Jan. 6	Talk at Creston School	Jarvi	Creston
12	Small Grain Weed Control Seminar	Stewart	Winnepeg, Canada
18	Great Western High 10 Sugar Beet Banquet	Stewart	Billings
19	Sugar Beet Research Conference	Stewart	Billings
Feb. 8	Western Montana County Agents Up-Dating Meeting	Stewart Jarvi	Missoula
9-11	Inter-regional Wheat Workers Conference	Stewart	Stillwater, Okla.
9	Agricultural Council	Jarvi	Kalispell
17	Advisory Committee Meeting	Stewart Jarvi	Polson
22-23	Highwood Alkali Control District Workshop	Stewart Jarvi	Great Falls
Mar. 8-12	Annual Planning Conference	Stewart Jarvi	Bozeman
15-19	Western Society of Weed Science	Stewart	Denver, Colo.
Apr. 13	TV Program	Stewart	Missoula
	Agricultural Council	Stewart	Kalispell
May 10-12	Conservation Day Tour	Stewart Jarvi	Rural Kalispell
13	Tour with Creston Lower Grades	Jarvi	Station
14	Tour with Creston Upper Grades	Stewart Jarvi	Station
June 8- 9	Meeting with Head, Plant Soil Science Dept.	Stewart	Bozeman
14-19	Western Section of Crop Science	Jarvi	Laramie, Wyo.
18	Tour, Biology class, Flathead High School	Stewart	Station
29	TV Program	Jarvi	Missoula
July 7- 9	Summer Staff Conference	Stewart Jarvi	Bozeman
15-16	Harvest Winter Barley Composite	Jarvi	Havre
20	Advisory Comm. Meeting and Field Day	Stewart Jarvi	Corvallis
Aug. 9-11	Barley Genetics Comm. of North American Research Workers	Jarvi	Bozeman
Sept. 30- Oct. 1	Agricultural Research Center Assoc. Meeting	Stewart Jarvi	Lewistown
Nov. 9	Agricultural Council	Stewart	Kalispell
11	Potato Growers Seminar	Stewart	Deer Lodge
12	Staff Consultation	Stewart	Bozeman

ACTIVITIES (con't)

DATE	ACTIVITY	STAFF	LOCATION
Dec. 9-10	Research Center Assoc. Meeging	Stewart	Lewistown
11-13	Interview applicant for res. position, conference with Dir. of Exp. Sta. & Staff	Stewart	Bozeman
15-16	Crop Quality Council Meeting	Stewart	Great Falls

VISITORS:

The following persons visited the station in 1971.

DATE	NAME	REPRESENTING	ADDRESS
Jan. 4	Don Siblerud	REA	Kalispell
	Walt Newgard	REA	Kalispell
7	Roy Nugent	Farmer	Kalispell
20	Art Shaw	MSU	Bozeman
	Howard Bowman	MSU	Bozeman
	Loren Wiesner	MSU	Bozeman
	Ashley Thornberg	MSU	Bozeman
21	Merle Lyda	County Agent	Kalispell
	Garry Hewitt	County Agent	Libby
	Louis Fuller	SCS	Kalispell
	Don Hughes	ASC	Kalispell
25	Sig Jonasen	Motel Operator	Kalispell
	Glen Roth	Farmer	Kalispell
26	W. M. Fluegel	Elanco Products	Fresno, Calif.
	Lloyd Warner	Elanco Products	Boise, Idaho
	Karl Schrade	Farmer	Kalispell
	Don Schnaidt	Investor	Kalispell
Feb. 3	Gilbert Passmore	Equity Supply	Kalispell
Mar. 3	Clyde Pederson	Farmer	Kalispell
22	Roy Nugent	Farmer	Kalispell
23	Gene Dose	Sheepman	Whitefish
24	Don Green	Land Clearing Firm	Kalispell
	Earl Wagner	Farmer	Kalispell
26	Tom Little	Snow Line Tree Co.	Kalispell
	Clinton DeLong	Snow Line Tree Co.	Kalispell
	Mr. & Mrs. Duncan	Farmers	Kalispell
29	Burton Isch	Farmer	Kalispell
30	Ken Dunster	Amchem Products	Loveland, Colo.
	Don Graham	Western Agr. Res. Center	Corvallis
	Merle Lyda	County Agent	Kalispell
31	Roy Nugent	Farmer	Kalispell
	Leo Evans	O'Neil Printers	Kalispell

VISITORS (con't):

DATE	NAME	REPRESENTING	ADDRESS
Apr. 5	Don Green	Land Clearing Firm	Kalispell
	Roy Nugent	Farmer	Kalispell
	Leo Evans	O'Neil Printers	Kalispell
	Ken Cottrell	Bomar Office Supply	Kalispell
6	Thad Wojciechowski	Extension Service	Missoula
	Paul Lynn	Farmer	Columbia Falls
	Delbert Martin	Farmer	Columbia Falls
8	Chuck Carter	BASF	Bloomington, Minn.
	Bob Rasmussen	Extension Service	Bozeman
12	Mr. & Mrs. C. W. Roath		Bigfork
14	Mr. Downs	U.S. Weather Service	Helena
23	Jack Warren	Chemagro Corp.	Yakima, Wash.
May 4	Mr. & Mrs. Everett Smyth	Chipman Chemicals	Walla Walla, Wash.
	Gene Sharp	MSU	Bozeman
	Allan Taylor	MSU	Bozeman
	Alfred Broemneman	MSU	Bozeman
7	Noble Dean	Bank of Columbia Falls	Columbia Falls
18	Jack Gordon	Equity Supply	Kalispell
24	Don Mathre	MSU	Bozeman
	Harold Yeager	Farmer	Kalispell
	Charles McKinley	Farmer	Kalispell
25	George Hubbard	Farmer	Kalispell
28	Marge Antonsen	Insurance Representative	Bozeman
June 15	Carl Johnson	Stauffer Chemical Co.	Billings
23	Jack Warren	Chemagro Chemical Co.	Yakima, Wash.
28	Dr. & Mrs. John Thomas	Stanford University	Stanford, Calif.
30	Harry McNeal	MSU	Bozeman
July 3	Dr. Dave Ried	USDA	Beltsville, Md.
	Dr. E. A. Hockett	USDA	Bozeman
5	Jim Snell	Farmer	Kalispell
6	Jerry Croissaut	Calif. State Polytech	Pomona, Calif.
22	George R. Peterson	BIA	Ronan
	Charles A. Sampson	BIA	Ronan
	Rudy Shircek	FHA	Polson
	Ed Bratton	Extension Agent	Ronan
	Robert Hamel	ASC	Ronan
	Lee Marick	FHA	Polson
	Bill Pederson	FS	Bigfork
26	Gretchen Thom	Student	Anaheim, Calif.
	Barbara Cugar	Student	Anaheim, Calif.
	Betty Thom	Teacher	Anaheim, Calif.
	Kevin Loogman	Student	Fullerton, Calif.
	Loren Wiesner	MSU	Bozeman
29	Howard Bowman	MSU	Bozeman
	Al Carleton	MSU	Bozeman
30	Jack Warren	Chemagro Chemical Co.	Yakima, Wash.

VISITORS (con't):

DATE	NAME	REPRESENTING	ADDRESS
Aug. 3	Dr. Jim Hoffman	USDA	Pullman, Wash.
	Jack Walters	USDA	Pullman, Wash.
	Joe Pender	Farmer	Sask., Canada
4	Richard Alterberg	Farmer	Kalispell
	Dee Morton	Farmer	Kalispell
6	Bob Waters	MSU	Bozeman
	Muhammad Ashraf	MSU	Bozeman
11	John Dunse	MSU	Bozeman
13	Dr. Tom Ramage	University of Arizona	Tuscon, Ariz.
	Dr. Gus Weibie	University of Idaho	Aberdeen, Id.
19	Everett P. Smyth	Chipman Chem.	College Pl., Wash.
20	Herman Dunkin	Farmer	Kalispell
24	Roger Scott	Geigy Chem. Co.	Twin Falls, Id.
25	Charles Carter	BASF Chdm. Company	Bloomington, Minn
31	Don Siblerud	REA	Kalispell
Sept. 13	Tom Neidlinger	Rohm-Haas	Portland, Ore.
14	John Heikins	Farmer	Kalispell
17	Charles Rhode	Supt. Agricultural Sta.	Pendleton, Ore.
22	Jim Hoffman	USDA - ARS	Pullman, Wash.
	Jack Walters	USDA - ARS	Pullman, Wash.
28	Don Grhama	Western Agr. Res. Center	Corvallis
Oct. 5-8	John Dunse	MSU	Bozeman
20	Francis P. Galli	Farmer	Sarona, Wis.
	A. H. Andrews	Farmer	Sarona, Wis.
Nov. 5	George Sedgwick	State Electrical Inspector	Kalispell
9	Clyde Pederson	Farmer	Kalispell
16	Clyde Pederson	Farmer	Kalispell
29	Wes Roath	Assoc. Agronomist-Emeritus	Bigfork
Dec. 1	Jim Snell	Farmer	Kalispell
	Clyde Pederson	Farmer	Kalispell
3	Lowell Wooden	Farmers Union	Kalispell

PHYSICAL PLANT - 751

In this project the changes or improvements made in the fiscal plant are listed. Probably the major improvement made on the station in 1971 was the replacing of the power service. Early in August we lost a couple of main line fuses. Talking with our power use man we found that we had an equivalent of 350 amp load. So with this thought in mind we undertook a complete renovation of our power service. We established a 400 amp loop and provided 100 amp service to each of the residences, to the shop and 100 amp service to the barn and the machine shed in one loop. A separate service of 60 amps was instaled for the pump, so in event of a fire there will always be power to the pump. All of the service cables were placed underground and makes a much neater appearing research center now with all wires buried. The telephone lines were also buried at the same time.

A quarter of a mile fence was replaced on the station, right south of the forage building down beyond the irrigation pump. This fence consists of 39" woven wire with two barb wires. The fence is all steel post except for the wooden brace posts.

During the winter months we used the farm labor available to remove the old dryer. The rest room was remodeled and a hot water tank was installed. Cupboards that were removed from residence #2 when remodeling in 1970 were installed in the shop area where the dryer had been removed. This provides us a place to handle glassware, work herbicides and storage for chemicals and supplies.

A new overhead door, 9' x 10' was installed in the shop. It is a translucent plastic door. These doors have given good service in other buildings which were built in 1963. It seals up a little tighter than the sliding door we had previously and allows more light to enter in the shop.

GENERAL FARM - 752

This project is supporting project for all other research projects. In this report we will be including general farm activities and the purchases of all equipment.

New equipment in 1971 consisted of a new 504 IHC tractor, an IHC swather and an IHC cub cadet with a tiller and lawn mower. These were all leased. The only item that was new and not a renewal is the cub cadet with the tiller and mower. The attachments we use in our research work to till alleys and to cultivate various test plots. The mower is used for roadways and keeping the lawns in shape.

Needed on the research center is a new combine. The present combine was leased in 1961 and finally purchased in 1969. The machine is inefficient, does not do a good job of separating, and this is really the main objection to it. Plus the fact,it does have steering clutches which makes it very awkward to handle in the field and to drive in a straight line if it is being used to measure yields. This is one piece of equipment that should be purchased or a new one leased.

The irrigation pump was moved to keep it from tumbling into the creek because of erosion. The area where it was mounted had been undermined by water and the pump had been suspended. Prior to moving it we had a ditch dredged to give more depth for water storage. The pump was repaired. A new foot valve and aluminum suction line were the repairs made on the pump.

A new irrigation system is needed on the research center. The present system has been used when purchased some 22 years ago. A new system should be so designed to assist in or provide the following:

1. Efficient irrigation of research plots and general crops.
2. Be able to study water use and its management on farm crops.
3. Studies of water movement of fertilizers and pesticides.
4. Studies on underground water pollution from overhead irrigation.

CLIMATOLOGICAL DATA

Northwestern Agricultural Research Center
Kalispell, Montana

Vern R. Stewart, Superintendent

A cooperative project between the United State Weather Service and the Northwestern Agricultural Research Center to secure weather data was established in March, 1949, with Mr. C. W. Roath as weather observer. Instruments were installed in February of 1949, with records starting March 1, 1949. These data are published monthly in the "Climatological Data", the official Weather Service publication. Included in the daily observations are the maximum and minimum temperatures, amount of snowfall, and the amount of snow on the ground. These observations are made at 8:00 A.M. each day. When first initiated the observations were made at 5:30 P.M. This change was made in July 1970.

In 1969 soil thermometers were installed as part of the weather instruments.

The presentation of this climtological data is somewhat different than in previous years. The data has been brought up to date. All the figures have been checked with the "Climatological Data". There are some small changes in figures as a result of some corrections. Some of the mistakes were made in recording and some were made in addition over the years.

Most of the data presented herein is presented by the crop year. This is done because the growing season for winter annuals begins in September. Some data is presented on a calendar year basis.

In the 1970-71 crop year we had a frost free period of 69 days. It is second shortest on record, the shortest being 57 days in 1949. The last killing frost occurred July 7, 1971 when it was just barely 32 degrees. There was not much crop injury on the station, but many fields of winter wheat were severely damaged. The first killing frost occurred September 14, 1971 when the temperature went down to 28 degrees Fahrenheit.

Precipitation was above average for the 1970-71 crop year. May moisture was above average, however July and August were slightly below the average. The total for the crop year was 18.82 inches. The mean for the period from 1949-71 is 19.33 inches.

The mean temperature for the crop year was 43.1 degrees which is .4 of a degree below the long time mean. The low for the crop season occurred December 24, 1970 and January 12, 1971, when -8 degrees was recorded. The high temperature was August 6th and 9th, 1971, when 96 degrees Fahrenheit was recorded. In table 1, is a summary of the climatic data for the year, September 1970 thru August 1971.

During the crop year several comments were made in the monthly reports on the weather. These in part are being included in this record.

September 1970: Weather was rather good, very cooperative in the harvest program. Frost occurred two days earlier than the average date. Precipitation was about average for September and there was good fall moisture for winter grain germination.

During the months of October, November and December, the author made no comments about weather conditions in the monthly report.

January 1971: There were five inches of snow on the ground the first part of January, by mid-month there was 19 inches and on January 31, the fields were bare. Temperatures ranged from -3 to 52 degrees.

February 1971: Mild winter conditions prevailed this month. There was no snow cover on the station, but there was six to eight inches on the winter wheat plots northwest of Kalispell.

March 1971: A typical March. Precipitation was a little below normal. There was considerable wind during the month, but no damage to crops, livestock or buildings.

April 1971: One of the dryer months. Only .58 of an inch of precipitation fell. The long time mean for April is 1.21 inches. Winter wheat was in excellent shape during this month.

May 1971: Statistics indicate that May was an average month over the 22 years of records at the research center. It was a month that allowed us to get our crops in on time and keep field work up to date. A great month.

June 1971: Temperatures for the month were much below normal and precipitation was 1.28 above normal. The cool temperatures caused very slow growth of corn. The cereal grains looked exceptionable except for some severe lodging in the winter wheat variety study.

July 1971: July could be discribed as being very cool with 32 degrees on July 7th, to very hot when it was 91 degrees on July 20th. Moisture was near normal based on the 22 year average.

August 1971: One of the warmest on record. There were 12 days in August when the temperature was over 90 degrees. There were 22 consecutive days when the temperature was above 85 degrees and it was above 83 degrees for all but 3 days of the month. The precipitation was just slightly below normal during the month.

Tables found in this report are as follows:

Table No.	Subject
1	Summary of climatological data 1970-71 crop year (Sept. to Aug.)
2	Summary of mean temperature data 1949-71 crop year (Sept. 1949 to August 31, 1971)
3	Summary of maximum temperature data 1949-71 crop year (Sept. 1949 to August 31, 1971)
4	Summary of minimum temperature data 1949-71 crop year (Sept. 1949 to August 31, 1971)
5	Summary of precipitation data 1949-71 crop year (Sept. 1949 to August 31, 1971)

Table 8/. Summary of climatic data by months for the 1970-71 crop year (September to August) and averages for the period 1949-1971 at the Northwestern Agricultural Research Center, Kalispell, Montana.

Item	Month and Year												Total or Average Growing Season
	Sept. 1970	Oct. 1970	Nov. 1970	Dec. 1970	Jan. 1971	Feb. 1971	Mar. 1971	Apr. 1971	May 1971	June 1971	July 1971	Aug. 1971	
Precipitation (inches)													
Current Year	1.79	1.38	1.75	.99	1.58	.77	.69	.58	2.45	4.42	1.31	1.11	18.82
Ave. 1949 to 1970-71	1.55	1.53	1.51	1.63	1.70	1.10	1.00	1.22	2.08	3.14	1.32	1.55	19.33
Mean Temperature (F)													
Current Year	48.7	40.1	31.3	26.2	26.4	29.9	33.1	43.6	52.4	54.9	61.9	68.2	43.1
Ave. 1949 to 1970-71	54.1	43.8	32.7	26.5	22.3	28.2	32.5	43.1	51.9	58.4	64.2	64.4	43.5
Last killing frost in spring*													
1971		July 7 (32)											
Ave. 1949-71		May 29											
First killing frost in fall*													
1971		Sept. 14 (28)											
Ave. 1949-71		Sept. 13											
Frost-free period													
1971		69 days											
Ave. 1949-71		106 days											
Maximum summer temperature		96 F on August 6 & 9											
Minimum winter temperature		- 8 F on December 24, 1970 & January 12, 1971											

* 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, 1971

	Average temperature by month and year												
	Degrees Fahrenheit												
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	$\bar{x}$ for Years
1949-50	54.1	41.5	38.5	25.0	4.2	25.6	31.2	41.9	49.7	57.0	64.0	62.5	41.3
1950-51	53.8	45.9	31.5	29.5	20.2	27.7	27.0	42.1	50.0	54.2	64.7	60.4	42.3
1951-52	50.6	40.8	30.8	16.9	18.0	26.6	29.3	45.8	52.4	56.7	61.8	62.8	41.0
1952-53	56.0	45.5	30.4	27.6	36.0	32.9	37.2	41.2	49.5	54.6	64.3	63.1	44.9*
1953-54	56.1	46.2	37.0	31.3	21.1	31.2	29.6	40.8	52.5	54.9	63.4	60.1	43.7*
1954-55	52.9	41.5	38.8	28.8	25.7	22.1	24.5	39.1	47.7	58.8	62.7	62.2	42.1
1955-56	52.5	44.6	23.5	21.8	23.3	20.9	31.5	44.2	54.0	59.0	64.8	62.0	41.8
1956-57	55.2	44.1	30.9	28.5	10.2	23.4	33.3	43.7	55.6	59.7	65.4	62.4	42.7
1957-58	55.8	41.4	32.1	32.4	29.1	30.4	32.2	43.6	59.6	62.3	65.2	67.9	46.0*
1958-59	55.5	44.6	32.8	28.2	24.7	23.1	35.3	45.2	48.1	59.9	64.5	61.0	43.6*
1959-60	53.0	43.9	25.5	27.6	19.4	25.2	32.3	44.3	50.6	59.6	68.8	60.6	42.6
1960-61	55.0	45.2	34.4	24.9	27.8	37.0	38.3	42.0	52.6	64.7	66.2	67.8	46.3*
1961-62	49.6	42.3	28.2	23.6	17.4	25.7	30.9	47.2	51.5	58.6	62.1	62.1	41.6
1962-63	54.7	44.7	38.0	32.5	11.8	33.1	38.7	43.2	51.4	59.4	63.0	64.9	44.6*
1963-64	58.7	47.4	35.8	24.0	28.5	28.3	30.6	42.8	51.1	58.7	64.3	58.9	44.1*
1964-65	51.2	43.7	33.7	22.1	30.2	28.7	28.6	45.2	50.6	57.6	64.6	63.6	43.3
1965-66	46.4	47.6	35.0	28.8	26.3	27.7	34.5	42.9	54.3	56.0	64.5	61.7	43.8*
1966-67	59.3	43.4	33.4	30.2	31.0	33.2	32.9	40.6	52.2	59.4	66.1	67.2	45.7*
1967-68	61.0	45.9	33.8	25.1	23.3	32.8	41.2	42.0	49.8	59.0	64.6	61.3	45.0*
1968-69	53.8	42.9	33.4	19.9	13.1	24.0	29.6	47.1	53.9	58.8	62.3	63.6	41.9
1969-70	56.0	40.0	35.2	27.7	21.9	29.9	32.8	40.2	53.2	62.0	64.8	62.6	43.9*
1970-71	48.7	40.1	31.3	26.2	23.6	29.9	33.1	43.6	52.5	54.9	61.9	68.2	42.8
$\bar{x}$	54.1	43.8	32.9	26.5	22.1	29.2	32.5	43.1	52.0	58.4	64.3	63.0	

Mean temperature for all years = 43.4

* 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, 1971.

	Average Maximum temperature by month & year Degrees Fahrenheit												x for
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Years
1949-50	71.4	52.4	45.7	32.1	14.4	34.6	38.4	52.3	63.1	70.1	78.6	79.5	52.7
1950-51	70.9	55.8	38.2	36.3	28.7	36.6	37.3	57.9	63.2	66.6	82.4	77.0	54.2
1951-52	64.2	47.5	37.2	23.6	25.9	35.7	39.5	61.8	65.7	70.2	79.2	79.5	52.5
1952-53	73.4	62.6	40.6	33.2	41.3	39.1	46.8	51.5	62.5	66.8	83.3	79.5	56.7*
1953-54	72.3	61.0	45.6	36.7	29.1	38.4	40.0	51.0	67.2	67.0	80.1	74.4	55.2*
1954-55	66.4	53.4	45.9	34.9	31.8	31.2	33.9	48.1	60.5	74.7	76.9	82.4	53.3
1955-56	67.6	55.5	30.8	29.2	30.7	30.1	39.7	57.4	67.5	73.3	81.2	77.8	53.4
1956-57	71.0	53.7	37.6	35.5	19.0	33.2	43.3	55.3	70.2	72.4	82.1	80.0	54.4
1957-58	74.3	50.5	40.1	38.5	33.7	37.9	43.5	54.4	77.5	75.7	80.8	85.5	57.7*
1958-59	69.7	57.9	39.6	34.1	31.8	31.9	43.9	57.9	61.5	74.3	83.2	76.3	55.2*
1959-60	64.0	53.6	33.9	33.3	27.5	34.1	43.4	56.1	63.0	74.8	88.7	74.1	53.9
1960-61	72.1	57.8	41.1	29.8	35.0	43.1	48.2	51.6	65.3	82.0	83.7	86.3	58.0*
1961-62	62.3	53.3	35.1	30.4	26.0	33.4	40.5	60.7	62.7	74.2	79.2	77.5	52.9
1962-63	71.7	54.7	43.8	37.9	19.9	41.4	48.9	55.7	67.1	71.8	79.6	82.5	56.2*
1963-64	74.6	59.4	43.4	30.2	35.1	37.7	39.7	53.3	63.5	71.4	80.3	72.9	55.1*
1964-65	63.9	55.0	41.0	28.9	35.1	36.9	41.0	57.6	64.3	71.4	80.8	77.1	54.4
1965-66	57.5	61.1	42.6	35.4	31.8	35.3	45.4	54.8	69.8	69.1	81.2	78.4	55.2*
1966-67	74.9	55.1	41.1	35.8	36.7	40.9	41.3	52.6	66.0	73.3	84.8	87.2	57.5*
1967-68	78.9	55.8	41.3	30.8	31.5	40.8	52.6	54.2	63.4	72.2	82.7	75.7	56.6*
1968-69	65.9	53.1	40.6	27.3	20.8	32.5	40.9	59.5	68.7	72.0	78.9	83.0	53.6
1969-70	70.4	49.7	43.0	32.8	28.5	36.2	42.5	49.7	67.9	75.5	79.1	80.9	54.7
1970-71	62.5	52.2	40.0	34.1	30.6	38.6	41.6	56.2	66.4	67.3	78.0	87.5	54.6
$\bar{x}$	69.1	55.1	40.4	32.8	29.3	36.3	42.4	55.0	65.8	72.1	81.1	79.8	

Mean temperature for all years = 54.9

* 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, 1971.

	Average Minimum Temperature by Months & Years Degrees Fahrenheit												$\bar{x}$ for
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Years
1949-50	36.7	35.0	31.2	17.8	-6.0	16.6	23.9	31.5	36.3	43.9	49.4	45.5	30.2
1950-51	36.6	36.0	24.8	22.6	11.7	18.8	16.6	26.2	36.7	41.7	46.9	43.7	30.2
1951-52	37.0	34.0	24.4	10.1	10.0	17.4	19.1	29.8	39.1	43.1	44.3	46.1	29.5
1952-53	38.6	28.3	20.2	21.9	30.6	26.7	27.5	30.9	36.5	42.3	45.3	46.7	33.0*
1953.54	39.8	31.4	28.4	25.9	13.1	24.0	19.2	30.6	37.7	42.8	46.7	45.7	32.1*
1954-55	39.3	29.5	31.6	22.7	19.5	13.0	15.0	30.0	34.9	42.8	48.5	42.0	30.7
1955-56	37.3	33.6	16.1	14.4	15.9	11.7	23.3	30.9	40.5	44.7	48.2	46.1	30.2
1956-57	39.4	34.4	24.2	21.5	1.4	13.6	23.2	32.0	40.9	47.0	48.7	44.8	30.9
1957-58	37.2	32.3	24.1	26.2	24.5	22.8	20.9	32.8	41.7	48.8	49.5	50.3	34.3*
1958-59	41.2	31.2	26.0	22.2	17.5	14.2	26.6	32.4	34.7	45.4	45.8	45.6	31.9
1959-60	42.0	34.1	17.0	21.8	11.2	16.3	21.1	32.4	38.1	44.3	48.8	47.0	31.2
1960-61	37.9	32.5	27.6	19.9	20.6	30.9	28.4	32.3	39.8	47.4	48.7	49.2	34.6*
1961-62	36.8	31.2	21.2	16.8	8.7	17.9	21.2	33.7	40.3	43.0	45.0	46.6	30.2
1962-63	37.6	34.6	32.2	27.1	3.7	24.7	28.4	30.6	35.7	47.0	46.4	46.9	32.9*
1963-64	42.7	35.3	28.1	17.7	21.8	18.9	21.4	32.2	38.6	46.0	48.3	44.9	33.0*
1964-65	38.4	32.3	26.4	15.3	25.3	20.4	16.2	32.7	36.9	43.8	48.4	50.0	32.2*
1965-66	35.2	34.0	27.4	22.1	20.8	20.0	23.6	30.9	38.7	42.8	47.7	45.0	32.4*
1966-67	43.6	31.7	25.6	24.6	25.3	25.5	24.5	28.6	38.4	45.4	47.4	47.2	34.0*
1967-68	43.1	35.9	26.3	19.4	15.0	24.8	29.7	29.8	36.1	45.7	46.4	46.8	33.3*
1968-69	41.7	32.6	26.1	12.5	5.4	15.4	18.2	34.6	39.0	45.5	45.7	43.5	30.0
1969-70	41.6	30.3	27.4	22.6	15.3	23.4	23.0	30.7	38.5	48.2	50.5	44.3	33.0*
1970-71	34.9	27.9	22.5	18.3	16.5	21.0	24.8	31.0	38.6	42.3	45.7	48.8	31.0
$\bar{x}$	39.0	32.6	25.4	20.2	14.9	19.9	22.5	31.2	38.1	44.7	47.4	46.2	

Mean temperature for all years = 31.9

* Denotes years above average.

Table 5. Summary of precipitation records obtained at the Northwestern Agricultural Research Center on a crop year basis, September 1, 1949 thru August 31, 1971.

Year	Total Precipitation in Inches by Month & Years												Total For Years
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	
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	-	12.75
1955-56	1.64	1.89	1.97	2.38	1.76	1.53	.87	1.28	1.06	4.20	2.13	3.21	23.92*
1956-57	1.16	1.10	.53	.96	1.47	1.14	.75	1.22	1.75	2.51	.52	.78	13.89
1957-58	.10	1.59	.96	1.76	1.56	2.67	.97	1.47	2.20	2.56	.84	.58	17.26
1958-59	1.99	1.16	2.90	2.77	1.95	1.33	.75	1.62	4.10	1.75	T	.91	21.23*
1959-60	4.22	3.36	4.32	.34	1.67	1.10	1.01	1.23	3.27	.69	.13	2.43	23.77*
1960-61	.55	1.44	1.72	1.24	.65	1.46	1.96	2.26	4.02	1.45	.76	.64	18.15
1961-62	3.40	1.22	1.77	2.09	1.33	1.15	1.59	.96	2.59	1.15	.11	.72	18.08
1962-63	.58	1.85	1.31	.91	1.69	1.21	.85	1.07	.57	5.00	1.44	2.10	18.58
1963-64	1.46	.75	.95	1.70	1.46	.41	1.57	.87	3.33	3.86	3.01	1.64	21.01*
1964-65	2.27	.85	1.62	3.62	2.25	.64	.24	2.55	.81	2.30	1.15	4.74	23.04*
1965-66	1.72	.21	1.31	.55	1.42	.67	.53	.76	1.18	6.57	2.49	1.64	19.05
1966-67	.79	1.34	3.33	1.68	1.50	.62	1.27	.99	1.30	2.53	.02	.01	15.38
1967-68	.91	1.88	.62	1.16	.79	1.15	.68	.57	3.92	2.22	1.00	3.42	18.32
1968-69	4.51	2.39	1.59	3.12	3.05	.75	.69	1.39	1.19	5.21	.70	.09	24.68*
1969-70	1.54	1.90	.31	1.14	3.10	.89	1.49	.76	1.97	4.37	3.08	.44	20.99*
1970-71	1.79	1.38	1.75	.99	1.84	.77	.69	.58	2.45	4.42	1.31	1.11	19.08
$\bar{x}$	1.53	1.54	2.77	1.63	1.71	1.10	1.00	1.21	2.08	3.13	2.45	1.55	

Mean precipitation for all crop years = 19.33 inches

* Denotes years above average precipitation.

Table 6. Precipitation by day for crop year September 1, 1970 thru August 31, 1971, Northwestern Agricultural Research Center, Kalispell, Montana.

Total Precipitation for Period = 19.08 inches

Date	Sept. 1970	Oct. 1970	Nov. 1970	Dec. 1970	Jan. 1971	Feb. 1971	Mar. 1971	Apr. 1971	May 1971	June 1971	July 1971	Aug. 1971
1	.20			.05	T	T	T			T		
2				T	.03	.11				.30	.34	
3				.06		.14	T			.05		.02
4	.10			T		T				.19	T	.08
5	.32			T	T	.07	T		.02	.67		
6	T	.22	.13	.15	T				.58	.08	.36	
7	.41		.02	T	.10				T	.06	.06	
8	.17	T		T	.02		T			.90		
9	.10	.05	.14		.11				.08	.11	.06	
10		.42			.11	.12	.01		.02	T	.40	
11	T			T	.22	.22				.04	T	
12	T	.23	.21		.12	.06	.06			.04	.05	
13			.01		T	.01	T		T	.06		
14					T		.18		.34	.33		
15				T	.07	T			T	.03		
16			.01	.07	.02	T			.51	T		
17				.20	.14				.30			
18			.08		T				.31			
19	.04	.03	T	.02	.20	T			.04	.04		
20	T	.02	.02		T				.10	.02		
21	.13	.13	.05	.10	T			.06	.08			
22	.01	.02	T	.18	.04			T				
23	.30	.04	T	.01			.11	.08				.50
24	.01	.22	.36				.05	.07				
25		T	.10	.05		.02	.05	T	T			
26			.04		.25		.19		T	.36		
27			.03	.06	.03			T		.01		
28			.41	T		.02		.30		T	.01	
29			.05	T			T	.07		1.12	.03	
30			.09	T	.08				.07	.05		.09
31				.04								.42
Total	1.79	1.38	1.75	.99	1.84	.77	.69	.58	2.45	4.42	1.31	1.11

Table 7. Frost free period at the Northwestern Agricultural Research Center from 1950 thru 1971.

Year	Date Last Freeze	Temperature	Date First Freeze	Temperature	Freeze Free Season
1950	June 10	32	Sept. 11	29	92
1951	June 1	29	Sept. 15	29	106
1952	June 14	32	Sept. 8	29	85
1953	May 23	32	Sept. 16	31	108
1954	May 29	31	Sept. 30	26	123
1955	May 25	28	Sept. 13	31	108
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
$\bar{x}$ for All Years	May 29	30	Sept. 13	29.9	107

Table 8. Temperature extremes at the Northwestern Agricultural Research Center, Kalispell, Montana from 1950 thru 1971.

	Minimum		Maximum	
Year	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

Table 9. Summary of temperature records obtained at the Northwestern Agricultural Research Center, January 1950 thru December 1971.

	Average Temperature by Month and Years Degrees Fahrenheit												
Date	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	x for Years
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	42.8
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	43.3
1961	27.8	37.0	38.3	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	43.2	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
$\bar{x}$	22.1	28.2	32.5	43.1	52.0	58.5	64.3	63.0	53.9	43.7	32.7	26.3	

Mean temperature for all years = 43.4

* Denotes years above average mean.

Table 10. Summary of precipitation records obtained at the Northwestern Agricultural Research Center, January 1950 thru December 1971.

Date	Total Precipitation (Inches) by Months & Years												Total for Years
	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
$\bar{x}$	1.71	1.10	1.00	1.31	2.08	3.14	1.34	1.55	1.52	1.53	1.51	1.66	

Mean annual precipitation for 22 years = 19.35

* Denotes years above average

TITLE: Chemical control of weeds in sugar beets

PROJECT: Weed Investigation MS 754

YEAR: 1971

PERSONNEL: Leader - Vern R. Stewart
Cooperators - Don Baldridge, Glen Hartman, Chemical Company Research and Development Representatives, Great Western and Holly Sugar Companies

LOCATION: Homer Bailey farm, Corvallis, Montana

DURATION: Unknown

OBJECTIVES:
1. To determine what herbicides will effectively control weeds in sugar beets.
2. To measure the effect of herbicides on sugar beet yield and sugar percentage.

FUTURE PLANS: Unknown

SIGNIFICANT FINDINGS:

The outstanding treatments this year, on an overall basis are, NC 8438 at 4 lbs/a and Cycloate at 4 lbs/a. Both treatments gave 80% or better weed control and farily high yields.

MATERIALS AND METHODS:

Two experiments were conducted in 1971. One in cooperation with Great Western Sugar Company to secure data for registration of the combination of cycloate and triallate. The second experiment consisted of herbicides used in various combinations and rates. The products used are given in Table 1. The rates and combinations are found in the tabulated data, Tables 2 thru 8.

Plots were 11 feet wide (6 rows spaced 22") and 40 feet long and replicated three times. Herbicides applied preplant were incorporated with a tandem disk and the plot was harrowed twice to make a firm seed bed. All the herbicides were applied broadcast in 39.3 gpa aqueous mixture.

Sugar beets were seeded April 29, one day following the application of the preplant incorporated herbicide.

Climatic conditions at time of herbicide applications follow in tabular form.

	Preplant incorporate	Post emergence
Application date	4/28/71	5/24/71
Temperature	55 degrees F	70 degrees F
Humidity	50%	30%
Wind velocity	Calm	Calm
Cloud cover	Partly Cloudy	Partly Cloudy
Soil moisture	Good	Fair

Plant counts of weeds and sugar beets were made when the beets were in the four to six leaf stage, eight counts were made in each plot using a quadrant 3 x 48 inches, placed over the beet row. After population counts of beets and weeds were made the beets were thinned and cultivated by the grower in the usual manner, with exception of the weedy check. The beets in the weedy check were thinned, but no weeds were removed. Yield data and sugar percentages were obtained. Sugar analysis were made by Great Western Sugar Company.

The beets were topped with a mechanical topper, lifted with a mechanical lifter and then removed from the soil and weighed. The plot size was 73.3 square feet.

The predominate weed species occurring naturally in this study were: pigweed (Amaranthus retroflexus L.); lambsquarter (Chenopodium album L.); black nightshade (Solanum nigrum L.). The other weed species found were: pennycress (Thlaspi arvense L.); kochia (Kochia scoparia L.) and tumble mustard (Sisymbrium altissimum L.). A few grasses were noted but were not a factor in the study.

Using a scale of 0 to 10, an estimate of beet injury by herbicides was made. An injury rating of 0 means that the foliar growth of plants was identical to untreated plants and 10 means all beets treated were dead. One injury evaluation was made nine days following application of post emergence herbicides.

These data were analyzed using the analysis of variance technique. The percent of weed control and percent stand of weeds is based on the actual count of the plants.

RESULTS AND DISCUSSION:

Experiment I

The products used in this study were all preplant incorporated. Significant stand reduction of beets was noted in the untreated check. Beet stands were all higher in plots treated with herbicides. Overall weed control was not completely effective, ranging from 64% to 80%. The highest degree of control was obtained with Pre-beta II BW (6#) at 4.5 lbs/a. The Pre-beta products gave fair control of nightshade, good control of lambsquarter and red root pigweed. The data indicate no control of kochia, however the population of species was very light. Mustards were effectively controlled. Injury to sugar beets was most noticable on the plots treated with Pre Beta I BW (5#), however later in the season this injury was not visible.

Sugar beet yields, percent sucrose along with number of beets per 100' of row were all found to be non-significant when analyzed statistically. Tables 2 thru 7.

Experiment II

Complete raw data is found in Table 8, for sugar beet and weed counts, by species.

Post emergence application of SN 503 at .75 lbs/a and 1.00 lb/a and SN 504 at 1.00 lb/a and 1.5 lbs/a, caused significant reductions in beet stands. Reductions were also significant in the non-treated checks because of weed competition.

The foregoing treatments resulted in stand loss of 8 to 10% this season.

R-7465 at 1 lb/a did not give any control of nightshade. The combination of cycloate at 3 lbs/a and R-7465 at 5 lbs/a was not effective in the control of nightshade. The use of 3 lbs/a of cycloate alone gave excellent control of nightshade. Cycloate at 3 lbs/a and R-7465 at 1 lb/a gave good control of nightshade. All other products were good to fair in this species.

There were no significant differences in treatments in the control of lambsquarter. There was not a large natural population of this species.

Data obtained for pigweed control when analyzed statistically was found to be non-significant. It is noted however that cycloate at 3 and 4 lbs/a was not as effective as NC 8438 at 3 and 4 lbs/a. The combination of phenmedipham and pyrazon was less effective on this species than NC 8438 and SN 503.

Several compounds were extremely effective in the control of mustard. These data show NC 8438 at 3 lbs/a, the combination of NC 8438 plus pyrazon, cycloate 4 and 5 lbs/a and SN 503 and SN 504 as being extremely effective on mustard.

Kochia populations were quite low in the study and no real evaluation can be made of the treatments on this species.

Overall weed control on a percentage basis is given in Table 13. Seven treatments provide 90% or better weed control. In this grouping 97% control was obtained with a combination of NC 8438 at 3 lbs/a and pyrazon at 3.75 lbs/a. In the 80% group there were 8 treatments reaching or surpassing this level with 89% control being obtained from a combination of phenmedipham at 1 lb/a plus pyrazon at 2 lbs/a.

No differences were found in the number of beets per 100' of liner row at harvest time. Table 9.

Yield differences were found in this study due to treatment. The highest yield was secured from the cycloate treatment at 4 lbs/a and the lowest in the weedy check. Yield reductions were noted at the 1 lb/a rate of SN 503, and the combination of cycloate at 3 lbs/a and phenmedipham at .5 lb/a. Table 10.

As in previous years, sugar content was found to be non-significant. Table 11

Gross sugar production is directly related to yield, yield of beets and percent of sugar. Tables 10 and 12.

Crop injury rating is found in Table 13. SN 503 and 504 treatments resulted in the most damage to the small beet seedling. The greatest amount of injury was with 1 lb/a of SN 503 where a rating of 5 was recorded.

A summary of the application times provides us with some interesting facts.

Preplant incorporation resulted in the least injury, second best stand, the highest yield but only third on weed control of 75.2%. Post emergence had the highest injury rating, lowest beet stand, second on yields and second on weed control. The combination of preplant and post emergence gave the best weed control (90.5%), lowest yield and the least injury.

Table 1. Herbicides used in sugar beet studies.

Chemical Name	Common Name[1/]	Trade Name	Company
2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulphonate	NC 8438	NC 8438	Fisons, Corporation Agricultural Chemicals
5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone	pyrazon	Pyramin	BASF
S-ethyl N-ethylthiocyclohexane=carbamate	cycloate	Ro-Neet	Stauffer Chemical Co.
2-(Naphthoxy)-N,N-diethylpropion=amide	R 7465	Waylay	Stauffer Chemical Co.
Ethyl-m-hydroxycarbanilate car=banilate	EP 475	EP 475	NOR-AM Agricultural Products Inc.
methyl m-hydroxycarbanilate m-methylcarbanilate	phenmedipham	Betanal	NOR-AM Agricultural Products Inc.
See above for chemical identification of these herbicides	phenmedipham + EP 475[a/]	SN 503 or SN 504	NOR-AM Agricultural Products Inc.
S-(2,3-dichloroallyl)diisopro=pylthiocarbamate	diallate	Avadex	Monsanto Company
S-propyl butylethylthiocarbamate	pebulate	Tillam	Stauffer Chemical Co.
S-(2,3,3-trichloroallyl)diisopro=pylthiocarbamate	triallate	Avadex BW	Monsanto Company

1/ Common name as used in this report.
a/ This mixture was formulated as equal parts of phenmedipham plus EP 475 (SN 503) and 2 parts of phenmedipham plus 1 part of EP 475 (SN 504).

Table 2. Data from sugar beet herbicide study conducted on the Homer Bailey farm, Corvallis, Montana in 1971. Exp. I

Treatment			Plant Counts[1]						
Herbicide	Rate #/A	Plot #	Sugar Beets	Night-shade	Lambs-quarter	Pig-Weed	Mustard	Kochia	Other
Pre-beta II (6#)[2]	3	1	145	12	1		1		
		9	125	8	1	1		1	
		15	110	6		1	3		
		Total	380	26	2	2	4	1	
		$\bar{x}$	127	9	.7	.7	1	.3	
Pre-beta I (5#)	3	2	130	10		5			
		14	126	9		2			
		19	108	7	2	3	1		
		Total	364	26	2	10	1		
		$\bar{x}$	121	9	.7	3	.3		
Pre-beta II-BW(6#)	3	3	130	13		5	1		1
		10	136	8				1	
		20	93	9	1	2	1		
		Total	359	30	1	7	2	1	1
		$\bar{x}$	120	10	.3	2	.7	.3	.3
Pre-beta II-BW(6#)	4.5	4	127	6	2	2			
		8	112	6	1		1		
		21	102	4		3			
		Total	341	16	3	5	1		
		$\bar{x}$	114	5	1	2	.3		
Check	0	5	124	35	5	7	7	1	1
		12	105	27	1	10	4		
		18	68	10		9	11		
		Total	297	72	6	26	22	1	1
		$\bar{x}$	99	26	2	9	7	.3	.3
Pre-beta I-BW(5#)	3	6	129	17	2	2			
		13	117	7		3	1		
		17	111	12	1		1		
		Total	357	36	3	5	2		
		$\bar{x}$	119	12	1	2	.7		
Pre-beta I-BW(5#)	4.5	7	132	7		1			
		11	116	12	1	6			
		16	106	9					
		Total	354	28	1	7			
		$\bar{x}$	118	9	.3	2			
		$\bar{x}$	117	11	1	3	2		
F value for treatment comparison			3.00**	4.38**	N.S.	4.94**	10.65**		
S.E.$\bar{x}$			5.049	2.86925	.7309	1.1919	.79518		
L.S.D.			15.5	8.845	N.S.	3.67	2.45		
C.V. %			4.32	25.74	85.28	40.37	52.18		

1/ Eight counts made per plot with a quadrant 3' x 48" based on 8 sq. ft. per plot.

2/ # active ingredient/gal.

Table 3. Number of sugar beets from forty linear feet of row at harvest time on the Homer Bailey farm, Corvallis, Montana in 1971. Exp. I

Treatment							
Herbicide	Rate #/A	Number of beets/plot I	II	III	Total	$\bar{x}$	No. Beets/ 100' of row
Pre-beta II (6#)[1/]	3	50	44	50	144	48	120
Pre-beta I (5#)	3	52	53	48	153	51	128
Pre-beta II-BW(6#)	3	49	43	44	136	45	113
Pre-beta II-BW(6#)	4.5	38	41	46	125	42	105
Check	0	47	39	44	130	43	108
Pre-beta I-BW(5#)	3	46	51	47	144	48	120
Pre-beta I-BW(5#)	4.5	47	52	54	153	51	128

1/# active ingredient/gal.

$\bar{x}$	114
F (.05)	2.00NS
S.E.$\bar{x}$	6.3893
C.V.%	5.60

Table 4. Yield of sugar beets treated with various herbicides grown on the Homer Bailey farm, Corvallis, Montana in 1971. Exp. I
Plot size 73.3 sq. ft. - randomized block design.

Treatment						
Herbicide	Rate #/A	Yield #/plot I	II	III	Total	Yield Tons/A
Pre-beta II (6#)[1/]	3	87.6	66.2	80.7	234.5	23.2
Pre-beta I (5#)	3	82.4	80.0	81.0	243.4	24.1
Pre-beta II-BW(6#)	3	90.8	66.1	74.9	231.8	23.0
Pre-beta II-BW(6#)	4.5	69.3	72.3	69.3	210.9	20.9
Check	0	84.0	82.7	79.1	245.8	24.4
Pre-beta I-BW(5#)	3	67.0	62.9	72.2	202.1	20.0
Pre-beta I-BW(5#)	4.5	68.0	82.2	71.3	221.5	21.9

1/ # active ingredient/gal.

$\bar{x}$	22.5
F	1.70NS
S.E.$\bar{x}$	12.43979
C.V. %	5.53

Table 5. Effect of herbicides on the sucrose content of sugar beets. Grown on the Homer Bailey farm, Corvallis, Montana in 1971. Exp. I

Treatment						
Herbicide	Rate #/A	% Sucrose I	II	III	Total	$\bar{x}$
Pre-beta II (6#)[1/]	3	15.9	15.6	16.0	47.5	15.8
Pre-beta I (5#)	3	15.8	17.4	16.5	49.7	16.6
Pre-beta II-BW(6#)	3	16.1	16.9	15.6	48.6	16.2
Pre-beta II-BW(6#)	4.5	16.0	17.6	16.7	50.3	16.8
Check	0	15.9	16.2	16.0	48.1	16.0
Pre-beta I-BW(5#)	3	15.9	16.7	15.4	48.0	16.0
Pre-beta I-BW(5#)	4.5	16.5	15.1	16.8	48.4	16.1

1/ # active ingredient/gal.

$\bar{x}$	16.2
F (.05)	1.14NS
S.E.$\bar{x}$	.16975
C.V.%	1.05

Table 6. Effect of herbicide on gross sugar production. Conducted on the Homer Bailey farm, Corvallis, Montana in 1971. Exp. I

Treatment						
Herbicide	Rate #/A	Sugar #/plot I	II	III	Total	Yield Lbs/A
Pre-beta II (6#)[1/]	3	13.9	10.3	12.9	37.1	7349
Pre-beta I (5#)	3	13.0	13.9	13.4	40.3	7983
Pre-beta II-BW(6#)	3	14.6	11.2	11.7	37.5	7428
Pre-beta II-BW(6#)	4.5	11.1	12.7	11.6	35.4	7012
Check	0	13.4	13.4	12.7	39.5	7825
Pre-beta I-BW(5#)	3	10.7	10.5	11.1	32.3	6398
Pre-beta I-BW(5#)	4.5	11.2	12.4	12.0	35.6	7052

1/ # active ingredient/gal.

$\bar{x}$	7293
F (.05)	1.85NS
S.E.$\bar{x}$	392.75
C.V. %	5.39

Table 7. Summary of weed control and yield data from sugar beet study conducted on the Homer Bailey farm, Corvallis, Montana in 1971. Exp. I

Treatment		%	%	Crop				Gross
Herbicide	Rate #/A	Beet Stand	Weed Control	Injury 0-10	# Beets/ 100' row	Yield Ton/A	% Sucrose	Sugar Lbs/A
Pre-beta II (6#)[1/]	3	128	73	1.3	120	23.2	15.8	7349
Pre-beta I (5#)	3	122	69	1.3	128	24.1	16.6	7983
Pre-beta II-BW(#6)	3	121	68	1.3	113	23.0	16.2	7428
Pre-beta II-BW(6#)	4.5	115	80	3	105	20.9	16.8	7012
Check	0	100	0	0	108	24.4	16.0	7825
Pre-beta I-BW(5#)	3	120	64	1	120	20.0	16.0	6398
Pre-beta I-BW(5#)	4.5	119	72	3.3	128	21.9	16.1	7052
$\bar{x}$					114	22.5	16.2	7293
F (.05)					2.00NS	1.70NS	1.14NS	1.35NS
S.E.$\bar{x}$					6.3893	12.43979	.16975	392.75
C.V.%					5.60	5.53	1.05	5.39

1/ # active ingredient/gal.

Table 8. Data from sugar beet study conducted on the Homer Bailey farm, Corvallis, Montana in 1971. Sugar beet and weed plant counts. Exp. II

Treatment			Plant counts[1]						
Herbicide	Rate #/A	Plot No.	Sugar Beets	Night-shade	Lambs-quarter	Pig-weed	Mustard	Kochia	Weed Total
			Pre plant incorporate						
NC 8438	2	1	122	15	2		2		19
		39	116	17	1	2	2		22
		52	95	4	2	1	4		11
		Total	333	36	5	3	8		52
		$\bar{x}$	111abcde[2]	12 bcd	2	1bc	3		
NC 8438	3	2	109	10	1			1	12
		34	100	15					15
		58	113	3	1				4
		Total	322	28	2			1	31
		$\bar{x}$	107abcde	9 bcd	.7			.3	
NC 8438	4	3	124	5			2	1	8
		49	137	4		1			5
		57	117	6	1				7
		Total	378	15	1	1	2	1	20
		$\bar{x}$	126a	5 cd	.3	.3c	.7	.3	
Pyrazon +	3 +	4	123	4		1			5
NC 8438	2	33	95	6					6
		70	98	2		1			3
		Total	316	12		2			14
		$\bar{x}$	105abcde	4 d		.7 bc			
Pyrazon +	3.75+	5	107	1		1			2
NC 8438	3	48	109	2					2
		65	84						0
		Total	300	3		1			4
		$\bar{x}$	100 bcde	1 d		.3 c			
Cycloate	3	6	126	6	7	1	1		15
		26	96	7	1	1			9
		53	110	9	2	6	1		18
		Total	332	22	10	8	2		42
		$\bar{x}$	111abcde	7 cd	3	3 b	.7		
Cycloate	4	7	134	9	5	2			16
		32	102	3				1	4
		51	108	2	1	3			6
		Total	344	14	6	5		1	26
		$\bar{x}$	115abcde	5 cd	2	2 bc		.3	
Cycloate +	3 +	8	141	11		4			15
R 7465	.5	41	105	11	1	2			14
		62	107	45	1	2	7		55
		Total	353	67	2	8	7		84
		$\bar{x}$	118abc	22abc	.7	3 b	2		

Table 8. (con't)

Treatment			Plant counts[1/]						
Herbicide	Rate #/A	Plot No.	Sugar Beets	Night-shade	Lambs-quarter	Pig-weed	Mustard	Kochia	Weed Total
Cycloate + R7465	3 + 1	9	141	5	4	1			10
		50	117	11		1	1		13
		55	106	5		1			6
		Total	364	21	4	3	1		29
		$\bar{x}$	121ab	7 cd	1	1	.3 c		
R7465 (50%)	1	10	129	35		7	1	2	45
		27	115	40		2			42
		60	113	22	1	2	1		26
		Total	357	97	1	11	2	2	113
		$\bar{x}$	119abc	32a	.3	4	.7 bc	.7	
Cycloate	5	11	129	9		3			12
		28	104	8	3	4			15
		56	116			1			1
		Total	349	17	3	8			28
		$\bar{x}$	116abcde	6 cd	1	3			
Cycloate + diallate	3 + 1	12	140	8	2	1	1	1	13
		40	133	11		2			13
		64	101	6					6
		Total	374	25	2	3	1	1	32
		$\bar{x}$	125a	8 bcd	.7	1	.3 c	.3	
Check (weedy)	0	13	134	37	4	6	14	4	65
		37	102	34		12	8		54
		66	109	28		3	10		41
		Total	345	99	4	21	32	4	160
		$\bar{x}$	115abcde	33a	1	7	11a	1	
Check (hand weeded)	0	14	113	15	21		1		37
		36	105	37	1	22	6		66
		63	71	32	2	4	2		40
		Total	289	84	24	26	9		143
		$\bar{x}$	96 de	28a	8	9	3 b		
			Post emergence						
SN503	.75	15	125	4	1				5
		31	73	26	3	5	4	1	39
		72	87						0
		Total	285	30	4	5	4	1	44
		$\bar{x}$	95 e	10 bcd	1	2	1 bc	.3	
SN503	1	16	126	3	1				4
		45	88	4		1			5
		54	79	5					5
		Total	293	12	1	1			14
		$\bar{x}$	98 cde	4 d	.3	.3			

Table 8. (con't)

Treatment			Plant counts[1/]						
Herbicide	Rate #/A	Plot No.	Sugar Beets	Night-shade	Lambs-quarter	Pig-weed	Mustard	Kochia	Weed Total
SN503	1.5	17	119	8		1			9
		30	91	10		1			11
		61	116	38	2	1			41
		Total	326	56	2	3			61
			109abcde	19abc	.7	1			
SN504	.75	18	146	7	2	1			10
		44	104	8		3			11
		68	105	5					5
		Total	355	20	2	4			26
		$\bar{x}$	118abc	7 cd	.7	1			
SN504	1	19	117	2					2
		47	97	4		1	1		6
		73	84	2		1			3
		Total	298	8		2	1		11
			99 cde	3 d		.7	.3	c	
SN504	1.5	20	115						0
		43	97	5		1			6
		74	97	2		1			3
		Total	309	7		2			9
		$\bar{x}$	103 bcde	2 d		.7			
Phenmedipham + pyrazon	1 + 2	21	133	1		2			3
		42	116	6	1	3			10
		67	113	3		1			4
		Total	362	10	1	6			17
		$\bar{x}$	121ab	3 d	.3	2			
Phenmedipham + pyrazon	1 + 3	22	125	5		4			9
		35	67	14		2	1		17
		59	108	5	1				6
		Total	300	24	1	6	1		32
		$\bar{x}$	100 bcde	8 bcd	.3	2	.3	c	
Phenmedipham	1	23	128	9	1	8			18
		29	95	31	1	6	2		40
		69	95	3					3
		Total	318	43	2	14	2		61
		$\bar{x}$	106abcde	14 bcd	.7	5	.7	bc	

Table 8. (con't)

Treatment			Plant counts[1/]						
Herbicide	Rate #/A	Plot No.	Sugar Beets	Night-shade	Lambs-quarter	Pig-weed	Mustard	Kochia	Weed Total
			Preplant incorporate + Post emergence						
Cycloate[a/] + phenmedipham[b/]	3 + .5	24	135	2	1	1			4
		46	106	6		3			9
		75	110			1			1
		Total	351	8	1	5			14
		$\bar{x}$	117abcd	3 d	.3	2			
Cycloate[a/] + phenmedipham[b/]	3 + 1	25	143	1	2	2			5
		38	114	6		4			10
		71	106	1					1
		Total	363	8	2	6			16
		$\bar{x}$	121ab	3 d	.7	2			

a/ Preplant incorporate
b/ Post emergence
1/ Eight counts made per plot with a quadrant 3" x48", $\bar{x}$ based on eight square feet per plot.
2/ Items having common letters are not significantly different one from another .05 (Duncans multiple range test)

$\bar{x}$	111	10	1	2	1	.15
F(.05)	222**	4.61**	1.30NS	1.57NS	7.95**	
S.E.$\bar{x}$	6.34362	4.37896	1.42666	1.65613	.78066	
C.V.%	5.72	42.87	133.75	80.65	81.31	

Table 9. Number of sugar beets from forty linear feet of beet row at harvest time in 1971. Homer Bailey farm, Corvallis, Montana. Exp. II

Treatment							
Herbicide	Rate #/A	# of beets/plot I	II	III	Total	x	No. Beets/ 100' of row
Preplant incorportat							
NC 8438	2	42	50	30	122	41	103
NC 8438	3	42	52	59	153	51	128
NC 8438	4	51	38	48	137	46	115
Pyrazon + NC 8438	3 + 2	53	48	57	158	53	133
Pyrazon + NC 8438	3.75+3	47	40	38	125	42	105
Cycloate	3	41	49	51	141	47	118
Cycloate	4	44	50	47	141	47	118
Cycloate + R 7465	3 + .5	46	49	48	143	48	120
Cycloate + R 7465	3 + 1	46	46	48	140	47	118
R 7465 (50%)	1	48	39	46	133	44	110
Cycloate	5	45	40	52	137	46	115
Cycloate + diallate	3 + 1	50	48	40	138	46	115
Check (weedy)	0	37	37	37	111	37	93
Check (hand weeded)	0	42	46	44	132	44	110
Post emergence							
SN 503	.75	52	47	49	148	49	123
SN 503	1	48	41	38	127	42	105
SN 503	1.5	48	44	44	136	45	113
SN 504	.75	38	39	40	117	39	98
SN 504	1	49	44	32	125	42	105
SN 504	1.5	58	38	37	133	44	110
Phenmedipham + pyrazon	1 + 2	52	57	43	152	51	128
Phenmedipham + pyrason	1 + 3	45	44	59	148	49	123
Phenmedipham	1	41	45	44	130	43	108
Preplant incorporate + Post emergence							
Cycloate[a/] + phenmedipham[b/]	3 + ½	40	38	40	118	39	98
Cycloate[a/] + phenmedipham[b/]	3 + 1	45	35	40	120	40	100

a/ Preplant incorporate
b/ Post emergence

$\bar{x}$	112
F(.05)	1.52NS
S.E.$\bar{x}$	8.21315
C.V.%	7.32

Table 10. Yield of sugar beets treated with various herbicides grown on the Homer Bailey farm, Corvallis, Montana in 1971. Plot size 73.3 sq. ft.

Treatment							
Herbicide	Rate #/A	Pounds per plot I	II	III	Total	$\bar{x}$	Tons/A
Preplant incorporate							
NC 8438	2	68.1	66.7	54.7	189.5	63.2	18.8 de[1/]
NC 8438	3	71.7	73.1	82.4	227.2	75.7	22.5abcd
NC 8438	4	86.6	60.2	77.8	224.6	74.9	22.3abcd
Pyrazon + NC8438	3 + 2	90.5	71.6	86.1	248.2	82.7	24.6abc
Pyrazon + NC8438	3.75+3	85.1	54.4	72.0	211.5	70.5	21.0abcd
Cycloate	3	64.4	76.8	53.4	194.6	64.9	19.3 cd
Cycloate	4	79.0	104.7	79.8	263.5	87.8	26.1a
Cycloate + R 7465	3 + .5	83.3	62.5	63.9	209.7	69.9	20.8abcd
Cycloate + R 7465	3 + 1	75.8	69.2	89.4	234.4	78.8	23.4abcd
R 7465 (50%)	1	90.9	75.2	86.2	252.3	84.1	25.0ab
Cycloate	5	68.1	67.6	73.7	209.4	69.8	20.7abcd
Cycloate + diallate	3 + 1	60.4	64.6	69.5	194.5	64.8	19.3 cd
Check (weedy)	0	42.3	42.5	57.6	142.4	47.5	14.1 e
Check (hand weeded)	0	64.9	77.9	77.1	219.9	73.3	21.8abcd
Post emergence							
SN 503	.75	73.3	76.7	73.6	223.6	74.5	22.1abcd
SN 503	1	65.0	64.2	75.6	204.8	68.3	20.3 bcd
SN 503	1.5	62.1	70.7	75.1	207.9	69.3	20.6 bcd
SN 504	.75	71.4	65.9	73.1	210.4	70.1	20.8abcd
SN 504	1	74.1	68.0	47.0	189.1	63.0	18.7 de
SN 504	1.5	71.6	68.0	80.5	220.1	73.4	21.8abcd
Phenmedipham + pyrazon	1 + 3	76.6	86.5	77.1	240.2	80.1	23.8abcd
Phenmedipham + pyrazon	1 + 2	76.7	51.1	72.0	199.8	66.6	19.8 bcd
Phenmedipham	1	67.6	69.8	77.4	214.8	71.6	21.3abcd
Preplant incorporate + Post emergence							
Cycloate[a/] + phenmedipham[b/]	3 + ½	72.1	56.6	57.5	186.2	63.1	18.7 de
Cycloate[a/] + phenmedipham[b/]	3 + 1	80.2	66.6	63.6	210.4	70.1	20.8abcd

a/ Preplant incorporate
b/ Post emergence
1/ Items having common letters are not significantly different one from another .05 (Duncans multiple range test)

$\bar{x}$	21.1
F(.05)	2.44**
S.E.$\bar{x}$	1.57822
C.V. %	7.48

Table 11. Effect of herbicides on the sucrose content of sugar beets grown on the Homer Bailey farm, Corvallis, Montana in 1971.

Treatment						
Herbicide	Rate #/A	% Sucrose I	II	III	Total	$\bar{x}$
	Preplant incorporate					
NC 8438	2	17.1	16.2	17.2	50.5	16.8
NC 8438	3	16.7	16.4	16.6	49.7	16.6
NC 8438	4	16.1	16.9	16.2	49.2	16.4
Pyrazon + NC 8438	3 + 2	15.5	16.3	16.3	48.1	16.0
Pyrazon + NC 8438	3.75 + 3	15.3	16.5	15.9	47.7	15.9
Cycloate	3	16.3	16.4	16.1	48.8	16.3
Cycloate	4	15.6	16.0	16.2	47.8	15.9
Cycloate + R 7465	3 + .5	12.2	16.2	16.5	44.9	15.0
Cycloate + R 7465	3 + 1	16.3	16.1	16.2	48.6	16.2
R 7465 (50%)	1	16.1	16.0	15.8	47.9	16.0
Cycloate	5	16.1	15.8	16.6	48.5	16.2
Cycloate + diallate	3 + 1	15.1	16.1	16.8	48.0	16.0
Check (weedy)	0	15.9	15.5	16.0	47.4	15.8
Check (hand weeded)	0	16.3	15.5	16.6	48.4	16.1
	Post emergence					
SN 503	.75	16.7	15.1	16.8	48.6	16.2
SN 503	1	16.1	17.0	16.1	49.2	16.4
SN 503	1.5	14.7	15.8	16.1	46.6	15.5
SN 504	.75	15.8	16.2	14.4	46.4	15.5
SN 504	1	16.4	16.3	16.4	49.1	16.4
SN 504	1.5	16.5	16.4	16.1	49.0	16.3
Phenmedipham + pyrazon	1 + 2	16.2	16.3	15.8	48.3	16.1
Phenmedipham + pyrazon	1 + 3	16.6	15.8	16.2	48.6	16.2
Phenmedipham	1	16.3	16.5	16.4	49.2	16.4
	Preplant incorporate + Post emergence					
Cycloate[a/] + phenmedipham[b/]	3 + ½	17.0	17.1	17.3	51.4	17.1
Cycloate[a/] + phenmedipham[b/]	3 + 1	16.6	15.5	16.8	48.9	16.3

a/ Preplant incorporate
b/ Post emergence

$\bar{x}$	16.1
F(.05)	1.21NS
S.E.$\bar{x}$	.39225
C.V. %	2.43

Table 12. Effect of herbicides on gross sugar production. Conducted on the Homer Bailey farm, Corvallis, Montana in 1971. Size of plot 73.3 square feet.

Treatment							
Herbicide	Rate #/A	Pounds per plot I	II	III	Total	$\bar{x}$	# Sucrose per Acre
Preplant incorporate							
NC 8438	2	11.6	10.8	9.4	31.8	10.6	6298 cd[1/]
NC 8438	3	12.0	12.0	13.7	37.7	12.6	7468abcd
NC 8438	4	13.9	10.2	12.6	36.7	12.2	7270abcd
Pyrazon + NC 8438	3 + 2	14.0	11.7	14.0	39.7	13.2	7864abc
Pyrazon + NC 8438	3.75 + 3	13.0	9.0	11.5	33.5	11.2	6636 bcd
Cycloate	3	10.5	12.6	8.6	31.7	10.6	6279 cd
Cycloate	4	12.3	16.8	12.9	42.0	14.0	8320a
Cycloate + R 7465	3 + .5	10.2	10.1	10.5	30.8	10.3	6101 d
Cycloate + R 7465	3 + 1	12.3	11.1	14.5	37.9	12.6	7507abcd
R 7465 (50%)	1	14.6	12.0	13.6	40.2	13.4	7963ab
Cycloate	5	11.0	10.7	12.2	33.9	11.3	6715abcd
Cycloate + diallate	3 + 1	9.1	10.4	11.7	31.2	10.4	6180 d
Check (weedy)	0	6.7	6.6	9.2	22.5	7.5	4457 e
Check (hand weeded)	0	10.6	12.1	12.8	35.5	11.8	7032abcd
Post emergence							
SN 503	.75	12.2	11.6	12.4	36.2	12.1	7171abcd
SN 503	1	10.5	10.9	12.2	33.6	11.2	6656 bcd
SN 503	1.5	9.1	11.2	12.1	32.4	10.8	6418 bcd
SN 504	.75	11.3	10.7	10.5	32.5	10.8	6438 bcd
SN 504	1	12.2	11.1	7.7	31.0	10.3	6141 d
SN 504	1.5	11.8	11.2	13.0	36.0	12.0	7131abcd
Phenmedipham + pyrazon	1 + 2	12.4	8.3	11.4	32.1	10.7	6339 bcd
Phenmedipham + pyrazon	1 + 3	12.7	13.7	12.5	38.9	13.0	7705abcd
Phenmedipham	1	11.0	11.5	12.7	35.2	11.7	6972abcd
Preplant incorporate + Post emergence							
Cycloate[a/] + phenmedipham[b/]	3 + ½	12.3	9.7	9.9	31.9	10.6	6319 cd
Cycloate[a/] + phenmedipham[b/]	3 + 1	13.3	10.3	10.7	34.3	11.4	6794abcd

a/ Preplant incorporate
b/ Post emergence
1/ Items having common letters are not significantly different one from another .05 (Duncans multiple range test)

$\bar{x}$	6808
F.05	2.61**
S.E.$\bar{x}$	491.7
C.V.%	7.22

Table 13. Summary of weed control and yield data from sugar beet study conducted on the Homer Bailey farm, Corvallis, Montana in 1971.

Treatment Herbicide	Rate #/A	% Beet Stand	% Weed Control	Crop Injury 0-10	# Beets/ 100' Row	Yield Tons/A	% Sucrose	Gross Sugar Lbs/A
			Preplant incorporate					
NC 8438	2	105	68	3.3	103	18.8 de[1/]	16.8	6298 cd[1/]
NC 8438	3	102	80	3.0	128	22.5abcd	16.6	7468abcd
NC 8438	4	119	87	2.3	115	22.3abcd	16.4	7270abcd
Pyrazon + NC 8438	3 + 2	100	91	2.7	133	24.6abc	16.0	7864abc
Pyrazon + NC 8438	3.75+3	95	97	2.0	105	21.0abc	15.9	6636 bcd
Cycloate	3	105	74	2.7	118	19.3 cd	16.3	6279 cd
Cycloate	4	109	84	3.0	118	26.1a	15.9	8320a
Cycloate + R 7465	3 + .5	111	48	.7	120	20.8abcd	15.0	6101 d
Cycloate + R 7465	3 + 1	115	82	1.3	118	23.4abcd	16.2	7507abcd
R 7465 (50%)	1	113	30	1.7	110	25.0ab	16.0	7963ab
Cycloate	5	110	82	3.0	115	20.7abcd	16.2	6715abcd
Cycloate + diallate	3 + 1	118	80	1.3	115	19.3 cd	16.0	6180 d
Check (weedy)	0	100	0	0	93	14.1 e	15.8	4457 e
Check (hand weeded)	0	100	100	0	110	21.8abcd	16.1	7032abcd
			Post emergence					
SN 503	.75	90	72	3.3	123	22.1abcd	16.2	7171abcd
SN 503	1	92	91	6.0	105	20.3 bcd	16.4	6656 bcd
SN 503	1.5	103	62	5.7	113	20.6 bcd	15.5	6418 bcd
SN 504	.75	112	74	4.0	98	20.8abcd	15.5	6438 bcd
SN 504	1	94	93	4.0	105	18.7 de	16.4	6141 d
SN 504	1.5	98	94	3.7	110	21.8abcd	16.3	7131abcd
Phenmedipham + pyraxon	1 + 2	114	89	2.7	128	19.8 bcd	16.1	6339 bcd
Phenmedipham + pyrazon	1 + 3	95	80	2.0	123	23.8abcd	16.2	7705abcd
Phenmedipham	1	100	62	4.7	108	21.3abcd	16.4	6972abcd
			Preplant incorporate + Post emergence					
Cycloate[a/] + phenmedipham[b/]	3 + ½	111	91	1.3	98	18.7 de	17.1	6319 cd
Cycloate[a/] + phenmedipham[b/]	3 + 1	115	90	2.7	100	20.8abcd	16.3	6794abcd
$\bar{x}$		112		21.1		16.1	6808	
F .05		1.52NS		2.44**		1.21NS	2.61**	
S.E.$\bar{x}$		8.21315		1.57822		.39225	491.7	
C.V. %		7.32		7.48		2.43	7.22	

a/ Preplant incorporate
b/ Post emergence
1/ Items having a common letter are not significantly different one from another .05. (Duncans multiple range test)

Ks VRS 1

TITLE: Chemical weed control in new seedings of legumes

PROJECT: Weed Investigations MS 754

YEAR: 1971

PERSONNEL: Leader - Vern R. Stewart
Cooperators - Chemical Company Research and Development Representatives

LOCATION: Northwestern Agricultural Research Center; Field No. Y-5

OBJECTIVES:
1. To determine the effectiveness of certain herbicides for the control of weeds and the establishment of legume stands.
2. To measure the long term effect of weeds on legume yields.
3. To measure the effect of the herbicide on the legume.

SIGNIFICANT FINDINGS:

Alfalfa - after three harvest years, including the seeding year, there is not any yield difference in legume production. Table 5

Sainfoin - there is no significant differences in yield after three harvest years.

Clover - yields are probably not significant, but it should be noted that when grown with a companion crop the clover yields are equal to chemically treated plots in 1971 or maybe a little superior.

FUTURE PLANS: This study is now completed. At this writing no specific legume work is planned.

MATERIALS AND METHODS:

Discription and procedures for this project are found in the 1969 annual report of the Northwestern Montana Branch Station located on pages 64 and 65.

Plot size harvested in 1971 was 2' x 10' (20 square feet). This was done with a power flail type machine. Thousand gram green samples were secured at random from the study, dried to determine the moisture percentage. Six samples were taken from each crop in each replication. The average of the six samples was used as a basis to obtain moisture percentages in all plots in the replication.

Chemicals used are found in the following table.

Table 1. Chemicals used were:

Common Name	Trade Name or other	Chemical Name	Company
EPTC	Eptam	ethyl N,N-dipropylthiolcarbamate	Stauffer
Bromoxynil	Brominal	3,5-dibromo-4-hydroxybenzonitrile	Amchem
	Buctril		Rhodia
Benefin	Balan	N-butyl-N-ethyl-a,a,a-trifluoro-2,6-dinitro-p-toluidine	
	VCS 438	2-(3,4-Dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione	Velsicol

Materials and Methods (con't)

Data was analyzed using the analysis varience technique.

Legumes used in this study were Vernal alfalfa, Eski sainfoin and altasweede mammoth red clover.

The 1968 seeding was not harvested in 1971 because no differences in yields between treatments was found in the 1970 yields. Thus for 1968 seeding we have only three years of yield data which includes the seeding year harvest.

RESULTS AND DISCUSSION:

Only one cutting was obtained from alfalfa study. This was caused by a mechanical error. When cutting around the plot, to prepare for harvest 24 plots of alfalfa were cut by mistake.

Alfalfa

The highest yields occurred where Bromoxynil was used as a post emergence treatment, however these differences were not found to be statistically different in 1971. Table 2.

Sainfoin

Yields were in the four to five ton per acre range. Yields were not found to be statistically different when analyzed. The lowest yielding treatment was where benefin had been used at 3 pounds per acre. Table 3.

Clover

The yields are quite low. Production of the legume in the study has not been high during the course of the study. Yields were not found to be significantly different when analyzed statistically. Table 4

It should be noted that the CV's are quite low which is an indication of fairly uniform stands throughout the study. In the sainfoin study there was considerable difference due to replications.

Table 2. Effect of certain herbicides on the yield of alfalfa two years following application. 1971

Treatment		Plot Yield Lbs. Dry Matter				Yield
Herbicide	Rate #/A	I	II	III	Total	T/A
EPTC 1/	2	1.635	2.394	2.278	6.307	2.3
EPTC 1/	4	2.278	1.869	2.336	6.483	2.4
EPTC 1/	6	1.986	1.752	2.336	6.074	2.2
EPTC 1/ + Bromoxynil 2/	2 + ¼	2.102	1.577	2.219	5.898	2.1
EPTC 1/ + Bromoxynil 2/	4 + ¼	2.102	2.920	1.986	7.008	2.5
EPTC 1/ + Bromoxynil 2/	6 + ¼	1.869	2.336	1.986	6.191	2.3
EPTC 1/ + Bromoxynil 2/	2 + 5/16	2.278	1.927	1.635	5.840	2.1
EPTC 1/ + Bromoxynil 2/	4 + 5/16	2.394	2.102	2.453	6.949	2.5
EPTC 1/ + Bromoxynil 2/	6 + 5/16	1.869	2.161	2.044	6.074	2.2
EPTC 1/ + Bromoxynil 2/	2 + 3/8	2.219	2.628	2.628	7.475	2.7
EPTC 1/ + Bromoxynil 2/	4 + 3/8	1.752	1.810	2.102	5.664	2.1
EPTC 1/ + Bromoxynil 2/	6 + 3/8	2.044	1.927	2.102	6.073	2.2
Benefin 1/	2	1.635	1.986	1.694	5.315	1.9
Benefin 1/	3	1.869	1.810	2.102	5.781	2.1
Benefin 1/	4	2.219	1.810	2.511	6.540	2.4
Velsicol 438 3/	2	1.869	2.336	2.044	6.249	2.3
Velsicol 438 3/	3	2.511	2.920	2.336	7.767	2.8
Velsicol 438 3/	4	2.511	2.336	1.927	6.774	2.5
Clipping (check)	0	2.336	2.102	1.869	6.307	2.3
Companion Crop	0	2.278	2.628	1.810	6.716	2.4
Bromoxynil 2/	¼	2.394	2.453	2.511	7.358	2.7
Bromoxynil 2/	5/16	3.270	2.453	2.161	7.884	2.9
Bromoxynil 2/	3/8	2.803	2.920	2.044	7.767	2.8
Bromoxynil 2/	½	1.869	2.511	2.219	6.599	2.4

1/ Pre plant incorporate
2/ Post emergence
3/ Post plant

$\bar{x}$	2.4
F. - Value for treatment comparison	1.71
S.E.$\bar{x}$	.197
L.S.D. (.05)	N.S.
C.V.%	8.29

Table 3. Effects of certain herbicides on the yield of sainfoin two years following application. 1971 Plot size 20 sq. ft.

Treatment			Plot Yield Lbs. Dry Matter				Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	T/A
EPTC[1/]	2	1	2.938	2.865	2.057	7.860	
		2	1.871	1.810	1.531	5.212	
			4.809	4.675	3.588	13.072	4.8
EPTC[1/]	4	1	2.130	3.673	2.057	7.860	
		2	1.624	1.810	1.217	4.651	
			3.754	5.483	3.274	12.511	4.5
EPTC[1/]	6	1	1.910	2.718	2.424	7.052	
		2	1.575	1.754	1.295	4.624	
			3.485	4.472	3.719	11.676	4.2
EPTC[1/] + Bromoxynil[2/]	2 + ¼	1	2.865	2.424	2.350	7.639	
		2	1.871	1.471	1.609	4.951	
			4.736	3.895	3.959	12.590	4.6
EPTC[1/] + Bromoxynil[2/]	4 + ¼	1	3.305	3.819	2.865	9.989	
		2	2.018	1.867	1.492	5.377	
			5.323	5.686	4.357	15.366	5.6
EPTC[1/] + Bromoxynil[2/]	6 + ¼	1	1.983	3.893	1.986	7.862	
		2	1.723	2.037	1.178	4.938	
			3.706	5.930	3.164	12.800	4.7
EPTC[1/] + Bromoxynil[2/]	2 + 5/16	1	2.350	2.204	2.865	7.419	
		2	1.428	1.867	1.452	4.747	
			3.778	4.071	4.317	12.166	4.4
EPTC[1/] + Bromoxynil[2/]	4 + 5/16	1	3.452	2.277	2.865	8.594	
		2	1.526	1.924	1.374	4.824	
			4.978	4.201	4.239	13.418	4.9
EPTC[1/] + Bromoxynil[2/]	6 + 5/16	1	3.085	2.791	2.277	8.153	
		2	1.132	1.414	1.688	4.234	
			4.217	4.205	3.965	12.387	4.5
EPTC[1/] + Bromoxynil[2/]	2 + 3/8	1	3.085	3.526	2.424	9.035	
		2	1.575	1.471	1.335	4.381	
			4.660	4.997	3.759	13.416	4.9
EPTC[1/] + Bromoxynil[2/]	4 + 3/8	1	2.350	2.571	2.644	7.565	
		2	1.920	1.358	1.531	4.809	
			4.270	3.929	4.175	12.374	4.5
EPTC[1/] + Bromoxynil[2/]	6 + 3/8	1	2.718	3.379	2.057	8.154	
		2	2.018	1.810	1.374	5.202	
			4.736	5.189	3.431	13.356	4.9
Benefin[1/]	2	1	2.204	2.277	1.910	6.391	
		2	1.378	1.810	1.413	4.601	
			3.582	4.087	3.323	10.992	4.0

Table 3 . (con't)

Treatment			Plot Yield Lbs. Dry Matter				Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	T/A
Benefin[1/]	3	1	1.910	2.057	2.571	6.538	
		2	1.231	1.641	1.335	4.207	
			3.141	3.698	3.906	10.745	3.9
Benefin[1/]	4	1	2.718	3.011	2.350	8.079	
		2	1.575	1.641	1.492	4.708	
			4.293	4.652	3.842	12.787	4.6
Velsicol 438[3/]	2	1	1.910	3.599	3.011	8.520	
		2	1.477	1.810	1.374	4.661	
			3.387	5.409	4.385	13.181	4.8
Velsicol 438[3/]	3	1	2.277	3.158	2.130	7.565	
			1.575	1.471	1.335	4.381	
			3.852	4.629	3.465	11.946	4.3
Velsicol 438[3/]	4	1	2.644	3.011	2.497	8.152	
		2	1.526	1.528	1.492	4.546	
			4.170	4.539	3.989	12.698	4.6
Clipping (check)	0	1	3.893	3.746	3.011	10.650	
		2	1.231	1.528	1.413	4.172	
			5.124	5.274	4.424	14.822	5.4
Companion Crop	0	1	2.718	1.689	2.277	6.684	
		2	1.526	1.584	1.531	4.641	
			4.244	3.273	3.808	11.325	4.1
Bromoxynil[2/]	¼	1	2.718	3.746	3.085	9.549	
		2	1.280	1.584	1.256	4.120	
			3.998	5.330	4.341	13.669	5.0
Bromoxynil[2/]	5/16	1	2.718	4.554	2.644	9.916	
		2	1.428	1.414	1.374	4.216	
			4.146	5.968	4.018	14.132	5.1
Bromoxynil[2/]	3/8	1	2.277	3.305	2.938	8.520	
		2	1.329	1.754	1.570	4.653	
			3.606	5.059	4.508	13.173	4.8
Bromoxynil[2/]	½	1	2.644	3.599	3.305	9.548	
		2	1.526	1.528	1.492	4.546	
			4.170	5.127	4.797	14.094	5.1

1/ Preplant incorporate
2/ Post emergence
3/ Post plant

$\bar{x}$	4.7
F.-Value for treatment comparison	1.30
S.E.$\bar{x}$	.354
L.S.D. (.05)	N.S.
C.V. %	7.58

Table 4. Effect of certain herbicides on the yield of clover two years following application. 1971

Treatment			Plot Yield Lbs. Dry Matter				Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	T/A
EPTC[1/]	2	1	1.586	1.682	1.634	4.902	
		2	.842	1.273	1.234	3.349	
			2.428	2.955	2.868	8.251	3.0
EPTC[1/]	4	1	1.970	1.874	1.345	5.189	
		2	.803	1.839	1.275	3.917	
			2.773	3.713	2.620	9.106	3.3
EPTC[1/]	6	1	1.634	1.682	1.826	5.142	
		2	.765	1.179	1.645	3.589	
			2.399	2.861	3.471	8.731	3.2
EPTC[1/] + Bromoxynil[2/]	2 + ¼	1	1.442	1.970	1.489	4.901	
		2	.995	.990	1.193	3.178	
			2.437	2.960	2.682	8.079	2.9
EPTC[1/] + Bromoxynil[2/]	4 + ¼	1	1.538	1.442	1.345	4.325	
		2	1.033	1.462	1.275	3.770	
			2.571	2.904	2.620	8.095	2.9
EPTC[1/] + Bromoxynil[2/]	6 + ¼	1	1.730	1.153	1.586	4.469	
		2	.803	1.226	.946	2.975	
			2.533	2.379	2.532	7.444	2.7
EPTC[1/] + Bromoxynil[2/]	2 + 5/16	1	2.066	1.682	1.489	5.237	
		2	.956	1.179	1.357	3.492	
			3.022	2.861	2.846	8.729	3.2
EPTC[1/] + Bromoxynil[2/]	4 + 5/16	1	1.730	1.297	1.345	4.372	
		2	.842	1.556	1.439	3.837	
			2.572	2.853	2.784	8.209	3.0
EPTC[1/] + Bromoxynil[2/]	6 + 5/16	1	1.778	1.153	1.442	4.373	
		2	.995	1.415	1.110	3.520	
			2.773	2.568	2.552	7.893	2.7
EPTC[1/] + Bromoxynil[2/]	2 + 3/8	1	1.538	1.634	1.538	4.710	
		2	1.033	1.462	1.193	3.688	
			2.571	3.096	2.731	8.398	3.0
EPTC[1/] + Bromoxynil[2/]	4 + 3/8	1	1.586	2.018	1.538	5.142	
		2	.727	1.415	1.481	3.623	
			2.313	3.433	3.019	8.765	3.2
EPTC[1/] + Bromoxynil[2/]	6 + 3/8	1	1.249	1.586	1.538	4.373	
		2	.689	1.367	1.193	3.249	
			1.938	2.953	2.731	7.622	2.8
Benefin[1/]	2	1	1.970	1.538	1.201	4.709	
		2	1.224	1.132	.781	3.137	
			3.194	2.670	1.982	7.846	2.9

Table 4 . (con't)

Treatment Herbicide	Rate #/A	Cutting	Plot Yield Lbs. Dry Matter I	II	III	Total	Yield T/A
Benefin 1/	3	1	1.874	1.538	1.538	4.950	
		2	1.109	1.462	.987	3.558	
			2.983	3.000	2.525	8.508	3.1
Benefin 1/	4	1	1.393	1.826	1.201	4.420	
		2	1.109	1.084	.617	2.810	
			2.502	2.910	1.818	7.230	2.6
Velsicol 438 3/	2	1	1.105	1.489	1.778	4.372	
		2	1.262	1.697	.946	3.905	
			2.367	3.186	2.724	8.277	3.0
Velsicol 438 3/	3	1	1.682	1.538	1.538	4.758	
		2	1.148	1.650	1.398	4.196	
			2.830	3.188	2.936	8.954	3.3
Velsicol 438 3/	4	1	1.970	1.442	1.586	4.998	
		2	1.186	1.320	1.234	3.740	
			3.156	2.762	2.820	8.738	3.2
Clipping (check)	0	1	1.682	1.393	1.682	4.757	
		2	.803	1.462	.946	3.211	
			2.485	2.855	2.628	7.968	2.9
Companion Crop	0	1	2.018	2.162	1.634	5.814	
		2	1.339	1.226	.987	3.552	
			3.357	3.388	2.621	9.366	3.4
Bromoxynil 2/	¼	1	1.970	1.730	1.682	5.382	
		2	.995	1.603	1.481	4.079	
			2.965	3.333	3.163	9.461	3.4
Bromoxynil 2/	5/16	1	1.970	1.778	1.826	5.574	
		2	1.109	1.792	.946	3.847	
			3.079	3.570	2.772	9.421	3.4
Bromoxynil 2/	3/8	1	1.778	1.778	1.345	4.901	
		2	.918	1.415	1.604	3.937	
			2.696	3.193	2.949	8.838	3.2
Bromoxynil 2/	½	1	1.922	1.634	1.489	5.045	
		2	1.339	1.273	.946	3.558	
			3.261	2.907	2.435	8.603	3.1

1/ Preplant incorporate
2/ Post emergence
3/ Post plant

$\bar{x}$	3.1
F.-Value for treatment comparison	1.18
S.E.$\bar{x}$	.203
L.S.D. (.05)	N.S.
C.V. %	6.64

Table 5. Summary of three harvests of alalfa which had been treatment with herbicides the seeding year.

Treatment		Yield Ton/Acre			
Herbicide	Rate #/A	1969	1970	1971	x̄
EPTC 1/	2	1.7	3.3	2.3	2.4
EPTC 1/	4	2.0	3.0	2.4	2.5
EPTC 1/	6	2.4	3.1	2.2	2.6
EPTC 1/ + Bromoxynil 2/	2 + ¼	2.1	3.0	2.1	2.4
EPTC 1/ + Bromoxynil 2/	4 + ¼	2.3	3.1	2.5	2.6
EPTC 1/ + Bromoxynil 2/	6 + ¼	2.2	3.1	2.3	2.5
EPTC 1/ + Bromoxynil 2/	2 + 5/16	2.1	3.4	2.1	2.5
EPTC 1/ + Bromoxynil 2/	4 + 5/16	1.9	3.3	2.5	2.6
EPTC 1/ + Bromoxynil 2/	6 + 5/16	1.7	3.1	2.2	2.3
EPTC 1/ + Bromoxynil 2/	2 + 3/8	2.1	3.4	2.7	2.7
EPTC 1/ + Bromoxynil 2/	4 + 3/8	2.1	3.4	2.1	2.5
EPTC 1/ + Bromoxynil 2/	6 + 3/8	2.5	3.2	2.2	2.6
Benefin 1/	2	2.0	2.9	1.9	2.3
Benefin 1/	3	2.0	3.0	2.1	2.4
Benefin 1/	4	1.8	2.9	2.4	2.4
Velsicol 438 3/	2	1.6	3.0	2.3	2.3
Velsicol 438 3/	3	1.5	2.9	2.8	2.4
Velsicol 438 3/	4	1.4	3.3	2.5	2.4
Clipping (check)	0	.9	3.1	2.3	2.1
Companion Crop	0		2.5	2.4	2.5
Bromoxynil 2/	¼	1.9	3.4	2.7	2.7
Bromoxynil 2/	5/16	1.8	3.0	2.9	2.6
Bromoxynil 2/	3/8	1.6	3.1	2.8	2.5
Bromoxynil 2/	½	.9	3.2	2.4	2.2

1/ Preplant incorporate
2/ Post emergence
3/ Post plant

Talbe 6. Summary of three harvests of sainfoin which had been treated with herbicides the seeding year.

Treatment		Yield Ton/Acre			
Herbicide	Rate #/A	1969	1970	1971	x
EPTC[1]	2	1.9	3.5	4.8	3.4
EPTC[1]	4	2.2	4.1	4.5	3.6
EPTC[1]	6	2.5	3.8	4.2	3.5
EPTC[1] + Bromoxynil[2]	2 + ¼	2.7	3.4	4.6	3.6
EPTC[1] + Bromoxynil[2]	4 + ¼	2.5	3.5	5.6	3.9
EPTC[1] + Bromoxynil[2]	6 + ¼	2.1	3.6	4.7	3.5
EPTC[1] + Bromoxynil[2]	2 + 5/16	2.3	4.0	4.4	3.6
EPTC[1] + Bromoxynil[2]	4 + 5/16	2.4	3.9	4.9	3.7
EPTC[1] + Bromoxynil[2]	6 + 5/16	2.3	3.4	4.5	3.4
EPTC[1] + Bromoxynil[2]	2 + 3/8	2.9	4.0	4.9	3.9
EPTC[1] + Bromoxynil[2]	4 + 3/8	2.5	4.0	4.5	3.7
EPTC[1] + Bromoxynil[2]	6 + 3/8	2.3	4.1	4.9	3.8
Benefin[1]	2	2.8	3.3	4.0	3.4
Benefin[1]	3	3.0	3.7	3.9	3.5
Benefin[1]	4	2.2	3.5	4.6	3.4
Velicol 438[3]	2	2.0	3.5	4.8	3.4
Velicol 438[3]	3	2.6	4.1	4.3	3.7
Velicol 438[3]	4	2.0	4.1	4.6	3.6
Clipping (check)	0	1.1	3.8	5.4	3.4
Companion Crop	0		2.4	4.1	3.3
Bromoxynil[2]	¼	1.7	4.0	5.0	3.6
Bromoxynil[2]	5/16	2.7	3.7	5.1	3.8
Bromoxynil[2]	3/8	2.1	4.1	4.8	3.7
Bromoxynil[2]	½	2.2	3.9	5.1	3.7

1/ Preplant incorporate
2/ Post emergence
3/ Post plant

Table 7. Summary of three harvests of clover which had been treated with herbicides the seeding year.

Treatment		Yield Tons/Acre			
Herbicide	Rate #/A	1969	1970	1971	x
EPTC 1/	2	1.1	2.8	3.0	2.3
EPTC 1/	4	.6	2.4	3.3	2.1
EPTC 1/	6	1.1	2.8	3.2	2.4
EPTC 1/ + Bromoxynil 2/	2 + ¼	1.0	2.3	2.9	2.1
EPTC 1/ + Bromoxynil 2/	4 + ¼	.9	2.5	2.9	2.1
EPTC 1/ + Bromoxynil 2/	6 + ⅜	.9	2.5	2.7	2.0
EPTC 1/ + Bromoxynil 2/	2 + 5/16	.8	2.5	3.2	2.2
EPTC 1/ + Bromoxynil 2/	4 + 5/16	1.0	2.5	3.0	2.2
EPTC 1/ + Bromoxynil 2/	6 + 5/16	1.0	3.0	2.7	2.2
EPTC 1/ + Bromoxynil 2/	2 + 3/8	1.0	2.4	3.0	2.1
EPTC 1/ + Bromoxynil 2/	4 + 3/8	.9	2.5	3.2	2.2
EPTC 1/ + Bromoxynil 2/	6 + 3/8	1.1	2.2	2.8	2.0
Benefin 1/	2	1.0	2.2	2.9	2.0
Benefin 1/	3	1.3	2.5	3.1	2.3
Benefin 1/	4	1.0	2.5	2.6	2.0
Velsicol 438 3/	2	.9	2.6	3.0	2.2
Velsicol 438 3/	3	.6	2.8	3.3	2.2
Velsicol 438 3/	4	.6	2.7	3.2	2.2
Clipping (check)	0	.8	2.7	2.9	2.1
Companion Crop	0		2.5	3.4	3.0
Bromoxynil 2/	¼	.9	2.8	3.4	2.4
Bromoxynil 2/	5/16	1.1	2.7	3.4	2.4
Bromoxynil 2/	3/8	.4	2.8	3.2	2.1
Bromoxynil 2/	½	.8	3.2	3.1	2.4

1/ Preplant incorporate
2/ Post emergence
3/ Post plant

TITLE: Control of spring and winter annuals in small grains

PROJECT: Weed Investigations MS 754

YEAR: 1971

PERSONNEL: Leader - Vern R. Stewart
Cooperators - Weed Research Committee, Chemical Company Research and Development Representatives

LOCATION: Northwestern Agricultural Research Center, Field No. R-3c, R-2b and D.D. Brenneman, Paul Boss, Jim Snell farms

DURATION: Indefinite

OBJECTIVES:
1. To find a herbicide or herbicides that will effectively and economically control winter annuals in winter wheat with little or no deleterious effect on wheat yields.
2. To determine the effectiveness of granular triallate for wild oat control in spring barley.

SIGNIFICANT FINDINGS:

1. Terbutryn provided excellent control of henbit, field gromwell and catchfly species when early spring applied to weeds in winter wheat. Yields were also significantly increased.
2. SD 30053, gave good control of wild oats, but caused a significant reduction in barley height.
3. BAS 3510H, gave excellent control of German Knawel with significiant increase in barley yield when compared with the check.

MATERIALS AND METHODS:

Three individual tests on small grains were conducted in 1971. A total of eleven herbicides were used at various rates in the experiments. Herbicides used are found in Table 1.

The predominate species being studied were; field gromwell (Lithospermum arvense (L.)); wild oats (Avena fatua (L.)); catchfly (Silene conoidea (L.)); henbit (Larmium amplexicaule (L.)) and German knawel (Scleranthus annuus (L.)).

Herbicides were applied to established stands of small grains. Plots were 10' x 20' (200 sq. ft.) in the replicated studies; 10' x 100' (1000 sq. ft.) in the strip tests. Applications were made at right angles to the grain rows. All herbicides were applied in an aqueous solution at 39.5 gpa except the granular materials.

Climatic conditions at time of herbicide application were recorded and are found in Table 2, for all three experiments.

Weed scores were obtained by visual observation using a scale of 0-10, 0 being no control, 10 being complete control.

Materials and Methods (con't)

All data when applicable were analyzed using the analysis of variance technique.

Harvesting of the replicated plots was done with a "Jeri" mower, with 18.75 sq. ft. being harvested to determine yields. The strip tests were harvested with a field combine.

RESULTS AND DISCUSSION:

Experiment I

Early spring application to growing weeds in winter wheat of various herbicides (Table 3) gave from poor to excellent control. Terbutryn gave almost 100% control of all weed species present. The main species were; field gromwell, henbit and a catch-fly species. The combination of bromoxynil and diuron as a package mix (ACP 69-386) was completely ineffective in weed control. The combination of bromoxynil and MCPA gave fair control of the species present. Dicamba plus bromoxynil was about equal to the bromoxynil-MCPA combination.

Yields when analyzed statistically were not found to be significant, however the terbutryn treatment resulted in a 9 bushel increase over the check. Other increases in yields as the result of treatments can be seen in Table 3.

Experiment II

Experiment two was conducted in an established stand of Ingrid barley, which contained a natural population of wild oats. This population was quite uniform throughout the plot area.

Two applications of herbicides were made; (1) when the wild oats were in the two leaf stage, (2) in the 4 to 5 leaf stage. Herbicides used and growth stage when applied are found in Table 4. Obtaining even distribution of granular triallate was quite difficult when applied by hand.

Weed control was quite poor with most all the triallate compounds, with the exception of granular formulation at 3 lbs/a which gave fairly good control. SD 30053 controlled 70% of the wild oats, but caused considerable reduction in plant height. In some cases plant height was reduced as much as four inches. The EC formulation of triallate did not affect the height of barley as greatly as the granular formulation. Table 4.

Field observations of the effect of the herbicides on barley and wild oat control are seen in Table 5.

Kernel size was not materially affected by any of the herbicides used, however the SD 30053 treatment did show a lower plump percentage than the check and triallate treatments. Table 4.

Yields vary greatly between treatments. The highest yield was obtained at 3 lbs/acre of granular triallate when applied at the two leaf stage.

The same rate of granular triallate applied at the 4 to 5 leaf stage caused a 17.2 bu/a reduction which was statistically significant. All herbicide treatments were higher in yield than the check. Table 4.

Results and Discussion (con't)

Experiment III

German Knawel (Scleranthus annuus (L.)) was the species under study in this experiment. A high population was growing in a field of established Freja barley. Seven herbicides were used in the study at two or more rates. The first sixteen treatments were applied June 21, 1971 and the remaining five, June 28, 1971. Barley was in the 5 to 6 leaf stage for both applications. Weeds were in about the same stage of development for both applications.

The herbicide providing the greatest amount of weed control was BAS 3510H. Yields from these treatments were highest in the study, Table 6. Mon-097 provided no weed control, but yields were higher than the check plot. Diuron at 1 lb/a gave 20% weed control and a slight increase in yield. Dic 1897 at 1.00 and 1.5 lbs/a gave 80 and 90% weed control respectively with four to five bushel increase in yield. At this low yield level these yield increases are probably significant. In Table 6, are found all the yield data plus the effect of the herbicide on barley and weed species present.

Table 1. Herbicides used in the experiments.

Common Name	Trade Name or other	Chemical Name	Company
triallate	Fargo	2,3,3-trichloroallyl NN-diisopropyl-thiolcarbamate	Monsanto
bromoxynil	Brominal Buctril	3,5-dibromo-4-hydroxybenzonitrile(4-cyano-2,6-dibromophenol)	Amchem Rhodia
MCPA		2-methyl-4-chlorophenoxyacetic acid (4-chloro-2-methylphenoxyacetic acid)	Amchem
diuron	Karmex	3-(3,4-dichlorophenyl)1,1-dimethylurea (N'-(3,4-dichloropheny)NN-dimethylurea	DuPont
linuron	Lorox	3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea	DuPont
terbutryn	Igran	2-(ter-butylamino-4+(ethyl amino)-6-(methylthio)-s=triazine	Geigy
acetochlor	Mon-097	2-chloro-N-(ethoxymethyl-6'-ethyl-o-acetotoluide	Monsanto
	BAS 3510H	3-isopropyl-1H-2,1,3-benzothiadiazin-(4)3H-one 2,2-dioxide	BASF
	Sencor	4-amino-6-t-butyl-3-(methylthio)-1,2,4 triazin-S(4H)-one	Chemagro
	Bay Dic 1897	no chemistry available	Chemagro
	SD 30053	ethyl 2-(N-benzoyl_3,4-dichloroanilino) propionate	Shell

Table 2. Climatic conditions at time of application of herbicides.

Experiment	Temperature Degrees F	Humidity %	Wind Velocity Mph	Cloud Cover	Date
1	46	35	3-9 mph	Partly Cloudy	4/12/71
2	42	59	Calm	Cloudy	5/15/71
2a 1/	56	55	Calm	Clear	6/ 7/71
3	80	14	Calm	Partly cloudy	6/21/71
3a 1/	52	75	Calm	Light rain	6/28/71

1/ Two application days for the experiment.

Table 3. Effect of several herbicides on the yield of Winalta winter wheat and control of winter annual weeds. Conducted on the D.D. Brenneman farm Route 4, Kalispell, Montana in 1971. Harvest Date: August 18, 1971.

Treatment		Weed	Replications			Yield
Herbicide	Rate #/A	Score 0-10	I	II	Total	Bu/A
			Pounds/Plot			
Bromoxynil	3/8	1	30.0	41.0	71.0	30.3
Bromoxynil + linuron	¼ + ¼	3	37.0	35.5	72.5	30.9
Bromoxynil + linuron	¼ + 1/8	3	40.0	37.0	77.0	32.8
Bromoxynil + diuron 1/	¼ + 3/10	1	47.0	34.0	81.0	34.5
Bromoxynil + diuron 2/	¼ + 3/10	3	46.5	40.0	86.5	36.9
Bromoxynil + diuron 3/	¼ + 3/10	3	45.0	34.5	79.5	33.9
Bromoxynil + MCPA	3/8 + 3/8	6	49.0	41.0	90.0	38.4
Bromoxynil + dicamba	¼ + 1/16	7	43.0	43.0	86.0	36.7
Terbutryn	1	10	52.0	44.5	96.5	41.2
Check	0	0	40.0	35.5	75.5	32.2

1/ ACP 69-386 (30% diuron, 25% bromoxynil)
2/ ACP 69-386 with wetting agent
3/ Surfactant 20ml

$\bar{x}$	34.8
S.E.$\bar{x}$	2.3397
L.S.D.	N.S.
CV %	6.72

Application date: 4/12/71
Temperature: 46 degrees F
Humidity: 35%
Wind Velocity: 3-9 mph
Plot size: 10 x 100

Table 4. Effect of several herbicides on the control of wild oats (Avena fatua (L.)) in Ingrid spring barley. Conducted on the Paul Boss farm, Route 4, Kalispell, Montana.

Harvest Date: September 7, 1971 Size of Plot: 18 square feet

Treatment		Height	Plot Yield in Grams				Yield	%	% Weed
Herbicide	Rate #/A	Inches	I	II	III	Total	Bu/A	Plump	Control
Triallate 1/ (10g)	1.5	30.5	218	227	235	680	25.2 bcde 4/	98	8
Triallate 1/ (10g)	2.0	27.0	167	178	173	518	19.2 de	95	33
Triallate 1/ (10g)	3.0	30.0	410	322	302	1034	38.3a	96	30
Triallate 2/ (10g)	1.5	26.5	231	188	194	613	22.7 cde	97	32
Triallate 2/ (10g)	2.0	25.5	201	129	219	549	20.3 de	96	35
Triallate 2/ (10g)	3.0	27.0	207	162	193	562	20.8 de	97	67
Triallate 1/ EC	1.5	32.5	162	194	194	550	20.4 de	97	3
Triallate 1/ EC	2.0	34.0	206	207	175	588	21.8 cde	96	17
Triallate 1/ EC	3.0	30.5	323	217	270	810	30.0 b	96	23
SD 30053 2/	.75	27.5	269	181	128	578	21.4 cde	96	70
SD 30053 2/	1.0	24.0	320	262	195	777	28.8 bc	93	70
SD 30053 2/	1.5	24.0	181	119	174	474	27.7 bcd	93	90
Check	0	30.5	197	164	142	503	18.6 de	98	0

1/ Applied at two-three leaf stage of wild oats 5/15/71
2/ Applied at four-five leaf stage of wild oats 6/7/71
3/ On top of 6/64 x 3/4 sieve
4/ Duncan multiple range test-any treatment having a common letter is not significantly different one from another.

$\bar{x}$	23.5
S.E.$\bar{x}$	2.204
CV %	9.93

Analysis of Variance

Source	D.F.	M.S.	F.
Replications	2	6970.564	5.91**
Treatment	12	8192.034	6.94**
Error	24	1180.008	
Total	38		

Table 5. Visual appraisal of the effects of certain herbicides on spring barley and wild oats.

Treatment		Remarks
Herbicide	Rate #/A	
Triallate[1/] (10g)	1.5	Poor distribution of material, no apparent crop injury
Triallate[1/] (10g)	2.0	Poor distribution of material, some reduction in barley stand, fair wild oat control
Triallate[1/] (10g)	3.0	Poor distribution of granular material, fair control of wild oats in plot centers
Triallate[2/] (10g)	1.5	Reduction in stand, poor distribution of material and reduction of barley height
Triallate[2/] (10g)	2.0	Uneven distribution of material, reduction in stand, fair weed control
Triallate[2/] (10g)	3.0	Quite a reduction in stand of barley, fairly effective weed control throughout the plot, good distribution
Triallate[1/] EC	1.5	No injury to barley, no weed control
Triallate[1/] EC	2.0	No injury to barley, some weed control
Triallate[1/] EC	3.0	Some reduction in height, no injury to barley, some wild oat control
SD 30053[2/]	.75	Few wild oats, four or five inches shorter than check, good weed control
SD 30053[2/]	1.0	Reduction in stand, barley about four inches shorter, good weed control
SD 30053[2/]	1.5	Reduction in stand, four or five inches taller than check, excellent weed control
Check	0	

1/ Applied at two to three leaf stage of wild oats

2/ Applied at four to five leaf stage of wild oats

Table 6. Effect of several herbicides on the control of German Knawel (Scleranthus annuus (L.)) in a stand of Freja barley. Conducted on the Jim Snell farm, Route 4, Kalispell, Montana in 1971. Experiment III

Date Harvested: September 13, 1971 Plot Size: 850 sq. ft.

Treatment		Yield	% Weed	Stand Reduction 1/	
Herbicide	Rate #/A	Bu/A	Control	%	Remarks
Terbutryn	1.00	4.0	100	30	Retardation in growth
Terbutryn	1.50	2.7	100	70	Retardation in growth
Terbutryn	2.00	1.9	100	90	Barley severely injured
Diuron	.25	12.0	0	0	No injury to barley
Diuron	.50	12.5	0	0	No injury to barley
Diuron	1.00	15.2	50	0	Slight retardation in growth
Linuron	.25	18.1	20	0	No injury to barley
Linuron	.50	13.9	95	-	Reduction in height of barley
Linuron	1.00	11.7	100	10	Quite a reduction in height of barley
Mon-097	1.00	17.3	10	0	No injury to barley
Mon-097	2.00	17.6	0	0	No injury to barley
Mon-097	4.00	13.9	0	0	Considerable reduction in height of barley
BAS 3510H	.50	17.9	90	0	No injury to barley
BAS 3510H	1.00	15.5	95	0	No injury to barley
BAS 3510H	1.50	17.9	100	0	No injury to barley
Dic 1897	.25	14.4	0	0	No injury to barley
Dic 1897	.50	13.3	20	0	Some injury on bottom leaves
Dic 1897	1.00	16.3	80	0	Reduction in height of barley
Dic 1897	1.50	17.3	90	0	Some barley injury, slight
Sencor	.25	17.1	70		Some burning of lower leaves
Sencor	.50	14.4	95	10	Leaves are shorter on these plants, some reduction in barley height
Check	0	12.8	0	0	

1/ Visual observation as compared with the check

TITLE: Chemical control of weeds in potatoes

PROJECT: Weed Investigations MS 754

YEAR: 1971

PERSONNEL: Leader - Vern R. Stewart
Cooperators - Weed Research Committee, Chemical Company Research and Development Representatives

LOCATION: Northwestern Agricultural Research Center Field No. "Potato Rotation Plots", Harold Small and Harold Yeager farms, Rt. 4, Kalispell, Montana

OBJECTIVES:
1. To measure the effectiveness of several herbicides for the control of weeds in potatoes.
2. Determine the effects of herbicides on growth of the potato plant.
3. Determine the effect of herbicides on yield and grade of the potato tuber.

FUTURE PLANS: Evaluation of herbicides will be continued in 1972.

SIGNIFICANT FINDINGS:

Experiment I

Eptam and Sencor are about equal in the control of the weed species present. Yields are very similar, about ten hundred weight more than the check. Other herbicides used in this test did not show much promise for weed control in potatoes.

Experiment II

Good control of quackgrass was obtained in location 1. Canadian thistle was adequately controlled with the use of Sencor in location 2.

MATERIALS AND METHODS:

Two experiments were conducted on potatoes in 1971. A discription of each follows. Eight herbicides at different rates were used in the studies and are listed in Table 2.

Experiment I

Plots 10 x 40 feet replicated three times were used in the experiment. Three rows of potatoes were planted in each plot. Rows were spaced 30" and seed spaced 9" in the row. The seed pieces weighted 2 ounces. Herbicides were applied in an aqueous solution at 39.5 gpa.

Depending on the herbicide requirement, they were applied: pre plant and incorporated 3" with a tandem disk; post plant and incorporated with a Lilliston-rolling cultivator; post plant-pre emergence of the potato; and post emergence of the potatoes when the weeds were quite small. The methods used for each herbicide is shown in Table 3.

Materials and Methods (con't)

Prior to application of the post plant products the potatoe rows were hilled twice with disk hillers. No further tillage operations were preformed during the growing season.

Weed species found in this study were wild oats (Avena fatua); red root pigweed (Amaranthus retroflexus (L.)) and mustards (Brassica species).

A visual rating of injury to potatoes and weeds was made two weeks following the last application of herbicides. Application dates are found in Table 1. A weed control score of 0 to 10 was used. 0 = no control, 10 = complete control.

The center row of the plot was harvested for yield with a single row potato combine. Harvested potatoes were graded, based on weight and appearance. Basis for weight division was 1½ to 4 ounces, 4 to 16 ounces and culls.

Experiment II

Application of herbicides was made to field plots with a specially designed sprayer. Two hilled rows were sprayed simultaneously, applying the herbicides in an aqueous solution at 20 gpa. Two rates of Sencor were used in location 1, where quackgrass (Agropyron repens (L.)) was the predominate weed species and one rate in location 2 where Canada thistle (Cirsium arvense (L.)) was the predominate species.

RESULTS AND DISCUSSION:

Experiment I

Trifluralin at all rates did not give effective weed control.

EPTC, pre-plant incorporated, gave fair weed control, however it did not control the mustard plants, but gave excellent control of wild oats. EPTC post plant incorporated was not as effective in weed control as it was when pre plant incorporated.

A combination of EPTC and R 7465, pre plant incorporated, gave limited control of weed species present, except at the 3 and 1 lb/A rate which had a weed score of 7. The post plant incorporation of this combination provided fairly effective weed control.

Rp 17623 caused some injury to potatoes at 2 lbs/A, weed control was good (7).

Sencor at ¼ lb/A, regardless of application techniques provided little or no weed control. At ½ lb/A, post plant and before emergence of the potato plant, Sencor caused some vine injury and reduction in growth. Weed control was good.

One lb/A of Sencor post-plant, pre-emergence of the potatoes gave excellent weed control, some reduction in plant growth, however by the end of the season this difference was not apparent.

Results and Discussion (con't)

Sencor applied post emergence caused reduction in plant growth. At ½ lb/A there was 35 to 40% reduction in plant growth of the potatoe plant. Weed control was excellent at all rates.

A-820 was not an effective product for control of wild oats, and only fair on the broad leaved species present.

BAS 3510H was very severe on the potato plants, causing reduction in vine growth.

BAS 2903 caused reduction in stand and gave very poor weed control. Table 3.

The yeild data was analyzed statistically as a total and by "sort", ie 1½ to 4 ounce tubers, 4 to 16 ounce tubers and culls. Yields because of herbicide treatments were only found to be significant in the 1½ to 4 ounce tubers. All other analysis were statistically non-significant. The highest yield, 1½ to 4 ounce size, occurred in the Sencor treatment at ½ lb/A, post plant pre-emergence of the potato plants. The highest total yield occurred in the Sencor treatment at 1 lb/A. Tables 4 and 5.

EPTC and Sencor were both effective products. They provided good weed control and a minimum amount of injury to the potato plant. Table 5.

EPTC, 4 lbs/A pre plant incorporated yielded 146 cwt/A and the weed control score was 7. At the 3 lb/A the weed control score was 8 and the yield 144.5 cwt/A.

Sencor at ½ lb/A applied post plant, pre emergence of the potatoes yielded 145.2 cwt/A and the weed score was 7. At 1 lb/A the yield was 148 cwt/A with a weed score of 9. This was also the highest yielding herbicide treatment.

Experiment II

Yields from Experiment II, location 1 are found in Table 6. The mean for the plot was 244 cwt/A, with the highest yield being secured from the check plot (269 cwt/A). Sencor at 1 lb/A resulted in the lowest yield which was 228 cwt/A. When analyzed statistically these data were found to be non-significant at the 5% level. A low C.V. of 6.12% would indicate that this is a very reliable test. The difference of 40 cwt/A seen here could be a significant factor in field production.

Quackgrass at location 1 was quite severe and Sencor at both rates gave good control.

The study at location 2 was conducted somewhat differently than location 1. The Sencor was applied at .7 lbs/A, followed by the hilling operation. Excellent control of Canada thistle was obtained. Due to an error in communications with the grower no yield data was secured.

Table 1. Climatic conditions at time of application of herbicides.

	Degrees F	% Humidity	Wind Mph	Cloud Cover	Date
Experiment on Northwestern Agricultural Research Center					
Pre plant incorporate	58	56	Calm	Partly Cloudy	5/26/71
Post plant pre emergence	60	35	1-3	Cloudy	6/10/71
Post plant post emergence	56	58	Calm	Partly Cloudy	7/27/71
Experiment on Small and Yeager farms					
Post plant post emergence	87	40	Calm	Partly Cloudy	7/27/71

Table 2. Herbicides used in the experiments.

Common Name	Trade Name or Other	Chemical Name	Company
trifluralin	Treflan	a,a,a-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine	Eli Lilly & Co.
EPTC	Eptam	S-ethyl dipropylthiocarbamate	Stauffer
	R-7465	2-(aNaphthoxy)-N,N-diethylpropionamide	Stauffer
	Rp 17623	2-tertiobutyl-4-(2,4-dichloro-5-isopropyloxyphenyl)-5-oxo-1,3,4-oxadiazoline	Rhodia
	Sencor	4-Amino-6-t-butyl-3-(methylthio)-1,2,4-triazin-5(4HO-one	Chemagro
	A-820	N-secondary-butyl-4-tertiary-butyl-2,6-dinitroaniline	Amchem
	BAS 3510H	3-isopropyl-1H-2,1,3-benzothiadiazin-(4)3H-one 2,2-dioxide	BASF
	BAS 2903H	2-chloro-N-(1 methyl-2 propynyl)acetanilide	BASF

Table 3. Effect of certain herbicides applied on potatoes for weed control at the Northwestern Agricultural Research Center, Kalispell, Montana in 1971.

Treatment			Weed	
Herbicide	Rate #/A	Plot #	Score	Comments
Trifluralin[1/]	½	101	3	
		215	6	
		321	1	
		$\bar{x}$	3	
Trifluralin[1/]	3/4	102	3	
		211	7	
		302	5	
		$\bar{x}$	5	
Trifluralin[1/]	1	103	2	
		216	8	
		308	8	
		$\bar{x}$	6	
EPTC[2/]	3	104	8	A few mustard plants left, real good control of wild oats.
		219	7	
		307	9	
		$\bar{x}$	8	
EPTC[2/]	4	105	10	
		212	6	
		320	5	Controlled wild oats, but left considerable number of broadleaves.
		$\bar{x}$	7	
EPTC[1/]	3	106	2	
		226	6	
		315	5	Left some mustard and wild oats.
		$\bar{x}$	4	
EPTC[1/]	4	107	2	
		227	6	
		303	7	
		$\bar{x}$	5	
EPTC + R7465[2/]	3 + ½	108	0	No control.
		228	8	
		301	6	
		$\bar{x}$	5	
EPTC + R7465[2/]	3 + 1	109	5	
		208	7	
		312	8	
		$\bar{x}$	7	
EPTC + R7465[1/]	3 + ½	110	9	Few mustard plants left
		222	7	
		305	7	
		$\bar{x}$	8	

Table 3 . (con't)

Treatment			Weed	
Herbicide	Rate #/A	Plot #	Score	Comments
Rp 17623[3/]	1	111	5	
		224	7	
		310	8	
		$\bar{x}$	7	
Rp 17623[3/]	1.5	112	6	
		214	5	
		306	8	
		$\bar{x}$	6	
Rp 17623[3/]	2	113	5	
		205	7	slight potato injury, fairly good weed control
		314	8	real good broadleaf control
		$\bar{x}$	7	
Sencor[3/]	.25	114	0	
		217	9	
		316	0	
		$\bar{x}$	3	
Sencor[3/]	.50	115	5	a lot of vine growth, no injury from Sencor
		225	8	
		313	9	20% reduction in growth
		$\bar{x}$	7	
Sencor[3/]	1.0	116	9	no apparent injury
		221	10	no apparent injury to the potatoes
		322	8	some reduction in plant growth
		$\bar{x}$	9	
Sencor[4/]	.25	117	6	
		220	9	
		304	9	20% retardation in plant growth
		$\bar{x}$	8	
Sencor[4/]	.50	118	9	35 to 40% reduction in growth
		223	8	50% reduction in vine growth
		327	9	slight reduction in growth
		$\bar{x}$	9	
Sencor[4/]	1	119	9	reduction in growth about 50%, good weed control
		213	9	reduction in stand & growth of potatoes
		311	10	slight reduction in stand and growth
		$\bar{x}$	10	
A-820[1/]	1	120	4	
		207	5	
		318	5	
		$\bar{x}$	5	

Table 3 . (con't)

Treatment			Weed	
Herbicide	Rate #/A	Plot #	Score	Comments
A-820[1/]	1.5	121	6	
		206	6	
		323	4	
		$\bar{x}$	5	
A-820[1/]	2	122	5	
		202	5	Some damage to vines
		328	7	
		$\bar{x}$	6	
BAS 3510H[4/]	1	123	0	35% reduction in growth & no weed control
		204	5	some reduction in stand and plant vigor
		324	0	50% reduction in growth of potatoes
		$\bar{x}$	2	
BAS 3510H[4/]	2	124	1	50% reduction in growth, noticed considerable discoloration & burning of leaves, they seem to have recovered from that from the day of application
		218	9	reduction in vigor, about 50%
		326	6	quite a reduction in plant growth, not enough material for this plot, only 1st part sprayed
		$\bar{x}$	5	
BAS 2903H[1/]	2	125	5	
		210	2	may have some reduction in stand
		317	5	
		$\bar{x}$	4	
BAS 2903H[1/]	4	126	2	
		209	3	not too sharp
		309	7	
		$\bar{x}$	4	
Check	0	127	10	handweeded check
		203	10	
		319	10	
		$\bar{x}$	10	
Check	0	128	0	
		201	0	
		325	0	
		$\bar{x}$	0	

1/ Post plant & incorporated with a Lilliston
2/ Pre plant incorporated
3/ Post plant no incorporation pre emergence
4/ Post plant no incorporation post emergence

Table 4. Yield and grade data from herbicide study conducted on netted gem potatoes in 1971 on the Northwestern Agricultural Research Center, Kalispell, Montana.

Treatment			Potato Size			
Herbicide	Rate #/A	Plot Number	4-16 Ounce	1½-4 Ounce	Culls	Total Tubers
			Plot Yield in Pounds			
Trifluralin[1]	½	101	8.5	32.0	1.5	42.0
		215	17.0	22.0	4.0	43.0
		321	5.0	20.0	2.0	27.0
		Total	30.5	74.0	7.5	112.0
		$\bar{x}$	10.2	24.7	2.5	
Trifluralin[1]	3/4	102	2.0	24.0	4.0	30.0
		211	7.5	27.5	2.0	37.0
		302	4.0	27.0	2.0	33.0
		Total	13.5	78.5	8.0	100.0
		$\bar{x}$	4.5	26.2	2.7	
Trifluralin[1]	1	103	2.0	27.0	3.5	32.5
		216	4.5	43.0	4.0	51.5
		308	4.5	25.0	4.5	34.0
		Total	11.0	95.0	12.0	118.0
		$\bar{x}$	3.7	31.7	4.0	
EPTC[2]	3	104	18.0	30.0	5.0	53.0
		219	15.0	20.0	.5	35.5
		307	1.5	25.0	3.5	30.0
		Total	34.5	75.0	9.0	118.5
		$\bar{x}$	11.8	25.0	3.0	
EPTC[2]	4	105	21.0	25.0	5.0	51.0
		212	2.0	28.0	0.0	30.0
		320	8.0	30.5	2.0	40.5
		Total	31.0	83.5	7.0	121.5
		$\bar{x}$	10.3	27.8	2.3	
EPTC[1]	3	106	5.5	22.5	3.0	31.0
		226	3.5	26.5	1.0	31.0
		315	6.0	28.0	2.0	36.0
		Total	15.0	77.0	6.0	98.0
		$\bar{x}$	5.0	25.7	2.0	
EPTC[1]	4	107	7.0	17.0	1.5	25.5
		227	4.0	25.5	2.0	31.5
		303	8.0	21.0	4.0	33.0
		Total	19.0	63.5	7.5	90.0
		$\bar{x}$	6.3	21.2	2.5	
EPTC + R 7465[2]	3 + ½	108	1.0	11.0	0.0	12.0
		228	4.0	25.0	4.0	33.0
		301	8.5	25.0	7.5	41.0
		Total	13.5	61.0	11.5	86.0
		$\bar{x}$	4.5	20.3	3.8	

Table 4 (con't)

Treatment			Potato Size			
Herbicide	Rate #/A	Plot Number	4-16 Ounce	1½-4 Ounce	Culls	Total Tubers
			Plot Yield in Pounds			
EPTC + R 7465 2/	3 + 1	109	7.0	21.0	4.5	32.5
		208	8.0	30.5	4.0	42.5
		312	8.0	20.0	2.0	30.0
		Total	23.0	71.5	10.5	105.0
		$\bar{x}$	7.7	23.8	3.5	
EPTC + R 7465 1/	3 + ½	110	16.5	21.5	3.0	41.0
		222	3.0	23.0	2.0	28.0
		305	0.0	25.0	4.0	29.0
		Total	19.5	69.5	9.0	98.0
		$\bar{x}$	6.5	23.2	3.0	
Rp 17623 3/	1	111	8.5	24.0	2.0	34.5
		224	4.0	31.5	2.0	37.5
		310	5.0	23.5	0.0	28.5
		Total	17.5	79.0	4.0	100.5
		$\bar{x}$	5.8	26.3	1.3	
Rp 17623 3/	1.5	112	8.5	17.0	7.5	33.0
		214	7.5	18.0	2.0	27.5
		306	5.0	23.5	4.0	32.5
		Total	21.0	58.5	13.5	93.0
		$\bar{x}$	7.0	19.5	4.8	
Rp 17623 3/	2	113	0.0	9.0	1.0	10.0
		205	17.0	25.5	1.0	43.5
		314	4.0	21.0	2.0	27.0
		Total	21.0	55.5	4.0	80.5
		$\bar{x}$	7.0	18.5	1.3	
Sencor 3/	.25	114	1.0	18.0	0.0	19.0
		217	3.5	30.0	2.5	36.0
		316	6.0	26.0	3.5	35.5
		Total	10.5	74.0	6.0	90.5
		$\bar{x}$	3.5	24.7	2.0	
Sencor 3/	.50	115	6.5	35.5	5.0	47.0
		225	16.0	25.0	1.0	42.0
		313	4.0	25.0	2.0	31.0
		Total	26.5	85.5	8.0	120.0
		$\bar{x}$	8.8	28.5	2.7	
Sencor 3/	1	116	13.0	25.5	9.0	47.5
		221	7.5	32.5	3.0	43.0
		322	4.5	24.0	4.0	32.5
		Total	25.0	82.0	16.0	123.0
		$\bar{x}$	8.3	27.3	5.3	

Table 4 (con't)

Treatment			Potato Size			
Herbicide	Rate #/A	Plot Number	4-16 Ounce	1½-4 Ounce	Culls	Total Tubers
			Plot Yield in Pounds			
Sencor[4/]	.25	117	10.0	22.0	3.0	35.0
		220	9.0	18.0	5.0	32.0
		304	11.0	23.0	2.0	36.0
		Total	30.0	63.0	10.0	103.0
		$\bar{x}$	10.0	21.0	3.3	
Sencor[4/]	.50	118	15.0	22.0	2.0	39.0
		223	5.0	20.0	4.0	29.0
		327	9.0	23.0	2.0	34.0
		Total	29.0	65.0	8.0	102.0
		$\bar{x}$	9.7	21.7	2.7	
Sencor[4/]	1	119	19.0	6.0	2.0	27.0
		213	7.0	18.0	6.0	31.0
		311	9.0	25.5	0.0	34.5
		Total	35.0	49.5	8.0	92.5
		$\bar{x}$	11.7	16.5	2.7	
A-820[1/]	1	120	8.0	24.0	5.0	37.0
		207	8.0	19.5	3.0	30.5
		318	16.0	18.0	.5	34.5
		Total	32.0	61.5	8.5	102.0
		$\bar{x}$	10.7	20.5	2.8	
A-820[1/]	1.5	121	6.0	22.0	2.0	30.0
		206	12.0	17.0	2.0	31.0
		323	0.0	32.5	5.0	37.5
		Total	18.0	71.5	9.0	98.5
		$\bar{x}$	6.0	23.8	3.0	
A-820[1/]	2	122	6.5	28.0	4.5	39.0
		202	2.5	30.0	5.0	37.5
		328	6.0	25.0	1.5	32.5
		Total	15.0	83.0	11.0	109.0
		$\bar{x}$	5.0	27.7	3.7	
BAS 3510H[4/]	1	123	0.0	10.5	1.0	11.5
		204	5.0	19.5	0.0	24.5
		324	0.0	8.5	0.0	8.5
		Total	5.0	38.5	1.0	44.5
		$\bar{x}$	1.7	12.8	.3	
BAS 3510H[4/]	2	124	0.0	5.0	0.0	5.0
		218	4.0	18.5	3.5	26.0
		326	3.5	18.0	1.0	22.5
		Total	7.5	41.5	4.5	53.5
		$\bar{x}$	2.5	13.8	1.5	

Table 4. (con't)

Treatment			Potato Size			
Herbicide	Rate #/A	Plot Number	4-16 Ounce	1½-4 Ounce	Culls	Total Tubers
			Plot Yield in Pounds			
BAS 2903H 1/	2	125	7.0	22.5	1.5	31.0
		210	2.0	14.5	1.5	18.0
		317	10.5	25.0	1.0	36.5
		Total	19.5	62.0	4.0	85.5
		$\bar{x}$	6.5	20.8	1.3	
BAS 2903H 1/	4	126	3.3	30.0	3.5	36.8
		209	1.5	18.0	0.0	19.5
		309	0.0	25.0	5.0	30.0
		Total	4.8	73.0	8.5	86.3
		$\bar{x}$	1.6	24.3	2.8	
Check(handweeded)	0	127	7.0	17.0	5.5	29.5
		203	8.5	25.0	7.0	40.5
		319	7.0	33.0	3.5	43.5
		Total	22.5	75.0	16.0	113.5
		$\bar{x}$	7.5	25.0	5.3	
Check	0	128	1.0	20.0	2.0	23.0
		201	1.5	30.5	4.0	36.0
		325	6.5	21.0	3.0	30.5
		Total	9.0	71.5	9.0	89.5
		$\bar{x}$	3.0	23.8	3.0	
$\bar{x}$			6.7	23.1	2.8	32.6
F-value for treatment comparison			1.13	1.77	>1	1.63
S.E.$\bar{x}$			2.783	3.249	1.317	4.766
L.S.D.			N.S.	9.2	N.S.	N.S.
C.V.%			41.79	14.08	46.70	14.64

1/ Post plant & incorporated with a Lilliston (rolling cultivator)
2/ Pre plant incorporated
3/ Post plant no incorporation pre emergence of the potato plants
4/ Post plant no incorporation post emergence of the potato plants

Table 5. Summary of data from herbicide study on netted gem potatoes at the Northwestern Agricultural Research Center, 1971.

Treatment		Potato Yield cwt/a				0-10	
	Rate	Size in Ounces				% Weed	
Herbicide	#/A	1½-4	4-16	Culls	Total	Control	Remarks
Trifluralin[1/]	½	89.7	37.0	9.1	135.8	3	
Trifluralin[1/]	3/4	95.1	16.3	9.8	121.2	5	
Trifluralin[1/]	1	115.1	13.4	14.5	142.9	6	
EPTC[2/]	3	90.8	42.8	10.9	144.5	8	good control of wild oats left some mustard plants
EPTC[2/]	4	100.9	37.4	8.4	146.7	7	left some broad leaved plants
EPTC[1/]	3	93.3	18.1	7.3	118.7	4	wild oats, mustard not controlled
EPTC[1/]	4	77.0	22.9	9.1	109.0	5	
EPTC + R7465[2/]	3+½	73.7	16.3	13.8	103.8	5	
EPTC + R7465[2/]	3+1	86.4	28.0	12.7	127.7	7	
EPTC + R7465[1/]	3+½	84.2	23.6	10.9	118.7	8	left some mustard plants
Rp 17623[3/]	1	95.5	21.1	4.7	121.3	7	
Rp 17623[3/]	1.5	70.8	25.4	17.4	113.6	6	
Rp 17623[3/]	2	67.2	25.4	4.7	97.3	7	slight potato injury, good broad leafed control
Sencor[3/]	.25	89.7	12.7	7.3	109.7	3	
Sencor[3/]	.50	103.8	31.9	9.8	145.2	7	slight reduction in vine growth
Sencor[3/]	1.0	99.1	30.1	19.2	148.8	9	some reduction in vine growth
Sencor[4/]	.25	76.2	36.3	12.0	124.5	9	retardation in plant growth
Sencor[4/]	.50	78.8	35.2	9.8	123.8	9	40% reduction in vine growth
Sencor[4/]	1.0	59.9	42.5	9.8	112.2	10	40% reduction in vine growth
A 820[1/]	1	74.4	38.8	10.2	123.4	5	poor weed control
A 820[1/]	1.5	86.4	21.8	10.9	119.1	5	
A 820[1/]	2.0	100.6	18.2	13.4	132.2	6	some vine damage
BAS 3510H[4/]	1	46.5	6.2	1.1	53.8	2	50% reduction in vine growth

Table 5. (con't)

Treatment		Potato Yield cwt/a				0-10	
	Rate	Size in Ounces				% Weed	
Herbicide	#/A	1½-4	4-16	Culls	Total	Control	Remarks
BAS 3510H 4/	2	50.1	9.1	5.5	64.7	6	reduction in vigor, leaf burning, 50% reduction in vine growth
BAS 2903H 1/	2	75.5	23.6	4.7	103.8	4	some stand reduction
BAS 2903H 1/	4	88.2	5.8	10.2	104.2	4	not too sharp
Check handweeded	0	90.8	27.2	19.2	137.2	10	
Check	0	86.4	10.9	10.9	108.2	0	

1/ Post plant and incorporated with a Lillistan (rolling cultivator)
2/ Pre plant incorporated
3/ Post plant no incorporation pre emergence of potatoes
4/ Post plant no incorporation post emergence of potatoes

Table 6. Effect of the herbicide sencor [1/] on the yield of netted gem potatoes on the Harold Small farm, Kalispell, Montana in 1971

Treatment		Plot yield cwt/acre			
Herbicide	Rate #/A	Rep. I	Rep. II	Total	$\bar{x}$
Sencor [2/]	.735	237.48	235.46	472.94	236.47
Sencor	1.11	215.23	240.71	455.94	227.97
Check [3/]	0	286.19	251.86	538.05	269.03

1/ Chemical name
2/ Plot size 10,767 square feet
3/ Plot size 12,812 square feet

$\bar{\bar{x}}$	244.48
S.E.$\bar{x}$	14.96864
L.S.D. .05	N.S.
C.V. %	6.12

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	1	19.6930	
Treatment	2	939.1974	2.09 NS
Error	2	448.11845	
Total	5		

TITLE: Screening of herbicides on several plant species

PROJECT: Weed Investigations MS 754

YEAR: 1971

PERSONNEL: Leader - Vern R. Stewart
Cooperators - Chemical Company Research and Development Representatives

LOCATION: Northwestern Agricultural Research Center Field No. R-14 and yard area

OBJECTIVES:
1. To determine the effect of herbicides on economic cultivated crops.
2. To determine the effect of herbicides on ornamental species.
3. To determine the effect of the herbicides on weed species.

SIGNIFICANT FINDINGS:

Experiment I

Of the crops tested sainfoin was the most tolerant to the herbicides used in the study.

BAS 3510H, had good selectivity in the cereal crops and gave good weed control.

Sencor at .5 lb/A, provided excellent weed control and slight injury to sainfoin and barley.

Experiment II

Dalapon was the most effective product for grass control in lilies, jonquils, iris and tulips.

MATERIALS AND METHODS:

Two experiments were conducted to screen 13 herbicides on 7 field crops and 4 ornamentals. Herbicides used in the two studies are given in Table 1.

Experiment I

Seven crops, listed in Table 3, were used. Herbicides were applied at right angles to the crop, in plots 10 x 24 feet. Herbicides were applied in an aqueous solution at 39.5 gpa. The herbicides were applied: pre plant incorporated; post plant, pre emergence; post emergence. The method used for each herbicide is found in Table 3. Climatic conditions and dates of applications are found in Table 2.

Weed species in the study as a natural population were; field chickweed, (Stellaria media (L.)); henbit, (Lamium amplexicauls (L.)); field pennycress, (Thlaspi arvense (L.)); shepherdspurse, (Capella bursa-pastoris (L.)).

Materials and Methods (con't)

Experiment II

Three herbicides were applied to four ornamentals, namely tulips, iris, lilies and jonquils. These were established plants, located in an area with a large population of quackgrass (Agropyron repens (L.)) and blue grass (Poa pratensis). Plot size was 10 x 80 feet or 800 square feet. Application dates and climatic data are found in Table 2. Herbicides were applied in an aqueous solution at 39.5 gpa.

RESULTS AND DISCUSSION:

Experiment I

Germination of alfalfa and vetch were quite poor in the check plots which resulted in poor stands. Thus it is difficult to really determine the effect of the herbicides on these two crops.

The preplant incorporated products did not effectively control any of the weed species in the test plot. Triallate eliminated all grass and caused some injury to wheat and oats. A-820 killed the grass present. Two and 4 lbs/A of R-21403 caused considerable injury to grass, wheat, oats and barley. The 4 lb/A rate of R-21414 caused considerable injury to oats and grass.

Mon-097 provided excellent weed control but was quite injurious to all crops tested. Sainfoin showed the most tolerence to this chemical.

Lasso controlled 100% of the weeds but severely injured alfalfa, vetch and grass. Oats, barley and sainfoin were quite tolerant to this herbicide.

Dic 1897 pre emergence, gave 100% weed control at all rates. Sainfoin was the most tolerant crop at all rates. Oats, wheat and barley were not affected at the .25 lb/A rate, but wheat and barley showed considerable injury at the 1 lb/A rate.

Rp 17623 controlled all weeds except field chickweed. All crops in the test were severely injured or killed at all rates.

Sainfoin and barley were quite tolerant to Sencor at ½ lb/A, whereas other crops were severely injured. Weed control was 100%. At 1 lb/A all crops and weeds were killed.

Seventy percent weed control was obtained with BAS 3510H. Some henbit and chickweed were left uncontrolled. Small grain and sainfoin were very tolerant to this product at the ½ lb/A rate. At 1 lb/A sainfoin was very tolerant, and cereal crops showed considerable injury. BAS 3510H at 1.5 lbs/A caused less injury to small grains than it did at 1 lb/A. Sainfoin at this rate showed little or no evidence of injury.

Ku 2236 was very severe on all crops, however weed control was excellent. Oats showed the most tolerance to this herbicide.

Results and Discussion (con't)

Dic 1897 post emergence, provided 100% weed control. Oats is the most tolerant crop and showed less injury at 1 lb/A than at ½ lb/A.

Complete data of this test is found in Table 3.

Experiment II

Diuron did not control quackgrass nor cause any injury to ornamental species. Sencor at 1 lb/A gave limited quackgrass control with no apparent injury to ornamental species.

Dalapon at 4 lbs/A controlled quackgrass and blue grass. Some injury was noted on some lilies, however they appeared to recover by the blooming season.

It was noted the lilies growing in the quackgrass stand were not as vigorous as those in the dalapon treated areas. Table 4.

Table 1. Chemicals used in the experiment.

Common Name	Trade Name or Other	Chemical Name	Company
triallate	Fargo	S-(2,3,3,trichloroallyl)diisopropylthiocarbmate	Monsanto
alachlor	Lasso	2-chloro-2',6'-diethyl-N-(methoxymethyl)ace=tanilide	Monsanto
acetochloro	Mon-097	2-chloro-N-(ethoxymethyl)-6'-ethyl-o-acetoto=luidide	Monsanto
	A-820	N-secondary-butyl-4-tertiary-butyl-2,6-dini=troaniline	Amchem
	R-21403	Chemistry confidential	Stauffer
	R-21414	Chemistry confidential	Stauffer
	Dic 1897	Not available	Chemagro
	Sencor	4-amino-6-t-butyl-3-(methylthio)-1,2,4-triazin-5(4H)-one	Chemagro
	Kue 2236	1,1-Dimethyl-3-(m-chloro-p-tri-fluorometh=oxyphenyl)urea	Chemagro
	BAS 3510H	3-isopropyl-1H-2,1,3-benzothiadiazin-(4)3H-one 2,2-dioxide	BASF
	Rp 17623	2-tertiobutyl-4-(2,4-dichloro-5-isopropylox=phenyl)-5-oxo-1,3,4-oxadiazoline	Rhodia
dalapon	Dowpon	2,2-dichloropropionic acid	Dow
diuron	Karmex	3-(3,4-dichlorophenyl)-1-,1-dimethylurea	DuPont

Table 2. Climatic data and dates of application of herbicides used in Experiment I and Experiment II.

Type of Application	Date	Degrees F	% Humidity	Wind Mph	Cloud Cover	Experiment Number
Preplant incorporate	5/28/71	63	60	2-3	Clear	1
Pre emergence	5/28/71	63	60	2-3	Clear	1
Post emergence	7/2/71	58	50	2-3	Partly Cloudy	1
Post emergence	4/22/71	45	80	Calm	Clear	2

Table 3. Effect of various chemicals on seven crops and their effect on weed species present. Weeds are natural in origin.

Treatment					
Herbicide	Rate #/A	% Weed Control	Crop	Injury[4] 0-10	Remarks
Triallate(10%)[1] + Mon-097	1 + 1	85	sainfoin	0	some fanweed and shepherdspurse left reduction in height of oats and barley
			alfalfa	5	
			vetch	2	
			grass	10	
			wheat	3	
			oats	4	
			barley	3	
A 820[1]	1	0	sainfoin	0	little or no weed control, especially broadleaves, mustard, shepherdspurse, fanweed all vigorous
			alfalfa	0	
			vetch	none	
			grass	7	
			wheat	1	
			barley	0	
			oats	0	
A 820[1]	1.5	10	sainfoin	0	same species as above, also chickweed
			alfalfa	0	
			vetch	none	
			oats	5	
			barley	0	
			wheat	1	
A 820[1]	3.0	50	sainfoin	0	
			alfalfa	0	
			vetch	0	
			grass	10	
			wheat	9	
			oats	9	
			barley	5	
R-21403[1]	1	0	sainfoin	0	henbit present
			alfalfa	0	
			vetch	none	
			grass	0	
			wheat	0	
			oats	0	
			barley	0	
R-21403[1]	2	0	sainfoin	0	
			alfalfa	0	
			vetch	none	
			grass	7	
			wheat	4	
			oats	8	
			barley	5	

Table 3 . (con't)

Treatment Herbicide	Rate #/A	% Weed Control	Crop	Injury[4/] 0-10	Remarks
R-21403[1/]	4	0	sainfoin	0	
			alfalfa	0	
			vetch	none	
			grass	10	
			wheat	2	
			oats	9	
			barley	5	
R-21414[1/]	1	0	sainfoin	0	
			alfalfa	none	
			vetch	none	
			grass	1	
			wheat	2	
			oats	0	
			barley	1	
R-21414[1/]	2	0	sainfoin	0	
			alfalfa	none	
			vetch	none	
			grass	0	
			wheat	0	
			oats	0	
			barley	0	
R-21414[1/]	4	0	sainfoin	2	may be some injury to sainfoin, grass
			alfalfa	none	about half missing
			vetch	none	
			grass	5	
			wheat	4	
			oats	8	
			barley	4	
Mon-097[2/]	1	100	sainfoin	4	
			alfalfa	7	
			vetch	10	
			grass	10	
			wheat	5	
			oats	2	
			barley	2	
Mon-097[2/]	2	100	sainfoin	7	sainfoin in bad shape
			alfalfa	8	
			vetch	none	
			grass	10	
			wheat	7	
			oats	7	
			barley	7	
Mon-097[2/]	4	100	sainfoin	3	
			alfalfa	9	
			vetch	9	
			grass	10	
			wheat	9	
			oats	9	
			barley	8	

Table 3. (con't)

Treatment					
Herbicide	Rate #/A	% Weed Control	Crop	Injury[4] 0-10	Remarks
Lasso[2]	1	100	sainfoin	2	leaving a few mustard, shepherds-purse, fanweed
			alfalfa	8	
			vetch	9	
			grass	8	
			wheat	3	
			oats	2	
			barley	3	
Dic 1897[2]	.25	100	sainfoin	1	leaving chickweed on one end of plot
			alfalfa	7	
			vetch	8	
			grass	8	
			wheat	0	
			oats	0	
			barley	0	
Dic 1897[2]	.50	100	sainfoin	4	
			alfalfa	9	
			vetch	9	
			grass	10	
			wheat	4	
			oats	3	
			barley	5	
Dic 1897[2]	1	100	sainfoin	1	
			alfalfa	10	
			vetch	10	
			grass	10	
			wheat	7	
			oats	0	
			barley	5	
Rp 17623[2]	1	---	sainfoin	7	controlled all species except field chickweed and it is really growing
			alfalfa	10	
			vetch	10	
			grass	10	
			wheat	10	
			oats	8	
			barley	10	
Rp 17623[2]	2	---	sainfoin	10	some chickweed
			alfalfa	10	
			vetch	10	
			grass	10	
			wheat	9	
			oats	10	
			barley	10	

Table 3 . (con't)

Treatment					
Herbicide	Rate #/A	% Weed Control	Crop	Injury[4] 0-10	Remarks
Rp 17623[2]	3	---	sainfoin	10	few chickweed left and that is all, even crops are gone
			alfalfa	10	
			vetch	10	
			grass	10	
			wheat	10	
			oats	10	
			barley	10	
Sencor[2]	.5	100	sainfoin	2	
			alfalfa	10	
			vetch	10	
			grass	10	
			wheat	7	
			oats	5	
			barley	3	
Sencor[2]	1	100	sainfoin	10	
			alfalfa	10	
			vetch	10	
			grass	10	
			wheat	10	
			oats	10	
			barley	10	
BAS 3510H[3]	.5	70	sainfoin	2	some henbit, some chickweed
			alfalfa	9	
			vetch	5	
			grass	4	
			wheat	3	
			oats	3	
			barley	3	
BAS 3510H[3]	1	85	sainfoin	1	
			alflafa	9	
			vetch	5	
			grass	5	
			wheat	6	
			oats	4	
			barley	6	
BAS 3510H[3]	1.5	95	sainfoin	1	some henbit
			alfalfa	9	
			vetch	5	
			grass	4	
			wheat	3	
			oats	3	
			barley	3	

Table 3 . (con't)

Treatment					
Herbicide	Rate #/A	% Weed Control	Crop	Injury[4] 0-10	Remarks
Kue 2236[3]	.5	100	sainfoin	8	
			alfalfa	10	
			vetch	10	
			grass	5	
			wheat	7	
			oats	5	
			barley	7	
Kue 2236[3]	1	100	sainfoin	10	
			alfalfa	10	
			vetch	10	
			grass	10	
			wheat	7	
			oats	5	
			barley	6	
Dic 1897[3]	.5	100	sainfoin	5	
			alfalfa	9	
			vetch	10	
			grass	8	
			wheat	4	
			oats	3	
			barley	4	
Dic 1897[3]	1	100	sainfoin	5	
			alfalfa	10	
			vetch	10	
			grass	9	
			wheat	5	
			oats	0	
			barley	0	
Check	0		sainfoin		check plot - the plot above which is a 72623 worked down in this plot and injured the sainfoin. No in-
			alfalfa		
			vetch		
			grass	0	on stand, some retardation in sain-
			wheat	0	foin due to adjacent plot.
			barley	0	
			oats	0	

1/ Pre plant incorporate
2/ Pre emergence
3/ Post plant
4/ 0 = no injury - 10 = all crop killed

Table 4. Herbicides applied to four ornamentals, tulips, lilies, iris and jonquils, and the effect of the herbicide. Grown on the Northwestern Agricultural Research Center, 1971.

Treatment		
Herbicide	Rate #/A	Remarks
Diuron	1	no quackgrass control, some blue grass control
Sencor	1	fair quackgrass control, some bluegrass control
Dalapon	4	excellent control of both grasses
Check	0	

TITLE: Sainfoin Seeding Rate, Row Spacing and Competition

PROJECT: Forage Investigations MS 755

PERSONNEL: Leader - A. J. Jarvi
Cooperator - A. E. Carleton

LOCATION: Northwestern Agricultural Research Center

DURATION: Planted 1968 through 1971

OBJECTIVE: Determine influence of different row spacings, seeding rates and some specie mixtures on sainfoin hay yields.

PROCEDURES: Treatments listed in Table 1 were planted in 4' x 20' plots in a RCB design with four replications in field Y-4 under irrigation.

RESULTS AND DISCUSSION:

The 1971 season yields are presented in Table 1. The individual degree of freedom tests indicate comparisons H and I are significant, the comparisons are given in Table 2. The sainfoin-grass mixture mean was 3.21 T/A compared to 2.78 T/A for sainfoin alone. In other words, the addition of a grass increased the yield significantly in the 3rd production year. The other significant comparison indicated in the 3rd year, sainfoin in 2' rows at 15#/A and sainfoin in 12" rows at 15#/A with barley at 30#/A average 3.42 T/A compared to 2.99 T/A for mean of all other entries. Again this was probably due to the blue-grass which had successfully established itself in the poorer sainfoin stands.

The three year summary is present in Table 3 along with the individual degrees of freedom test for the three years. For treatments being compared check Table 2. No treatment was consistantly superior over the three year period. It appears that higher seeding rates (30#/A) contribute to better yields the first harvest year and at this harvest the addition of a grass reduces yields. In the second and third year seeding rates of sainfoin become less important and a grass added to the sainfoin results in better yields.

Table 1. Sainfoin seeding rate, row spacing and competition influence on 1971 yields in T/A at 12% moisture. Planted in 1968 in Field Y-6.

Entry	Cut	Replications I	II	III	IV	$\bar{x}$
Sainfoin in 1' rows at 15#/A	1	1.24	1.18	1.54	1.36	
	2	1.35	1.55	1.49	1.55	
	Total	2.59	2.73	3.03	2.91	2.81
Sainfoin in 1' rows at 30#/A	1	1.26	1.26	1.23	1.50	
	2	1.18	1.27	1.44	1.55	
	Total	2.44	2.53	2.67	3.05	2.67
Sainfoin in 6" rows at 30#/A	1	1.03	1.45	.99	1.39	
	2	1.27	1.45	1.27	1.62	
	Total	2.30	2.90	2.26	3.01	2.62
Sainfoin in 6" rows at 15#/A with Latar at 3#/A	1	1.92	1.58	1.41	1.58	
	2	1.41	1.76	1.92	1.41	
	Total	3.33	3.34	3.33	2.99	3.25
Sainfoin in 6" rows at 15#/A with Oahe at 6#/A	1	1.63	1.93	1.46	1.83	
	2	1.39	1.48	1.37	1.39	
	Total	3.02	3.41	2.83	3.22	3.12
Sainfoin in 6" rows at 15#/A	1	1.28	1.50	1.24	1.08	
	2	1.83	2.05	1.39	1.62	
	Total	3.11	3.55	2.63	2.70	3.00
Sainfoin in 12" rows at 15#/A with Hypana barley in 12" rows at 30#/A	1	1.72	1.93	1.46	1.78	
	2	1.66	2.17	1.66	1.90	
	Total	3.38	4.10	3.12	3.68	3.57
Sainfoin at 15#/A in alternate 12" rows with Latar at 3#/A	1	1.86	1.65	1.48	1.55	
	2	1.75	1.45	1.75	1.75	
	Total	3.61	3.10	3.23	3.30	3.31
Sainfoin at 15#/A in alternate 12" rows with Oahe at 6#/A	1	1.84	1.70	1.62	1.55	
	2	1.66	1.55	1.32	1.46	
	Total	3.50	3.25	2.94	3.01	3.17
Sainfoin in 2' rows at 15#/A	1	1.93	1.36	1.55	1.62	
	2	1.64	1.15	1.26	2.53	
	Total	3.57	2.51	2.81	4.15	3.26

ANOVA for 1971

Source		D.F.	Mean Square
Treatments (9)	A 1/	1	.2730
	B	1	.0163
	C	1	.0541
	D	1	.1922
	E	1	.0689
	F	1	.0138
	G	1	.0001
	H	1	1.5313**
	I	1	1.1323**
Replications		3	.1811
Error		27	.1320
Total		39	

1/ Treatment comparisons given in Table 2.

** Significant at .01 probability level.

Table 2. Breakdown of individual degrees of freedom.

Comparison	Sainfoin 12" row at 15#/A	Sainfoin 12" row at 30#/A	Sainfoin 6" row at 15#/A	Sainfoin 6" row at 30#/A	Sainfoin 15#/A + Latar 3#/A 6" row	Sainfoin 15#/A + Oahe 6#/A 6" row	Sainfoin 15#/A + Latar 3#/A 12" alternate rows	Sainfoin 15#/A + Oahe 6#/A 12" alternate rows	Sainfoin 15#/A 12" rows + Hypana barley 30#/A	Sainfoin 15#/A 24" rows
A Sainfoin 15#/A vs 30#/A	-1	+1	-1	+1						
B Sainfoin 6" vs 12" row	-1	-1	+1	+1						
C Interaction seeding rate x row width	-1	+1	+1	-1						
D Sainfoin plus barley vs 24" row sainfoin									-1	+1
E Sainfoin plus "Oahe" vs sainfoin + "Latar"					-1	+1	-1	+1		
F Sainfoin + grass in 6" vs 12" alternate rows					-1	-1	+1	+1		
G Interaction grass species x row type					-1	+1	+1	-1		
H Sainfoin alone vs sainfoin plus grass	-1	-1	-1	-1	+1	+1	+1	+1		
I Sainfoin + barley & sainfoin 24" rows vs others	-1	-1	-1	-1	-1	-1	-1	-1	+4	+4

Table 3. Three year summary of sainfoin seeding rate, row spacing and competition influence.

Entry	Rate #/A	x̄ Yields 1969	1970	1971	Yield T/A 3 yr. x̄
Sainfoin in 1" rows at 15#/A	15	3.86	2.74	2.81	9.41
Sainfoin in 1' rows at 30#/A	30	4.12	2.27	2.67	9.06
Sainfoin in 6" rows at 30#/A	30	4.18	2.36	2.62	9.16
Sainfoin in 6" rows at 15#/A with Latar at 3#/A	15 + 3	4.13	2.20	3.25	9.58
Sainfoin in 6" rows at 15#/A with Oahe at 6#/A	15 + 6	4.04	2.96	3.12	10.12
Sainfoin in 6" rows at 15#/A	15	3.71	2.22	3.00	8.93
Sainfoin in 12" rows at 15#/A with Hypana barley in 12" rows at 30#/A	15+ 30	2.16	2.61	3.57	8.34
Sainfoin at 15#/A in alternate 12" rows with Latar at 3#/A	15 + 3	2.41	2.89	3.31	8.61
Sainfoin at 15#/A in alternate 12" rows with Oahe at 6#/A	15 + 6	2.46	2.92	3.17	8.55
Sainfoin in 2' rows at 15#/A	15	2.01	2.44	3.26	7.71

ANOVA for individual degrees of freedom for 3 year yields.

Source	D.F.	Mean Square 1969	1970	1971
Treatments (9)				
A[1/]	1	.5329**	.1073	.2730
B	1	.0100	.1785	.0163
C	1	.0484	.3691*	.0541
D	1	.0465	.0595	.1922
E	1	.0123	.6202**	.0689
F	1	10.9560**	.4389*	.0138
G	1	.0182	.5293*	.0001
H	1	4.0045**	.9453**	1.5313**
I	1	14.9818**	.0123	1.1323**
Replications	3		.0222	.1811
Error	27		.0711	.1320
Total	39			

* Significant at the .05 level of probability
** Significant at the .01 level of probability
1/ Treatment comparison given in Table 2.

TITLE: Interstate sainfoin variety trial

PROJECT: Forage Investigations MS 755

PERSONNEL: Leader - A. J. Jarvi
Cooperator - A. E. Carleton

LOCATION: Northwestern Agricultural Research Center

DURATION: Planted 1968 through 1971

OBJECTIVES: Determine the forage yield of regrowth sainfoin types in comparison to the one cut sainfoins and Ladak 65 alfalfa for irrigated and dryland hay.

PROCEDURE: The nurseries were planted in fields Y-4 (irrigated) and F-2 (dryland) in 1968. Plots consisted of 4 rows, 12 feet long in a RCB design with four replications. Harvest area consisted of 24 square feet from the center of each plot. Plots were harvested when regrowth sainfoin types were at the full bloom stage for the harvest and at optimum bloom for various entries on the second harvest.

RESULTS AND DISCUSSION:

Irrigated - Table 1. No significant differences were obtained in seasons yield in 1971. The variety Persian was the highest in yield. This nursery had a complete ground cover of Kentucky bluegrass which may have masked any yield differences between entries.

Dryland - Table 2. No significant differences were obtained in the 1971 seasons yield. The regrowth line 'Remont' was the highest yielding entry with White (a white flower Eski type) yielding about the same. This trial also had a complete Kentucky bluegrass ground cover and probably contributed a major portion to the yield.

Three Year Summary - Table 3. The irrigated four year yields indicate Ladak yielded more than any sainfoin. Of sainfoins under irrigation, the entry Canadian was the highest yielding. Under dryland conditions Ladak Alfalfa was lowest yielding entry over the four year period, and again the sainfoin line Canadian was the better yielding line.

Table 1. Irrigated interstate sainfoin variety trial hay yields in T/A at 12% moisture.

Variety	Harvest	Replications I	II	III	IV	$\bar{x}$
Eski	1st	1.99	1.92	1.63	1.63	
	8/11	.45	1.26	.97	1.19	
	Total	2.44	3.18	2.60	2.82	2.76
Regrowth	1st	1.71	1.65	2.00	1.51	
	8/ 4	1.05	.82	1.23	.99	
	Total	2.76	2.47	3.23	2.50	2.74
White	1st	2.14	1.65	1.45	1.86	
	8/11	.22	.62	.97	1.08	
	Total	2.36	2.27	2.42	2.94	2.50
Augusta	1st	1.93	1.65	2.33	1.60	
	8/11	.68	.48	1.03	1.03	
	Total	2.61	2.13	3.36	2.63	2.68
Ladak	1st	1.92	2.05	2.13	1.55	
	8/11	1.19	1.19	1.60	1.19	
	Total	3.11	3.24	3.73	2.74	3.21
Canadian	1st	1.89	1.77	1.96	1.20	
	8/11	1.30	.68	1.47	.51	
	Total	3.19	2.45	3.43	1.71	2.69
Persian	1st	2.16	1.68	1.74	2.03	
	8/ 4	1.41	.92	1.56	1.41	
	Total	3.57	2.60	3.30	3.44	3.23

$CV = \frac{s_{\bar{y}}}{\bar{y}} = 8.5\%$

ANOVA for irrigated yield trial

Source	D.F.	Mean Square
Varieties	6	.3090 NS
Replications	3	.3949 NS
Error	18	.1883
Total	27	

Table 2. Dryland interstate sainfoin variety trial hay yields in T/A at 12% moisture.

Variety	Harvest Date	Replications I	II	III	IV	$\bar{x}$
Eski	6/22	2.40	1.60	2.54	1.27	
	8/11	.77	.95	.67	.47	
	Total	3.17	2.55	3.21	1.74	2.23
Regrowth	6/22	1.67	2.66	2.19	1.81	
	8/ 4	.92	.73	1.29	.83	
	Total	2.59	3.39	3.48	2.64	3.03
White	6/22	2.26	2.66	2.15	2.66	
	8/11	.80	.51	.51	.51	
	Total	3.06	3.17	2.66	3.17	3.02
Augusta	6/22	2.44	1.01	2.24	2.30	
	8/11	.83	.36	.46	.56	
	Total	3.27	1.37	2.70	2.86	2.55
Ladak 65	6/22	1.83	1.61	1.61	1.24	
	8/11	1.05	.73	.84	.73	
	Total	2.88	2.34	2.45	1.97	2.41
Canadian	6/22	2.81	1.05	2.18	2.10	
	8/ 4	.87	1.10	.94	.87	
	Total	3.68	2.15	3.12	2.97	2.98
Persian	6/22	2.13	1.62	1.87	2.90	
	8/ 4	1.31	.74	.26	.56	
	Total	3.44	2.36	2.13	3.46	2.85

$CV = \frac{s\bar{y}}{\bar{y}} = 11.1\%$

ANOVA for dryland yield trial

Source	D.F.	Mean Square
Varieties	6	.2414 NS
Replications	3	.8950 NS
Error	18	.3832
Total	27	

Table 3. Four year summary of irrigated and dryland interstate sainfoin variety trial hay yields in T/A.

Variety	Irrigated x̄ 1968	1969	1970	1971	Yield T/A 4 yr. x̄	Dryland x̄ 1968	1969	1970	1971	Yield T/A 4 yr. x̄
Eski	2.13	4.57	2.18	2.76	11.64	1.68	3.26	2.34	2.23	9.51
Regrowth	1.87	4.72	2.27	2.74	11.60	1.75	3.11	1.58	3.03	9.47
White	1.73	4.19	2.31	2.50	10.73	1.79	2.60	2.20	3.02	9.61
Augusta	1.53	3.59	1.96	2.68	9.76	1.99	2.09	2.23	2.55	8.86
Ladak	2.01	4.90	2.66	3.21	12.78	1.62	2.97	1.65	2.41	8.65
Canadian	2.19	5.00	2.60	2.69	12.48	1.97	3.64	2.19	2.98	10.78
Persian	1.61	4.45	2.55	3.23	11.84	1.91	2.82	1.59	2.85	9.17
L.S.D. (.05)	-	.47	N.S.	N.S.		-	.41	.54	N.S.	
C.V. %	-	3.5	9.5	8.5		-	4.8	9.3	11.1	

TITLE: Sainfoin inoculation strains USDA

PROJECT: Forage Investigations MS 756

PERSONNEL: Leader: A. J. Jarvi
Cooperator: A. E. Carleton

LOCATION: Northwestern Agricultural Research Center

OBJECTIVES: To determine the effectiveness of six rhizobia strains developed by the USDA, Soil and Water Conservation Service, Beltsville, Maryland, as measured by forage yield of Eski and Hall varieties of sainfoin at Kalispell.

PROCEDURE: The study was planted in field R-6c (dryland site) on May 31, 1968. The experimental design was a split-plot with inoculants as main plots and varieties as sub-plots. Plots consisted of five rows with the center row of each plot being inoculated and hand planted with the nursery planter.

The trail was not harvested in 1969 because inoculated rows were obviously less in yield in all cases. Probably due to different methods of seeding than used on border rows.

The center row of each plot was harvested for forage. Yields per 20 ft. of row are converted to tons dry matter per acre.

RESULTS AND DISCUSSION:

No significance was obtained between inoculant strains, sainfoin varieties or the interaction between strains and varieties. Table 1.

A two year summary is presented in Table 2. It appears that none of the strains warrant further testing and there is still a need for an effective sainfoin inoculum.

Table 1. Yields of Eski and Hall sainfoin when inoculated with six inoculums and non-inoculated, Northwestern Agricultural Research Center at Kalispell in 1971.

Inoculum Strain	Sainfoin Variety	Replications T/A I	II	III	IV	x
I-1 3G2ela	Eski	1.16	2.32	.59	1.52	1.40
	Hall	.95	1.92	1.92	1.28	1.52
	Strain $\bar{x}$					1.46
I-2 3G2c2	Eski	2.21	.59	2.32	2.46	1.90
	Hall	2.02	1.60	2.13	2.55	2.08
	Strain $\bar{x}$					1.99
I-3 3G1c1 (a)	Eski	.82	2.21	2.32	2.10	1.86
		1.60	1.60	1.28	2.99	1.87
	Strain $\bar{x}$					1.87
Non-inoculated check	Eski	2.57	1.16	2.21	3.28	2.31
	Hall	1.07	2.02	1.39	1.71	1.55
	Strain $\bar{x}$					1.93
I-5 eG2c4	Eski	1.75	1.16	1.75	2.32	1.75
	Hall	1.28	1.18	1.48	2.88	1.71
	Strain $\bar{x}$					1.73
I-6 3F6g3	Eski	1.75	1.16	2.10	2.32	1.83
	Hall	.40	1.28	1.92	2.87	1.62
	Strain $\bar{x}$					1.73
I-4 3I7a4	Eski	1.87	1.05	1.05	2.21	1.55
	Hall	.42	2.13	1.18	1.92	1.41
	Strain $\bar{x}$					1.48

ANOVA for forage yield of Eski and Hall sainfoin inoculum trial.

Source	D.F.	Mean Square
Inoculums	6	.3451NS
Replications	3	1.9132*
Error (@)	18	.3910
Varieties	1	.2016NS
V x I	6	.1951NS
Error (b)	21	.3695
Total	55	

CV (a) = $s\bar{y}/\bar{y}$ = 18.0% CV (b) = $s\bar{y}/\bar{y}$ = 17.5%

Table 2. Two year summary of yields of Eski and Hall sainfoin when inoculated with six inoculums and non-inoculated. Grown at the Northwestern Agricultural Research Center in 1971.

Inoculum Strain	Sainfoin Variety	x 1970	x 1971	Yield T/A 2 yr. $\bar{x}$
I-1 3G2ela	Eski	1.65	1.40	3.05
	Hall	2.19	1.52	3.71
	Strain $\bar{x}$			3.38
I-2 3G2c2	Eski	1.97	1.90	3.87
	Hall	2.58	2.08	4.66
	Strain $\bar{x}$			4.27
I-3 3Glcl (a)	Eski	2.21	1.86	4.07
	Hall	1.47	1.87	3.34
	Strain $\bar{x}$			3.71
I-4 3I7a4	Eski	1.91	1.55	3.46
	Hall	2.01	1.41	3.42
	Strain $\bar{x}$			3.44
I-5eG2c4	Eski	1.41	1.75	3.16
	Hall	2.21	1.71	3.92
	Strain $\bar{x}$			3.54
I-6 3F6g3	Eski	1.43	1.83	3.26
	Hall	1.61	1.62	3.23
	Strain $\bar{x}$			3.25
Non-inoculated check	Eski	1.69	2.31	4.00
	Hall	1.75	1.55	3.30
	Strain $\bar{x}$			3.85

ANOVA for forage yield of Eski and Hall sainfoin inoculum trial.

Source	D.F.	Mean Square 1970	Mean Square 1971
Inoculums	6	.4331NS	.3451NS
Replications	3	.5683NS	1.9132*
Error (a)	18	.4543	.3910
Varieties	1	.6953NS	.2016NS
V x I	6	.5130*	.1951NS
Error (b)	21	.1853	.3695
Total	55		

TITLE: Intrastate Legume Nursery

PROJECT: Forage Investigations MS 755

PERSONNEL: Leader - A. J. Jarvi
Cooperator - A. E. Carleton

LOCATION: Northwestern Agricultural Research Center

DURATION: Through 1973

OBJECTIVES: Evaluate Montana legume selections and commercial legume varieties for forage production.

PROCEDURE: Experiment was planted in Field Y-6 on May 15, 1970 in a RCB design within a plot and 24" between adjacant plots. An application of 400 #/A of 0-45-0 preceded seeding. Harvest area consisted of 2' x 20' from the center of each plot. First harvest was made on a uniform date and second and third harvests were made when each entry was at the optimum harvest stage.

RESULTS AND DISCUSSION:

The yields of the trial are given in Table 1, along with the date of each species harvest. The cicer milkvetch selection PX Bridger significantly out yielded all other entries in the trial at 5.35 T/A on two cuttings. In general the cicer's, trefoils and later single-cut sainfoins were put to a disadvantage by the single cutting date on the first harvest, which was too early for these entries.

The regrowth types of sainfoins furnished three harvests this season but yields per harvest were fairly low. The Creston composite was the lowest yielding entry in the nursery and the low yield was probably due to the early harvest on the first cutting which should have probably been delayed about two weeks. All cicer plots contained a good stand of shepherdspurse at the first harvest. No grass was present in any of the plots this season.

No significant differences were obtained between any of the alfalfa entries or between any of the trefoil entries.

Table 1. Intrastate legume trial grown at the Northwestern Agricultural Research Center in 1971. Yields in tons/acre at 12% moisture.

Variety	Harvest Date	Replications I	II	III	IV	$\bar{x}$*
PX Bridger Cicer milkvetch	6/23	2.04	1.73	1.70	1.49	
	9/ 3	3.61	3.83	3.83	3.17	
	Total	5.65	5.56	5.53	4.66	5.35a
Thor NK alfalfa	6/23	1.98	2.31	1.97	1.90	
	8/19	2.77	2.60	2.57	2.35	
	Total	4.75	4.91	4.54	4.25	4.61 b
Regrowth sainfoin	6/23	1.55	1.74	1.60	1.78	
	8/ 4	1.63	1.76	1.84	1.34	
	9/ 3	.64	1.00	2.62	.90	
	Total	3.82	4.50	6.06	4.02	4.60 b
ICA-6 sainfoin	6/23	2.35	2.57	2.54	2.86	
	8/19	1.54	2.04	2.20	1.96	
	Total	3.89	4.61	4.74	4.82	4.52 bc
VIVA sainfoin	6/23	1.92	1.72	2.43	1.72	
	8/ 4	1.63	1.50	1.67	1.26	
	9/ 3	.81	.92	.92	.58	
	Total	4.36	4.14	5.02	3.56	4.27 bcd
Eski sainfoin	6/23	3.34	1.90	2.63	1.97	
	8/19	1.81	1.74	1.85	1.78	
	Total	5.15	3.64	4.48	3.75	4.26 bcd
Haymor alfalfa	6/23	2.10	1.37	2.93	1.40	
	8/19	2.26	1.99	2.42	2.46	
	Total	4.36	3.36	5.35	3.86	4.23 bcd
Ladak 65 alfalfa	6/23	1.86	1.98	1.71	1.53	
	8/19	2.59	2.03	2.59	2.59	
	Total	4.45	4.01	4.30	4.12	4.22 bcd
Tana trefoil	6/23	1.86	2.20	1.58	2.48	
	8/19	1.86	2.04	1.97	1.97	
	Total	3.72	4.24	3.55	4.45	3.99 bcd
Wivilcex alfalfa	6/23	2.00	1.89	1.82	2.41	
	8/19	2.24	1.57	2.03	1.81	
	Total	4.24	3.46	3.85	4.22	3.94 bcd
Persain NK-11 sainfoin	6/23	1.67	1.88	1.48	1.19	
	8/ 4	1.38	1.54	1.46	1.30	
	9/ 3	.75	1.01	.79	1.01	
	Total	3.80	4.43	3.73	3.50	3.87 bcd
NK 3270 sainfoin	6/23	1.40	1.58	1.70	1.60	
	8/ 4	1.41	1.52	1.09	1.34	
	9/ 3	.90	1.15	.84	.96	
	Total	3.71	4.25	3.63	3.90	3.87 bcd

Table 1 . (con't)

Variety	Harvest Date	Replications I	II	III	IV	$\bar{x}$*
Leo trefoil	6/23	2.16	2.06	1.69	1.48	
	8/19	1.83	1.98	2.01	2.17	
	Total	3.99	4.04	3.70	3.65	3.85 bcd
Sidney Cicer milkvetch	6/23	1.76	1.73	1.61	1.82	
	9/ 3	2.22	2.14	2.10	1.62	
	Total	3.98	3.87	3.71	3.44	3.75 cd
Melrose sainfoin	6/23	2.80	1.23	2.36	1.48	
	8/19	1.44	1.62	1.80	1.76	
	Total	4.24	2.85	4.16	3.24	3.62 de
Tretana trefoil	6/23	1.74	1.44	1.10	1.62	
	8/19	1.87	1.90	2.28	2.22	
	Total	3.61	3.34	3.38	3.84	3.54 de
Lutana Cicer milkvetch	6/23	1.51	1.30	1.81	1.03	
	9/ 3	1.87	1.83	2.62	2.17	
	Total	3.38	3.13	4.43	3.20	3.54 de
Creston composite sainfoin	6/23	2.13	1.08	1.53	1.42	
	8/19	1.24	1.60	1.46	1.18	
	Total	3.37	2.68	2.99	2.60	2.91 e

* Means followed by the same letter are not significantly different at the .05 level of probability.

$CV = \frac{s\bar{y}}{\bar{y}} = 6.0\%$ L.S.D. (.05) = 0.696 T/A

ANOVA for intrastate legume nursery

Source	D.F.	Mean Square
Varieties	17	1.1520**
Replications	3	0.7158*
Error	51	0.2392
Total	71	

TITLE: Intrastate Cicer Trial

PROJECT: Forage Investigations MS 755

PERSONNEL: Leader - A. J. Jarvi
Cooperator - A. E. Carleton

LOCATION: Northwestern Agricultural Research Center

DURATION: Through 1972

OBJECTIVES: Evaluation of Cicer milkvetch selections.

PROCEDURE: This trial was planted in 1969 in Field Y-5 in a RCB design with four replications. Harvest area consisted of 2' x 20' from the center of each plot. Yields are presented as T/A at 12% moisture.

RESULTS AND DISCUSSION:

The first harvest on this nursery was complete at the 10% alfalfa bloom stage. This was too early for maximum cicer yeilds and also may have had an effect on reducing second harvest yields. All plots in this nursery were very weedy at the first harvest with shepherdspurse being the predominant weed. Yields are presented in Table 1. All entries yielded significantly less than the Ladak 65 alfalfa check.

Table 1. Intrastate cicer trial grown on the Northwestern Agricultural Research Center in 1971. Yields in Tons/Acre at 12% moisture.

Variety	Harvest Date	Replications I	II	III	IV	$\bar{x}$
Bridger Cicer milkvetch	6/24	2.18	1.91	2.36	2.36	
	8/23	1.55	1.09	.86	1.34	
	Total	3.73	3.00	3.22	3.70	3.41*
Ladak 65 alfalfa	6/24	3.21	2.35	2.58	3.45	
	8/23	2.63	2.69	2.66	3.49	
	Total	5.84	5.04	5.24	6.94	5.77 check
Eski sainfoin	6/24	2.12	1.94	2.08	2.12	
	8/23	1.91	1.81	2.33	1.54	
	Total	4.03	3.75	4.41	3.66	3.98*
Sidney Cicer milkvetch	6/24	2.13	1.46	2.08	2.46	
	8/23	1.56	1.93	1.53	1.65	
	Total	3.69	3.39	3.61	4.11	3.70*
Bozeman Cicer milkvetch	6/24	2.00	1.46	1.53	1.94	
	8/23	1.42	1.33	1.20	1.45	
	Total	3.42	2.79	2.73	3.39	3.08*
Pengrift Crown vetch	6/24	1.63	1.91	2.10	1.99	
	8/23	1.24	.95	1.35	1.27	
	Total	2.87	2.86	3.45	3.26	3.11*

* Yields significantly less than check at the .05 probability level.

$CV = \frac{s\bar{y}}{\bar{y}} = 5.0\%$ L.S.D. (.05) = 0.58 T/A

ANOVA for intrastate Cicer trial

Source	D.F.	Mean Square
Varieties	5	4.0372**
Replications	3	.5451*
Error	15	.1487
Total	23	

TITLE: Annual Dryland Forages

PROJECT: Forage Investigations MS 755

PERSONNEL: Leader - A. J. Jarvi
Cooperator - J. L. Krall

LOCATION: Northwestern Agricultural Research Center

DURATION: Undetermined

OBJECTIVES: Evaluation of given species for annual forage production.

PROCEDURES: The trail was planted, May 26, 1971 in field P-3 in a RCB design with four replicatins. Plots consisted of 4 rows 20' long with 12" between rows within a plot and 24" between plots. Harvested area consisted of 2' x 20' from the center of each plot. The field had been cropped to barley the previous year. No fertilizer was added.

RESULTS AND DISCUSSION:

Cool season forage crop yields are presented in Table 1. Unitan barley as a hay crop yield yielded significantly more forage than other entries. One should not directly compare yields in this trial because of the different nutritive values of the different entries. The addition of peas to a cereal for hay resulted in a slight reduction in total yield, not considering the effect on quality.

Warm season forage chop yields are presented in Table 2. Sunflowers yielded significantly more than any other entry. Corn did not make much growth until about July 15th. Probably due to the below normal temperatures. Kernel development on the early corn was in the very early stages at harvest.

Table 1. Cool season annual forage yeidls, grown at the Northwestern Agricultural Research Center in 1971.

Entry	Harvest Date	% DM	Yield in T/A at 12% H_2O I	II	III	IV	$\bar{x}$ 1/
Unitan Hay	8/ 3	27.8	5.12	5.07	4.34	4.17	4.68a
Mammoth Oats	8/12	24.9	3.93	4.43	4.35	3.85	4.14 b
Unitan Head Chop	8/23	66.7	4.43	3.98	4.12	3.90	4.11 b
Mammoth oats & Peas	8/12	25.7	4.49	4.10	3.74	3.82	4.04 b
Horsford	8/12	33.8	3.97	4.65	4.23	3.19	4.01 b
Spring rye	8/12	38.3	4.38	3.38	3.97	3.50	3.81 bc
Park oats	8/23	38.2	3.78	3.84	3.96	3.60	3.80 bc
Triticales	8/23	34.4	3.56	4.42	3.51	3.40	3.72 bc
Horsford & Peas	8/12	26.2	4.13	3.81	3.61	3.20	3.69 bcd
Serra oats	8/12	28.7	3.46	3.73	3.28	3.37	3.46 cd
Serra oats + peas	8/12	27.2	3.49	2.65	3.66	3.66	3.37 cd
Unitan/H_2O	8/23	70.8	3.17	3.58	3.23	2.79	3.19 d
Unitan Dry Grain	8/27	88.0	2.91	2.83	2.36	2.62	2.68 e
Vetch	8/ 3	10.7	1.33	1.16	.85	.97	1.08 f

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

$CV = \frac{s\bar{y}}{\bar{y}} = 4.6\%$ L.S.D. (.05) = .45 T/A

ANOVA for cool season annual forage yeilds.

Source	D.F.	Mean Square
Varieties	13	2.9504**
Replications	3	.5560**
Error	39	.1079
Total	55	

Table 2. Warm season annual forage yields, grown at the Northwestern Agricultural Research Center in 1971.

Entry	Harvest Date	% DM	Yield T/A at 12% H_2O I	II	III	IV	$\bar{x}$ 1/
Sunflowers	9/1	13.7	6.31	6.25	6.24	6.86	6.42a
Corn 75-90 day	9/1	19.2	4.43	3.81	4.51	4.64	4.35 b
White millet	9/1	23.2	4.41	4.59	4.49	3.09	4.15 b
Corn 90-110 day	9/1	17.8	4.18	3.89	3.30	3.89	3.82 b
Corn 60-65 day	9/1	19.4	3.48	3.73	4.06	3.71	3.75 b
Sorghum x Sudan hybrid	9/1	21.4	2.99	3.18	2.88	3.21	3.07 c
Mini milo	9/1	20.9	2.26	1.89	2.72	1.75	2.16 d

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

CV = 5.4% L.S.D. (.05) = .64 T/A

ANOVA for warm season annual forage yields

Source	D.F.	Mean Square
Varieties	6	6.8917**
Replications	3	.0386NS
Error	18	.1821
Total	27	

TITLE: Wetland Forage Trial

PROJECT: Forage Investigation MS 755

PERSONNEL: A. J. Jarvi

LOCATION: Northwestern Agricultural Research Center

DURATION: Through 1974

OBJECTIVE: Evaluate species for wet non-alkaline conditions.

PROCEDURES: The trial was planted on June 1, 1970 in field R-11 in an area with a high water table. A RCB design was utilized with four replications. Plots consist of four rows, 20' long with 12" between rows and 24" between plots. Harvest area consisted of 2' x 20' from the center of each plot.

RESULTS AND DISCUSSION:

No harvest was taken the year of seeding. Manchar smooth Brome grass was included but no stand emerged. Stands of reed canary, Alsike clover and cicer were very poor. Sainfoin, alfalfa and cicer exhibited a considerable amount of frost heaving in the spring of 1971 and resulted in the loss of some of the stands. Tall wheat was used as a border and was harvested for yield also. Kenmont tall fescue, tall wheat and Garrison were the top yielding entries. Cicer milkvetch was the lowest yielding entry this season and was yellow colored most of the growing season.

Table 1. Wetland forage trial grown at Northwestern Agricultural Research Center at Kalispell in 1971. Yields in Tons/Acre at 12% moisture.

Variety	Harvest Date	Replications I	II	III	IV	$\bar{x}$*
Kenmont Tall Fescue	6/10	3.11	3.28	3.28	3.28	
	8/23	2.78	1.47	1.18	1.67	
	Total	5.89	4.75	4.46	4.95	5.01a
Tall Wheatgrass	6/22	3.11	3.20	2.54	2.54	
	8/23	2.10	1.75	1.31	1.07	
	Total	5.21	4.95	3.85	3.61	4.41ab
Garrison Creeping Foxtail	5/21	2.18	2.43	2.02	2.02	
	8/ 4	2.25	2.49	1.83	1.32	
	Total	4.43	4.92	3.85	3.34	4.14ab
Alfalfa, Vernal	6/22	1.92	1.92	1.27	2.16	
	8/23	1.75	1.47	1.18	1.67	
	Total	3.67	3.39	2.45	3.83	3.34 bc
Timothy, Hopkins	6/22	3.34	1.74	1.39	2.85	
	8/23	1.58	.56	.79	.65	
	Total	4.92	2.30	2.18	3.50	3.23 bc
Reed canary grass	6/22	.61	2.01	1.03	2.11	
	8/23	1.11	1.15	.72	.83	
	Total	1.72	3.16	1.75	2.94	2.39 c
Alsike clover	6/22	.75	.88	.85	.73	
	8/23	1.34	1.08	1.20	1.48	
	Total	2.09	1.96	2.05	2.21	2.08 c
Sainfoin, Eski	6/22	1.08	1.04	.75	1.62	
	8/23	1.14	1.03	.92	.73	
	Total	2.22	2.07	1.67	2.35	2.08 c
Cicer milkvetch, Lutana	8/ 4	2.59	1.49	1.90	1.70	
	Total	2.59	1.49	1.90	1.70	1.92 c

* Means followed by the same letter are not significantly different at the .05 level of probability.

$CV = \frac{s\bar{y}}{\bar{y}} = 14.0\%$ L.S.D. (.05) = 1.30 T/A

ANOVA for wetland forage trials

Source	D.F.	Mean Square
Varieties	8	3.9702**
Replications	3	1.3716NS
Error	24	.7952
Total	35	

TITLE: Small Grain Investigations

PROJECT: Spring Barley MS 756

YEAR: 1971

PERSONNEL: Leader - A. J. Jarvi
Cooperators - R. F. Eslick and E. A. Hockett

LOCATION: Northwestern Agricultural Research Center, Field A-1 (dryland), Y-1 (irrigated) and G. R. Snyder farm Lake County.

DURATION: Indefinite

OBJECTIVES: 1. To determine the adaptation of new and introduced barley varieties and selections for Western Montana.

MATERIALS AND METHODS:

Standard four row plots with four to five replications in a RCB design were used on varietal trials. Genetic trials consisted of RCB design with nurseries over five entries and Latin square design used with five entry nurseries. Four genetic trials were conducted on dryland and seven under irrigation in cooperation with R. F. Eslick and E. A. Hockett.

No fertilizer was applied to either location. Adequate moisture prevailed under the irrigated location so no additional water was applied.

The World Collection x ms composite cross was grown in space planted rows. This was planted in a block 12 rows wide and bordered by spring wheat.

RESULTS AND DISCUSSION:

Irrigated Intra-state Nursery - Table 1. Yields were satisfactory without supplemental irrigation. No varieties or selections significantly better than the check Ingrid. Thirteen entries yielded significantly less than Ingrid. Differential lodging was observed in this nursery, with Centennial being the most resistant variety in the nursery.

Dryland Intra-state Nursery. Table 2. Four entries yielded significantly more than the check variety Piroline, these being WA3564/Unitan (a Washington Selection), Centennial, Stiff Freja (a Montana Selection) and Zephyr. WA 3564/Unitan warrants further testing as it out yielded Centennial by about 14 bu/a and Piroline by about 30 bu/a. This line is a 6-row type derived from a Unitan cross. Differential lodging occurred under this dryland test and appears to be a different type of lodging than occurred under the irrigated conditions. The dryland location is a sandy loam in which case lodging appears to be primarily the result of a weak crown and/or root system. Under the irrigated location it appears that lodging is primarily related to straw strength.

Off station. G. R. Snyder farm, Lake County. Table 3. This was a very uniform nursery. It was not irrigated during the growing season. Yields ranged less than 14 bu/a with no significant differences between varieties. Centennial exhibited the best lodging resistance in this nursery.

Genetic studies. None of the genetic yield trial results are included. These will be in the feed grain general report under the leaders Eslick and Hockett. In general, none of the entries in these studies had acceptable level of straw strength to warrent production under either dryland or irrigated conditions here.

About 230 Trisomics were evaluated as to being balanced for specific genetic characteristics. All trisomic plants were harvested and seggregation ratios recorded and forwarded to R. F. Eslick.

Composite Cross. Male sterile plants were harvested from this composite. The mean seed set on these male sterile plants was 58.79% $\pm$ 23.3%. A considerable amount of ergot was present on the male-sterile plants. Some selections were made from the composite. These plants were choosen for yield potential and straw strength. All of these plants are F_1's and reselection will have to be done again in the following generations. All plants should segregate ms2.

A 10 year summary of yields for the irrigated trials on the station is presented in Table 4 and the corresponding dryland summary in Table 5.

Table 1. Agronomic data from the irrigated intrastate barley yield nursery grown at the Northwestern Agricultural Research Center, Kalispell in 1971. Field Y-1, RCB design with 5 replications.

Planting date: May 3, 1971 Harvest date: August 18, 1971 Plot size: 16 square feet

C. I. or Sel. No.	Variety	Yield	Test Weight	Jan. 1 to Heading	Plant Height	Lodging		Plump
						Prev	Sev.	
		Bu/A	Lbs/Bu	Days	Inches	%	0-9	%
ID 601810	Betzes x Domen 60AB1810	116.24	51.0	190.6	39.8	34.0	2.6	89.6
WA 642866	WA3564/Unitan	115.99	47.5	184.6	39.2	64.0	7.0	88.4
CI 13796	Primus II	115.24	48.0	176.8	44.6	80.0	2.4	93.8
CI 10083	Ingrid (check)	114.84	51.5	193.8	40.4	36.0	2.2	92.4
CI 13667	Zephyr	114.64	50.5	191.0	37.0	24.0	3.2	88.0
CD 5914	Centennial	111.61	50.5	193.6	38.4	8.0	1.6	96.6
MT 46669	Semi Smooth Awn Titan	108.86	50.5	184.8	44.2	34.0	4.0	92.4
MT 204723	Ingrid x Betzes	108.31	52.0	193.2	40.4	24.0	3.6	86.4
MT 8553	Stiff Freja	106.94	50.0	188.0	37.4	34.0	6.0	77.2
MT 204738	Ingrid x Betzes	104.31	52.0	191.4	40.4	32.0	5.2	93.6
CI 10421	Unitan	102.93	47.5	183.6	41.8	76.0	7.2	88.6
CI 7324	Vantage	102.73	48.0	184.8	45.8	44.0	4.4	92.0
MT 72132	Bet x Pall DB 5-120	101.61	51.5	184.6	41.8	58.0	5.4	90.8
MT 72654	Erectoides Betzes II	97.83*	52.5	187.0	36.8	22.0	2.8	86.8
MT 699422	Pale Green Betzes	96.46*	51.0	193.6	40.0	60.0	6.2	84.6
MT 695801	Erectoides Compana	96.23*	48.5	190.0	28.0	24.0	2.8	96.0
CI 13827	Shabet	93.58*	50.5	189.4	41.6	72.0	5.0	87.2
CI 10968	Dickson	93.58*	48.0	186.6	40.8	68.0	6.0	77.8
CI 13334	Bet x HH 2x Pir 7698-62	92.53*	50.5	186.4	38.8	42.0	7.0	79.2
CI 7130	Freja	90.28*	48.5	190.4	34.4	64.0	6.6	69.2
CI 6398	Betzes	89.15*	51.0	189.8	38.6	62.0	6.4	84.6
CI 13826	Erbet	88.63*	51.5	176.0	35.4	99.0	6.8	82.0
CI 9558	Piroline	88.53*	51.0	185.4	39.8	61.8	7.6	77.6
MT 72129	Bet x Pir IB 6-3	83.48*	49.0	186.4	37.0	66.0	7.8	68.0
CI 15216	Nordic	75.42*	48.5	187.2	43.0	74.0	6.8	83.0
CI 5438	Compana	71.60*	47.0	184.2	33.2	93.6	8.8	84.6
* Varieties yielding significantly less than the check (.05)								
	$\bar{x}$	99.3	50.1	187.4	39.2	52.2	5.20	85.8
	Variety ms	773.4**	0.0	103.9**	71.7**	2839.0**	20.7**	280.2**
	Error ms	122.0	0.0	1.0	3.4	552.9	6.2	54.3
	CV % $s_{\bar{y}}/\bar{y}$	4.97	0.0	0.24	2.10	20.16	21.40	3.84
	L.S.D. (.05)	13.84	0.0	1.28	2.31	29.48	3.12	9.24

** significant at the 0.01 level

Table 2. Agronomic data from the dryland intrastate barley yield nursery grown at the Northwestern Agricultural Research Center, Kalispell, 1971. Field A-1, RCB design with four replications.

Planting date: April 29, 1971 Harvest date: August 19, 1971 Size of plot: 16 sq. ft.

C. I. or Sel. No.	Variety	Yield	Test Weight	Jan.1 to Heading	Plant Height	Lodging		Plump
						Prev.	Sev.	
		Bu/A	Lbs/Bu	Days	Inches	%	0-9	%
WA 642866	WA3564/Unitan	97.91*	50.5	178.25	34.50	25.00	1.75	95.25
CD 5914	Centennial	83.72*	50.0	192.25	34.75	34.75	2.00	91.00
MT 8553	Stiff Freja	82.21*	51.0	185.25	33.25	32.25	1.00	83.00
CI 13667	Zephyr	82.18*	52.5	190.00	33.50	.00	.00	83.00
CI 10421	Unitan	78.53	49.5	183.00	39.00	67.50	4.50	90.25
MT 72132	Bet x Pall DB 5-120	77.53	52.0	183.50	38.50	67.50	5.25	82.75
CI 13796	Primus II	77.21	51.0	175.25	42.00	42.25	2.50	88.25
ID 601810	Betzes x Domen 60AB1810	76.09	51.0	188.25	36.75	60.00	2.50	82.75
MT 46669	Semi Smooth Awn Titan	75.84	48.5	181.75	40.50	62.50	5.50	90.75
KK 1	Yukon	73.62	49.5	183.75	45.75	67.25	3.25	91.75
CI 3351	Dekap	73.43	52.0	182.75	33.75	99.00	6.25	84.50
CI 7130	Freja	72.84	51.0	188.75	32.50	27.50	3.50	79.25
MT 72129	Bet x Pir IB 6-3	72.77	53.0	184.50	36.75	59.50	2.50	81.50
MT 204723	Ingrid x Betzes	72.62	52.5	192.50	34.50	22.50	.75	85.75
CI 6398	Betzes	72.52	51.0	186.75	37.25	94.25	5.25	74.25
MT 73481	Early Carlsberg II	70.34	49.0	178.50	33.75	92.00	5.50	93.50
MT 204738	Ingrid x Betzes	70.02	53.5	192.25	36.00	17.50	1.00	87.00
CI 13334	Bet x HH 2x Pir 7698-62	69.80	51.5	184.50	36.00	42.50	2.75	79.50
CI 13827	Shabet	68.37	49.0	185.50	37.25	80.00	6.00	75.00
CI 9558	Piroline (check)	67.68	53.0	184.25	36.75	35.00	1.75	91.50
CI 14005	Caribou	65.43	49.0	175.00	31.50	96.75	7.25	77.25
CI 15216	Nordic	64.99	52.0	182.25	44.75	39.75	1.50	86.50
MT 699422	Pale Green Betzes	63.96	52.0	192.00	35.75	57.50	4.25	76.00
MT 695801	Erectoides Compana	61.86	46.5	188.25	25.00	99.00	4.75	90.00
MT 72654	Erectoides Betzes II	61.55	52.0	185.50	32.75	77.25	4.25	74.50
CI 13826	Erbet	59.80	49.0	181.00	32.75	99.00	7.25	90.00
CI 5438	Compana	58.64	48.5	181.50	33.00	99.00	7.00	90.75
	$\bar{x}$	72.3	50.7	184.7	35.9	59.1	3.7	85.0
	Variety ms	291.1**	0.0	94.6**	70.9**	3483.9**	18.4**	157.4**
	Error ms	88.2	0.0	2.0	3.3	603.5	2.1	49.5
	L.S.D. .05	13.21	0.0	1.99	2.56	34.55	2.05	9.89
	CV % $s_{\bar{y}}/\bar{y}$	6.50	0.0	.38	2.54	20.77	19.74	4.14

* Varieties yielding significantly more than the check.

** significant at the 0.01 level

Table 3. Agronomic data from the off station barley nursery grown at the G. R. Snyder farm, Lake County in 1971. RCB design with four replications.

Planting date: May 5, 1971
Harvest date: August 26, 1971
Plot size: 16 sq. ft.

C. I. or Sel. No.	Variety	Yield	Test Weight	Plant Height	Lodging		Plump
					Prev.	Sev.	
		Bu/A	Lbs/Bu	Inches	%	0-9	%
CI 10421	Unitan	95.28	44.0	37.75	96.75	4.75	88.50
CI 13827	Shabet	95.28	49.5	34.00	92.00	4.00	88.25
WA 642866	WA3564/Unitan	92.22	45.5	33.75	99.00	1.25	94.50
CD 5914	Centennial	91.47	49.0	30.25	.00	.00	97.00
CI 6398	Betzes	89.65	51.5	33.25	94.50	5.00	89.75
CI 11868	Vanguard	88.72	53.0	33.00	89.50	1.50	95.25
CI 13667	Zephyr	88.59	51.5	29.75	49.50	.50	92.50
ID 601810	Betzes x Domen 60AB1810	85.37	51.5	32.25	39.75	.50	91.00
CI 9558	Piroline	82.43	52.5	33.25	64.50	1.25	95.50
CI 10083	Ingrid	81.37	51.5	32.00	44.75	.50	96.25
	$\bar{x}$	89.0	49.9	32.9	67.0	1.9	92.8
	Variety ms	93.6NS	0.0	19.5**	4371.4**	14.5**	43.3**
	Errors ms	93.6	0.0	2.9	1140.0	0.5	9.4
	CV % $s_{\bar{y}}/\bar{y}$	5.43	0.0	2.57	25.19	17.44	1.65
	L.S.D. .05	14.04	0.0	2.45	48.99	.97	4.44

** significant at 0.01 level
NS not significant at the 0.05 level

Table 4. Summary yields for irrigated intrastate and station yield nursery grown on the Northwestern Agricultural Research Center, Kalispell, Montana from 1960 thru 1971.

Variety	C.I. or State #	1960	1961	1962	1965	1966	1967	1968	1969	1970	1971	Sta. Yrs.	% of Ingrid
Betzes x Domman	ID601810										116.2	1	101
WA3564/Unitan	WA642866										116.0	1	101
Primus II	CI 13796									87.8	115.2	2	107
Centennial	CD 5914							106.6	106.9	76.0	111.6	4	106
Semi-Smooth awn Titan	MT 46669								91.4	92.1	108.9	3	98
Zephyr	CI 13667						120.5	95.0	110.8	68.7	114.6	5	104
Unitan	CI 10421	73.0	80.4	76.4	84.4	90.8	128.4	98.4	92.1	80.0	102.9	10	100
Vantage	CI 7324	55.8	71.5	78.2	101.6	67.8	119.2	90.3	96.0	87.4	102.7	10	96
Ingrid	CI 10083	68.8	90.8	70.8	92.0	88.9	111.7	80.6	109.3	75.0	114.8	10	100
Ingrid x Betzes	MT204738							95.5	80.8	66.1	104.3	4	91
Ingrid x Betzes	MT204723							70.7	91.9	75.2	108.3	4	91
Piroline	CI 9558	72.4	78.7	72.0	95.9	87.3	108.8	93.3	85.3	64.8	88.5	10	94
Stiff Freja	MT 8553									61.2	106.9	2	89
Betzes x HH 2x	CI 13334						109.2	74.5	103.8	70.1	92.5	5	92
Betzes x Pall D	MT 72132								82.1	62.4	101.6	3	82
Pale Green Betzes	MT699422									62.0	96.5	2	84
Shabet	CI 13827								80.4	67.7	93.6	3	81
Freja	CI 7130			71.1	77.8	79.3				63.0	90.3	5	91
Erectoides Betzes	MT 72654							74.9	79.9	58.2	97.8	4	82
Betzes	CI 6398	65.0	66.9	73.0	88.5	67.6	104.7	63.2	82.7	66.1	89.2	10	85
Erectoides Compana	MT695801									55.4	96.2	2	80
Dickson	CI 10968				76.8	60.9			81.1	66.7	93.6	5	89
Erbet	CI 13826						91.4	73.3	76.4	71.1	88.6	5	82
Betzes x Piroline IB	MT 72129										83.5	1	73
Nordic	CI 15216										75.4	1	66
Compana	CI 5438	65.4	46.0	71.2	70.7	60.0	85.5	63.4	72.3	59.9	71.6	10	74

Table 5. Summary of yields for dryland intrastate and station yield nurseries grown on the Northwestern Agricultural Research Center, Kalispell, Montana from 1960 thru 1971.

Variety	C.I or State #	1960	1961	1964	1965	1966	1967	1968	1969	1970	1971	Sta. Yrs.	% of Piroline
WA3564/Unitan	WA642866										97.9	1	145
Stiff Freja	MT 8553									89.6	82.2	2	117
Centennial	CD 5914							101.4	64.3	94.9	83.7	4	117
Primus II	CI 13796									84.7	77.2	2	111
Zephyr	CI 13667						60.9	94.8	60.5	93.7	82.2	5	112
Freja	CI 7130			67.6	91.4	71.9				83.7	72.8	5	104
Betzes x Domman	ID601810										76.1	1	112
Yukon	KK 1									83.5	73.6	2	107
Ingrid x Betzes	MT204723								62.7	87.5	72.6	3	113
Betzes x HH 2x	CI 13334						60.8	101.6	56.6	92.7	69.8	5	109
Unitan	CI 10421	50.0	37.9	65.5	80.4	72.6	60.7	90.1	64.5	86.2	78.5	10	101
Ingrid x Betzes	MT204738								58.2	90.0	70.0	3	111
Betzes x Pir IB	MT 72129										72.8	1	108
Piroline	CI 9558	46.9	54.1	75.3	80.8	69.1	58.3	96.5	50.4	78.7	67.7	10	100
Betzes	CI 6398	46.1	31.6	61.7	73.5	69.9	56.5	90.4	76.4	72.0	72.5	10	96
Early Carlsberg	MT 73481									75.0	70.3	2	99
Erectoides Betzes	MT 72654							94.8	57.6	80.2	61.6	4	100
Semi-Smooth awn Titan	MT 46669								43.9	82.6	75.8	3	103
Shabet	CI 13827								57.8	73.4	68.4	3	101
Pale Green Betzes	MT699422									73.3	64.0	2	94
Betzes x Pall DB 5-120	MT 72132								43.1	74.0	77.5	3	99
Dekap	CI 3351	52.8	45.7	56.8	72.5	56.5	52.4	86.7	53.8	74.8	73.4	10	92
Caribou	CI 14005										65.4	1	97
Erbet	CI 13826						53.3	85.1	66.3	66.9	59.8	5	94
Nordic	CI 15216										65.0	1	96
Compana	CI 5438	45.5	34.9	57.1	79.8	62.9	58.2	89.1	44.9	66.2	58.6	10	88
Erectoides Compana	MT695801									69.6	61.9	2	90

TITLE: Winter Barley Trials

PROJECT: Small Grains Investigations MS756

PERSONNEL: A. J. Jarvi, R. F. Eslick, Cooperator

LOCATION: Northwestern Agricultural Research Center, Field R 6a

DURATION: Indefinite

OBJECTIVES:
1. Evaluate adaptability of winter barley varieties developed outside of Montana.
2. Recycle composite cross bulk populations to improve winter survival in the population and to select agronomically desirable types for possible new varieties.
3. Establish a hybrid system in winter barley based on the balanced tertiary trisomic system.

PROCEDURES: General - All winter barley plots were grown under dryland conditions following a fallow season. Fertilization consisted of 200#/A of 16-16-16.

Uniform Winter Barley Yield Nursery consisted of four row plots in a RCB design with four replications. The Uniform Winter Hardiness Nursery consisted of single row plots, 12 feet long with two replications. Both nurseries were planted on September 15, 1970.

Composite cross material was planted in two foot rows at eight pounds per acre on September 14, 1970.

RESULTS AND DISCUSSION:

Agronomic data for the Uniform Yield nursery are presented in Table 1. The fourth replication of this nursery was lost to pocket gopher damage. Luther (119.1 bu/a), Alpine (114.7 bu/a) and Schuyler (113.4 bu/a) were the top three yielding varieties. Both Luther and Schuyler have better lodging resistance than Alpine. In general, this nursery was severely infected with scald with readings presented in Table 1. No ergot was observed in any of the winter varieties.

Winter survival data of the winter hardiness nursery are presented in Table 2. This nursery was not harvested for yield.

The composite cross (world collection x ms1) was harvested on weekly intervals for four weeks. Data obtained from the four harvest dates are listed below:

Harvest Date	% Seed Set on 100 Head Samples Mean	Standard Error	Ergot
July 12	72.1%	10.2%	One head observed with honeydew.
July 19	77.8%	17.5%	Several plants with honeydew, no sclerotia.
July 26	76.3%	21.3%	First few sclerotia present.
August 2	60.7%	31.0%	Still less than 1% sclerotia.

The first harvest date was made when seed on the early tillers was in the soft dough stage. Ergot infections this season were very low in the winter barley trials.

None of the seed which was irradiated in 1970 to produce translocations grew at Kalispell this last season due to late planting, but a sizable increase was obtained in Arizona by Dr. R. T. Ramage. Seed from this increase was planted in 1971.

Some selections were made from the composite in 1970 and the evaluation of some of the more desirable types is to be continued in 1971-72. Also about 60 more selections were made in 1971 from the composites.

Some material which survived at Havre in 1970-71 was harvested and is currently being increased at Kalispell. This material is possibly from a different composite, may be segregating ms2.

Table 1. Uniform Winter Barley Nursery (Hardy Varieties) for 1970-71, Northwestern Agricultural Research Center, Kalispell. Field R-6, harvested July 26, 1971.

Variety	C.I. No.	Winter Surv. %	Yield(by replications) B/A I	II	III	Ave.	Test Wt.	Date Headed	Ht. In.	Lodging %	Lodging Sev.	Scald
Luther	13340	73	116.5	112.2	128.6	119.1	49.5	162	40	7	.7	4.5
Alpine (check)	9478	80	114.5	118.1	111.4	114.7	49.5	162	48	87	4.7	3.8
Schuyler	11887	60	88.4	116.4	135.5	113.4	51.0	151	35	33	.3	3.8
OAC WB41-7-1	13873	57	113.8	98.5	119.6	110.6	45.5	152	36	0	0	2.3
N.Y. 6005-19		57	109.2	100.9	115.0	108.4	45.0	147	34	0	0	1.3
Hudson	8067	67	99.4	104.9	117.9	107.4	50.5	148	40	60	1.3	.8
N.Y. 6005-18		60	107.9	100.6	113.2	107.2	51.0	149	37	27	1.7	4.5
Lakeland	13734	30	107.5	97.6	115.0	106.7	48.0	150	34	0	0	1.3
N.Y. 6005-15		57	102.0	102.4	103.1	102.5	53.0	149	38	0	0	.8
Mich. 62-439-12		73	112.8	90.6	96.6	100.0	43.0	147	41	57	2.7	1.5
Purd. 5924A7-14-1		70	104.6	88.6	98.9	97.4*	46.0	146	32	0	0	2.5
Purd. 5294A7-14-4		83	90.2	92.9	103.2	95.4*	44.5	147	31	13	1.0	3.8
Olympia	6107	87	88.2	102.4	88.9	93.2*	47.0	149	45	87	5.3	2.8
Okla. S-633717	13855	43	77.8	91.2	108.6	92.5*	49.0	149	35	23	2.7	5.0
Mich. 62-448-24		80	96.2	73.8	106.5	92.2*	45.0	145	36.	30	.7	2.5
Mo. B1898		77	81.9	93.6	99.5	91.7*	47.5	145	39	40	1.3	2.5
Ky. 66-7-63-1294	13876	63	103.6	76.2	90.0	89.9*	47.0	142	32	0	0	5.0
Mo. B-475	9168	83	90.2	80.1	96.0	88.8*	48.0	147	43	90	7.0	3.3
Harrison	10667	40	79.9	84.1	100.5	88.2*	49.0	149	36	13	.7	3.3
Mo. B-1773		77	81.8	78.8	100.5	87.0*	49.0	149	40	63	4.0	2.0
Mo. B-1899		73	78.8	80.0	96.9	85.2*	48.0	146	40	30	.7	3.0
Kentucky 1	6050	57	98.8	68.0	81.2	82.7*	49.0	151	45	67	8.0	3.8
Mich. 62-420-32		60	75.6	83.6	80.0	79.7*	47.5	151	42	67	3.0	3.5
Reno	6561	87	88.5	88.0	61.8	78.4*	47.5	148	38	93	7.7	2.0
Kans. 66217		33	84.4	73.5	76.6	78.2*	47.5	149	35	93	5.3	5.0
Barsoy	11904	70	78.6	63.1	86.9	76.2*	51.5	141	31	0	0	5.0
Knob	11910	70	77.5	64.6	65.4	69.2*	48.0	144	35	0	0	3.0
Kearney	7580	53	69.0	44.9	81.8	65.2*	49.0	147	37	80	5.0	5.0
Jefferson	11902	40	63.5	47.6	72.1	61.1*	45.5	148	37	0	0	2.5

Lodging: % = percent of plot affected
Sev = 0 = no lodging, 9 = Completely flat

Scald: 0 = no scald present
5 = severe

* - Significantly less than check (.05)

Analysis of Variance for Yield

Source	D.F.	ms	
Varieties	28	683.01**	L.S.D.(.05) 16.29bu/a
Replications	2	962.12**	C.V. = $\frac{s\bar{y}}{\bar{y}}$ 6.2%
Error	56	99.15	
Total	86		

Table 2. 1970-71 Barley Winterhardiness Nursery survival notes grown at the Northwestern Agricultural Research Center, Kalispell. Field No. R-6

Entry No.	C. I. No.	Variety	Survival (pct.) Reps. I	II	Ave.
1	6034	Tenn. Winter (check)	50	30	40
2	7580	Kearney	60	60	60
3	--	NB. 69129 (a)	80	60	70
4	--	NB. 69130 (a)	70	50	60
5	--	NB. 69131 (a)	80	50	65
6	--	NB. 69135 (a)	80	40	60
7	--	NB. 69139 (a)	60	40	50
8	1442	Kharkof (wheat)	95	95	95
9	--	Okla. S-654833-2S (b)	30	20	25
10	--	Okla. S-654833-7R (b)	40	30	35
11	6034	Tenn. Winter (check)	30	30	30
12	10667	Harrison	60	50	55
13	11902	Jefferson	60	50	55
14	--	Purd. 5924A7-14-1	90	80	85
15	--	Purd. 5924A7-14-4	60	60	60
16	--	Tenn. 65-117 (c)	60	30	45
17	--	Tenn. 65-118 (c)	80	60	70
18	--	Tenn. 65-137 (c)	50	30	40
19	--	Tenn. 60-34-69 (c)	40	60	50
20	936	Trebi	30	40	35
21	6034	Tenn. Winter (check)	40	40	40
22	--	Or. 6832	70	40	55
23	--	Cor. 59-17, OR 6924 (d)	40	30	35
24	--	Or. 2212U, OR 681 (e)	80	70	75
25	6051	Mo. Ey. Bdls.	60	50	55
26	--	Mo. B1766	80	90	85
27	--	Mo. B1790	40	50	45
28	--	Mo. B1807	-	60	60 1/
29	--	Mo. B1891	-	40	40 1/
30	9168	Mo. B-475	90	90	90
31	6034	Tenn. Winter (check)	20	50	35
32	--	Belts. 68-1447	80	60	70
33	--	Belts. 68-1448	60	80	70
34	--	Belts. 68-1428 (f)	90	70	80
35	--	Belts. 69-1049RR) (g)	70	70	70
36	--	Belts. 69-1051rr) (g)	70	80	75
37	--	Belts. 69-1065 RR) (h)	80	80	80
38	--	Belts. 69-1067 rr) (h)	80	70	75
39	--	Belts. 69-1191 RR) (i)	80	90	85
40	--	Belts. 69-1192 rr) (i)	60	80	70
41	6034	Tenn. Winter (check)	20	50	35
42	--	Belts. 69-1174 RR) (j)	70	80	75
43	--	Belts. 69-1175 rr) (j)	50	60	55
44	--	Belts. 69-1201 SS) (k)	20	60	40
45	--	Belts. 69-1203 ss) (k)	10	50	30

1/ Plots in Rep. I were seeded in same row.

Table 2 . (con't)

Entry No.	C. I. No.	Variety	Survival (pct.) Reps. I	II	Ave.
46	--	Belts. 69-1258 OO) (l)	20	60	40
47	--	Belts. 69-1259 oo) (l)	30	50	40
48	--	Belts. 69-1156 NN) (m)	50	60	55
49	--	Belts. 69-1157 nn) (m)	30	50	40
50	13794	Malta (n)	30	40	35
51	6034	Tenn. Winter (check)	40	30	35
52	--	Belts. 69-1168 NN) (o)	50	50	50
53	--	Belts. 69-1169 nn) (o)	30	50	40
54	6728	Wong	70	80	75
55	11887	Schuyler	70	60	65
56	--	N.Y. 6005-15	80	60	70
57	--	N.Y. 6005-18	70	90	80
58	--	N.Y. 6005-19	70	70	70
59	--	OAC WB58-27 (p)	70	60	65
60	--	OAC WB58-32 (p)	70	50	60
61	6034	Tenn. Winter (check)	40	50	45
62	12218	Blackhawk (wheat)	95	95	95
63	6050	Kentucky 1	80	60	70
64	--	Ks. 66217	20	40	30
65	6561	Reno	80	70	75
66	5529	Dicktoo	50	50	50

Parentage or origin of new entries

(a) CI 10,880 2x Sabbaton x Meimi (E3,4,5,6,7)
(b) 2* Rogers/Omugi greenbug isogenics -- E9, Susc.; E10, Res.
(c) Parentage not submitted
(d) Cascade x Wocus
(e) Olympia $\frac{x}{4}$ Alpine
(f) Jaydee x Mo. B-475 (E44)
(g) Iso. pair for rough (E35) vs. semismooth (E36) awns. Dicktoo x_8 Kenbar
(h) " " " " (E37) " " (E38) awns. Kearney x_8 Kenbar
(i) " " " " (E39) " " (E40) awns. Tschermak x_8 Kenbar (both 6-row)
(j) " " " " (E42) " " (E43) awns. Tschermak x_8 Kenbar (both 2-row)
(k) " " " long (E44) vs. short- (E45) haired rachilla. Rogers $\frac{x}{4}$ x_8 Dicktoo
(l) " " " normal (E46) vs. orange (E47) lemma. Orange lemma x 8 Mo. B-400
(m) " " " covered (E48) vs. naked (E49) Kernel; naked x_8 Dayton
(n) Malta: (Carstens x Aurea) x Dea) x Herfordia. Bred by Ackermann Plant Breeders in Germany. Entered by Rothwell Plant Breeders of England. Malta is subject to Plant Breeders rights and is not to be multiplied but to be used for experimental trials only.
(o) Iso. pair for covered (E52) vs. naked (E53) kernel; naked x_8 Kenbar
(p) OAC Wb2-11 (Kearney x Wong) 2x Dover (E59,60)

TITLE: Small Grains Investigations

PROJECT: Spring Oats MS 756

YEAR: 1971

PERSONNEL: Leader - Vern R. Stewart
Cooperator - R. F. Eslick

LOCATION: Northwestern Agricultural Research Center

DURATION: Indefinite

OBJECTIVES: To determine the adaptation of new and introduced oat varieties.

SIGNIFICANT FINDINGS:

Cayuse continues to give high yields, however several new lines show promise. They are somewhat higher in yield than Cayuse and Park. These lines are OT 717, OT 714, Harmon and a new entry ID 68710.

FUTURE PLANS: If funds are reduced greatly in 1972 this project will be discontinued.

MATERIALS AND METHODS:

Standard nursery procedures were used in the variety testing program. A randomized block design was used for both nurseries, four row plots replicated three times. Two dryland nurseries were grown on the station in 1971. The uniform nursery which is grown throughout the Pacific Northwest, consisted of 25 entries. In the Montana nursery there were 10 entries.

RESULTS AND DISCUSSION:

Uniform Northwestern State Nursery

The mean yield of this nursery was 186.6 bushels per acre. Probably some of the highest yields we have had in an oat nursery at the Northwestern Agricultural Research Center for some 15 years. The range of the yield was 152.5 bushels per acre for Victory to 208.69 bushels per acre for the cross of Cayuse by Orbit, ID 68710. In this nursery Cayuse is used as a check variety. There were no varieties significantly higher in yield and three were significantly lower in yield; Gopher, Bridger and Victory.

Several lines were found to be considerably higher in test weight than the variety Cayuse, which was two pounds below the standard. This could be due in part to the rather wet conditions at harvest time.

The earliest heading entry in the nursery is Pendak x Glen OT 717. This is earlier than Cayuse by four days.

All entries were found to be significantly taller than Cayuse in this study.

There was no significant difference in lodging prevalence, but there was considerable difference in the lodging severity. Cayuse has the strongest straw of any entry in the nursery. The author would consider this to be a very reliable test as it pertains to yields, as indicated by the low CV.

Complete tabulation of the data is found in Table 1.

Results and Discussion: (con't)

Montana Oat Nursery

In this nursery the check, Cayuse is the highest yielding entry with 195.5 bushels per acre. The mean for the nursery is 172.08. There were four varieties that were found to be significantly lower in yield than Cayuse. They were; Basin, Park, Bridger and Gopher. In test weight Cayuse is low, but not significantly lower than Park.

Gopher is the earliest heading variety and also the lowest yielding in the study. Cayuse is significantly shorter than all other ten entries. Cayuse has the best straw of the ten entries. The low CV of 4.30% for yield indicates that the data are quite reliable.

Complete tabulation of the data from this study are found in Table 2.

In Table 3, is found a ten year summary of varieties grown in the Uniform Northwest Regional Nursery, 1958-71. In an eight year comparison, Basin is 107% of Park, a five year comparison, Cayuse is 107% of Park. Other comparisons can be made in the table.

Table 1. Agronomic data from dryland uniform oat nursery grown at the Northwestern Agricultural Research Center, Kalispell, Montana in 1971.
Field No. Y-1

Planting Date: May 3, 1971 Harvest Date: August 21, 1971
Size of Plot: 16 sq. ft.

C.I. or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Heading Date	Plant Height	Lodging Prev.	Lodging Sev.
ID 68710	Cayuse x Orbit	208.69	31.70	194.33a	47.00a	82.67	5.00a
OT 717	Pendak x Glen	208.44	32.03	187.33b	48.33a	99.00	2.00
ID 654547	Park x Russell	199.94	33.67a	195.33a	51.67a	99.00	2.33
ID 635100	Cx202xSxS	198.50	32.03	191.67	47.00a	56.33	6.33a
OT 716	Random	197.69	30.73	188.33b	44.67a	33.00	.33
ID 352801	CI 5345 x Zanster	196.19	34.30	191.33	50.67a	99.00	2.67
CI 8263	Cayuse 1/	195.94	30.53	191.33	39.67	66.00	.67
ID 68644	Cayuse x Orbit	195.44	32.50a	194.33a	44.67a	66.00	.67
OT 611	Kelsey	195.31	34.43a	190.00b	48.00a	49.67	2.00
ID 654602	Park x Russell	191.69	32.97a	192.67a	44.33a	99.00	1.00
CI 6611	Park	190.56	32.77a	194.00a	47.33a	66.00	2.33
ID 352807	CI 5345 x Zanster	190.44	35.27a	191.67	47.67a	99.00	2.67
ID 69443	Cayuse x Orbit	187.94	29.70	196.00a	44.00a	99.00	5.00a
ID 683975	Cayuse x Glen	183.62	30.77	190.67	44.67a	99.00	1.00
OT 714	Pendak x Glen	183.62	30.87	187.67a	47.33a	99.00	1.33
ID 68615	Cayuse x Orbit	181.87	30.27	193.33a	46.00a	99.00	4.00a
CI 8318	Fraser	181.87	34.47a	195.00a	49.33a	99.00	1.00
CI 7989	Harmon	177.75	34.50a	193.00a	51.67a	74.33	2.00
CI 5346	Basin	177.00	33.73a	193.67a	48.00a	99.00	1.67
IL 631668	Albion x N2 x M	176.81	32.57a	188.33b	49.00a	74.33	3.00
CI 2053	Markton	175.12	33.33a	191.33	53.00a	96.00	7.00a
CI 6661	Rodney	169.93	36.00a	194.33a	50.00a	66.00	.67
CI 2027	Gopher	168.87*	33.83a	186.33b	49.67a	99.00	6.67a
CI 2611	Bridger	165.74*	34.70a	197.67a	57.00a	99.00	6.33a
CI 1145	Victory	152.55*	34.27a	197.33a	55.00a	96.00	5.67a

1/ Check variety
* Varieties yielding significantly less than the check
a/ Values significantly more than the check
b/ Values significantly less than the check

$\bar{x}$	186.06	32.88	192.28	48.23	84.53	2.93
F-value for variety comparison	2.08*	8.07**	63.63**	12.47**	1.27	5.14**
S.E.$\bar{x}$	16.33	1.05	.67	1.84	30.16	1.65
L.S.D. .05	26.78	1.72	1.10	3.01	N.S.	2.70
C.V. %	5.07	1.85	.20	2.20	20.60	32.45

Table 2. Agronomic data from dryland Montana oat nursery grown at the Northwestern AGricultural Research Center, Kalispell, Montana in 1971. Field No. Y-1

Planting Date: May 3, 1971 Harvest Date: August 24, 1971
Size of Plot: 16 sq. ft.

C.I. or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Heading Date	Plant Height	Lodging Prev.	Lodging Sev.
CI 8263	Cayuse 1/	195.50	31.60	190.67	43.00	49.67	2.67
ID 352807	CI 5345 x Zanster	188.25	34.13a	191.67a	49.00a	99.00	1.67
OT 611	Kelsey	183.31	32.60	190.33	49.67a	99.00	4.67
ID 635100	Cx202xSxS	182.75	32.13	192.00a	46.33a	99.00	3.33
OT 716	Random	179.25	30.20b	186.67b	46.33a	99.00	1.33
CI 6661	Rodney	175.68	33.33a	192.33a	52.67a	99.00	5.33
CI 5346	Basin	170.43*	33.90a	193.00a	49.33a	69.33	5.67
CI 6611	Park	154.74*	32.63	194.00a	48.67a	99.00	4.67
CI 2611	Bridger	146.05*	33.07a	197.67a	58.33a	99.00	8.33
CI 2027	Gopher	144.86*	32.80	186.67b	50.00a	99.00	5.67

1/ Check variety
* Varieties significantly less than the check (.05)
a/ Values significantly more than the check (.05)
b/ Values significantly less than the check (.05)

$\bar{x}$	172.18	32.64	191.5	49.33	91.10	4.33
F - value for variety comparison	5.76**	7.66**	149.40**	19.40**	1.61	2.43
S.E. $\bar{x}$	7.40	.41	.27	.93	13.64	1.36
L.S.D. (.05)	21.98	1.23	.80	2.77	N.S.	N.S.
C.V. %	4.30	1.27	.14	1.89	14.97	31.50

Table 3. Summary of oat yield data from the uniform oat nursery, Northwestern Agricultural Research Center 1958-71.

CI. or State No.	Variety	1958	1959	1960	1962	1964	1967	1968	1969	1970	1971	Sta. Yrs.	% Park
CI 6661	Rodney	141.1	51.6	15.9	84.8	73.0	126.2	121.4	126.2	132.2	169.9	10	98
CI 6611	Park	63.5	99.4	17.5	89.5	80.5	108.3	120.3	171.4	127.1	190.6	10	100
CI 1145	Victory	49.4	92.5	18.1	78.8	62.8	81.2	114.3	122.2	131.2	152.6	10	85
CI 2053	Markton	52.5	89.7	16.9	74.7	89.1	89.9	101.7	120.2	120.5	175.1	10	87
CI 2027	Gopher		49.7	10.6	61.6	46.2	116.8	101.0	134.9	127.4	168.9	9	81
CI 5346	Basin			15.0	89.5	120.7	120.2	149.1	151.5	148.7	177.0	8	107
CI 2611	Bridger				91.8	87.1	95.7	104.5	147.9	121.4	165.7	7	92
CI 8263	Cayuse						142.6	130.0	138.1	158.7	195.9	5	107
ID 654547	Park x Russell							153.8	190.7	138.4	199.9	4	112
CI 8318	Fraser							136.2	161.1	129.7	181.9	4	100
ID 635100	Cx202xSxS							123.9	133.7	150.8	198.5	4	100
OT 611	Kelsey								142.5	127.6	195.3	3	95
ID 654602	Park x Russell								135.0	122.6	191.7	3	92
OT 714	Pendak x Glen									167.7	183.6	2	111
ID 352807	CI5345 x Zanster									155.3	190.4	2	109
CI 7989	Harmon									142.3	177.8	2	101
OT 717	Pendak x Glen									135.0	208.4	2	108
IL 631668	Albion x N2 x M									131.2	176.8	2	97
ID 352801	CI5345 x Zanster									130.7	196.2	2	103
ID 68710	Cayuse x Orbit										208.7	1	110
OT 716	Random										197.7	1	104
ID 68644	Cayuse x Orbit										195.4	1	103
ID 69443	Cayuse x Orbit										187.9	1	99
ID 683975	Cayuse x Glen										183.6	1	96
ID 68615	Cayuse x Orbit										181.9	1	95

TITLE: Winter Wheat

PROJECT: Small Grains Investigations MS 756

YEAR: 1971

PERSONNEL: Leader - Vern R. Stewart
Cooperator - G. A. Taylor

LOCATION: Northwestern Agricultural Research Center and several off station locations throughout western Montana which will be identified in the manuscript.

DURATION: Indefinite

OBJECTIVES:

1. To obtain the information necessary for making varietal recommendations and evaluating new varieties and selections.

2. To cooperate in a breeding program in Northwest Montana designed to produce high yielding varieties with particular emphasis on the acceptable quality and resistance for dwarf bunt and stripe rust. Other agronomic characteristics such as straw strength, winter hardiness etc., will be evaluated in this program.

SIGNIFICANT FINDINGS:

1. Semi-dwarf lines used provide good straw strength, but are not satisfactory for dwarf smut resistance.

2. Lines with PI 178383 parentage provide good dwarf smut resistance.

3. Cheyenne or Cheyenne types are best suited for Ravalli County wheat growing area.

FUTURE PLANS: Plans for 1971-72 include regular yield nurseries and assistance in the overall state breeding program.

MATERIALS AND METHODS:

Standard nursery procedures were used in all of the variety testing programs. A randomized block design was used having four to six replications. Data obtained were: yield; plant height; test weight; disease and lodging. Nurseries grown were: Intrastate Winter Wheat Nursery at the Northwestern Agricultural Research Center in Field E-3; Western Regional Hard Red Winter Wheat Nursery grown on the L. B. Claridge farm, Northwest of Kalispell in a dwarf bunt area; Uniform White Wheat Nursery grown at the Northwestern Agricultural Research Center in Field E-3. The off station nurseries were planted in Ravalli, Missoula, Lake, Sanders and Mineral Counties.

Plots were harvested with a power harvester.

RESULTS AND DISCUSSIONS:

Intrastate Hard Red Winter Wheat Nursery

Four semi-dwarf lines were significantly higher in yield than Crest the check variety, and had exceedingly good straw strength. In all four varieties there was a high incidence of dwarf smut. Table 1. The mean of the nursery 52.3 bu/a is about average for the area in which it was grown. Lodging was very severe throughout the nursery except for the semi-dwarf lines already discussed.

In this area only short strawed or very strong strawed varieties should be considered for future testing.

Nine varieties are included in the ten year summary as seen in Table 2. Cheyenne is used as the long term check and is the only variety grown for the last consecutive ten years. Wanser, McCall and Crest are the only varieties that are equal to or exceed Cheyenne in yield. Only Crest is resistant to the prevelent race of dwarf smut.

Western Regional Hard Red Winter Nursery

The C.V. is rather high in this nursery because of uneveness in stands in replication number three. The dwarf smut level was not high, but of a high enough level to secure good differential reading. McCall and Wanser, both high yielding varieties, are very susceptible to dwarf smut. A trace amount of dwarf smut was noted in the variety Crest this season.

There were no yields significantly higher than Crest (the check) in this nursery, however twelve entries were found to be significantly lower. The mean of 36.6 bu/a is about average for this area of the valley.

Uniform White Wheat Nursery

Dwarf smut levels in this nursery were sufficient to make good differential reading between entries. Those lines with P.I. 178383 in their parentage had a high level of resistance. Luke and Nugaines were about equal in yield. Straw strength in Luke is some less than Nugaines. There were no other entries in the nursery that would be of potential value in this area, because of their susceptibility to dwarf smut. Luke is about four days later in heading than Nugaines and two to three inches taller. See Table 4 for complete details.

Seven varieties have been tested for nine years in this nursery (Table 5). Some of these will be dropped in the 1972 growing season as long time checks. Based on two years data at this location plus additional data from Washington and Oregon, Luke is to be added to the recommended list for 1972. A seed increase is being grown this season.

Off Station Nurseries

These nurseries were composed of 16 entries.

A severe infestation of blue mustard in the nursery located on the Jack Marrinan farm in Sanders County, made harvest impossible and the nursery was abandoned. Very poor wheat stands in Mineral County was the reason for dropping this nursery. This study was located on the Elmer Hankenson farm near Tarkio, Montana.

Missoula County

Yield data obtained from this location was found to be statistically non-significant, however Crest was the highest yielding entry. These rather poor results can be attributed to low tillering, quite dry growing conditions and low fertility. Table 6.

Ravalli County

Cheyenne or Cheyenne type wheats continue to preform the best in this area of Western Montana. Crest was somewhat lower in yield, but was not statistically significant. Stands were good with no significant differences found between varieties. White wheats in this area have not been consistant in their performance over the years, however Omar was one of the higher yielding entries in 1971. Table 7.

Lake County

Soil variations were variable in this location, with replication one being in a very favorable location and number four in a rather dry sandy soil type. When analyzed statistically yield data was found to be non-significant. The mean yield in the nursery was quite high at 62.2 bu/a.

Table 9, is a summary of off station locations in 1971. McCall is the highest yielding entry of the hard red entries. Crest is No. 3 in rank.

Table 1. Agronomic data from the intrastate hard red winter wheat nursery grown on the Northwestern Agricultural Research Center at Kalispell, Montana in 1971. Experimental design - random block, 6 replications.

Planting date: September 16, 1970
Harvest date: August 10, 1971
Size of plot: 16 sq. ft.

C.I. or State #	Vareity	Yield Bu/A	Test Wt Lbs/Bu	Heading Date	Plant Height	Lodging Prev %	Lodging Sev.0-9	Dwarf Smut 2/
DK 184		81.68*	61.0	159.83a	44.33	81.00	1.33b	25
DK 142		79.91*	62.5	157.67	44.17	82.50	1.00b	15
MT 6928	NB55-391-56-D8/Wmt11-4-3	79.88*	61.5	157.83	42.17	16.50b	.17b	15
DK 176		74.76*	59.5	159.83a	43.50	83.67	4.00b	20
CI13844	Wanser	59.57	62.5	160.17a	50.67a	98.33	7.17b	x
CI13842	McCall	58.47	62.0	163.33a	48.83a	95.17	6.17b	x
MT 691	Yogo/Rsc//Marmin/3/Td	56.39	60.5	162.67a	45.83	99.00	8.50	x
CI13181	Rego	56.32	59.5	161.50a	47.67a	99.00	8.50	x
CI13670	Winalta	55.94	62.0	161.17a	49.33a	93.50	7.50b	x
CI13880	Crest 1/	54.08	60.5	157.17	44.33	99.00	8.83	x 3/
CI12933	Itana	53.25	60.5	162.00a	53.17a	99.00	8.67	x
MT 6910	Wsc/Yogo//Rsc/3/Td 231	52.70	59.0	160.00a	46.00	99.00	8.33	x
MT 6615	Rego x Yto 457	52.65	59.5	165.67a	47.00a	99.00	8.67	x
CI14580	Bridger	51.00	62.5	162.00a	49.67a	96.83	7.33b	x
MT 698	Wsc/Yogo//Rsc/3/Wrr 189	49.30	59.0	160.17a	47.17a	99.00	8.33	x 3/
CI 8033	Yogo	48.62	59.5	164.00a	51.17a	99.00	8.50	x
CI 8885	Cheyenne	48.57	60.5	163.00a	48.67a	99.00	8.33	x
CI13190	Warrior	48.32	60.5	159.67a	48.00a	99.00	8.17	x
MT 6535	Rego/Cnn 39-7-4	47.40	61.0	164.17a	49.50a	99.00	7.83	x
MT 694	MM/Yogo//Rsc/3/Yogo/Tk/0	46.92	60.0	160.33a	49.67a	99.00	8.33	x
CI13544	Sawmont	46.80	61.0	163.33a	47.33a	99.00	8.33	x
MT 6532	Rego x Cnn 37-12-4	46.78	59.5	162.83a	48.17a	99.00	8.50	x
NB66425		46.78	60.5	159.00a	47.67a	99.00	8.33	x
MT 692	MM/Yogo//Rsc/3/Td 123	46.72	60.5	162.67a	46.83a	99.00	8.50	x
CI14000	Winoka	46.32	61.5	163.00a	47.67a	95.83	7.83	x
MT 654	Sel Bulk 7-58	44.91	60.0	163.83a	50.50a	99.00	8.33	x
MT 693	Winalta 41	44.73	60.5	162.00a	49.00a	99.00	8.17	x
CI13999	Trapper	44.58	59.0	162.17a	47.83a	99.00	8.67	x
CI13872	Froid	43.81	61.0	163.67a	51.00a	99.00	8.50	x
CI13547	Lancer	42.65	62.0	157.50	47.83a	90.83	8.33	x
MT 6616	Sel Bulk 6-142-6	40.68	60.5	164.33a	50.17a	99.00	8.00	x
CI13998	Trader	38.80	60.5	161.50a	48.33a	99.00	8.33	x
CI 6938	Kharkof Mc22	36.18	59.0	168.00a	48.17a	99.00	9.00	x
$\bar{x}$		52.3	60.6	161.7	47.9	94.3	7.4	
F-value for variety comparison		15.50**	0.0	19.96**	7.32**	8.0**	48.09**	
S.E. $\bar{x}$		2.91	0.0	.55	.89	5.23	.33	
L.S.D. (.05)		8.08	0.0	1.52	2.46	14.49	.92	
C.V. %		6.78	0.0	1.28	2.06	12.16	.77	

1/ Check variety
2/ x indicates presence of smut, where variety was standing % of smut was recorded.
3/ found in trace amounts.
* varieties yielding significantly more than the check .05.
a/ values significantly more than the check .05.
b/ values significantly less than the check .05.

Table 2. Summary of selected winter wheat data from the intrastate yield nurseries grown at the Northwestern Agricultural Research Center, Kalispell, Montana from 1962 - 1971.

Variety	Number	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	Sta. Yrs.	% of Cheyenne	$\bar{x}$	2 Yrs. Average	3 Yrs. Average	4 Yrs. Average	10 Yrs. Bu/A
Cheyenne	8885	55.5	61.9	57.5	48.7	59.3	46.4	57.2	57.0	63.7	48.6	10	100	55.6	56.2	56.4	56.6	55.6
Rego	13181	60.6	60.2	49.9	42.5	62.4	43.6		51.3	58.7	56.3	9	97	53.9	57.5	55.4	52.5	
Winalta	13670			54.4	31.4	67.4	44.9	55.8	45.7	57.9	55.9	8	94	51.7	56.9	53.2	53.8	
Itana	12933	50.3	54.5	46.8	38.3	58.2				61.1	53.3	7	95	51.8	57.2	57.5	52.7	
Crest	13880				40.8	73.4	53.5	51.5	43.8	69.0	54.1	7	101	55.2	61.6	55.6	54.6	
McCall	13842					56.4	51.9	76.8	40.5	63.3	58.5	6	105	57.9	60.9	54.1	59.8	
Lancer	13547					57.0	41.7	44.0	38.3	58.7	42.7	6	85	47.1	50.7	46.6	45.9	
Wanser	13844					73.9	51.7	76.5	56.0	65.5	59.6	6	115	63.9	62.6	60.4	64.4	
Warrior	13190			45.8	37.1	59.5	43.5			60.8	48.3	6	89	49.2	54.6	50.9	53.0	

Table 3. Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Lance Claridge farm, Kalispell, Montana in 1971. Experimental design - random block, four replications.

Planting date: September 18, 1970
Harvest date: August 18, 1971
Size of plot: 16 sq. ft.

C. I. or State No.	Variety	Yield Bu/A	Test Weight Lbs/Bu	Heading[1] Date	Plant Height	Dwarf Smut %	Stripe Rust Sev. %	Stripe Rust Type 0-9
13842	McCall	48.89	62.5	171a	38.5	13.8a	.0	.0
MT 6826	Burt/PI 178383 4-1192	47.89	59.5	167a	37.8	.0	.0	.0
13844	Wanser	46.77	61.5	168a	39.8	13.8a	.0	.0
13880	Crest[2]	46.47	61.5	165	36.8	.3	.0	.0
MT 6929	NB176/Y18181//YTO1171-3	43.16	60.0	169a	39.3	.0	.0	.0
ID 0039	II-60-157/Wanser//IT	42.41	61.0	165	35.0	11.5a	.0	.0
13426	Tendoy	41.99	62.0	170a	43.3a	6.3	.0	.0
UT 755079	DM/178383//Columbia	39.74	61.5	171a	44.3a	.0	.0	.0
ID 0037	IT//KO/PI178383	39.54	62.0	169a	43.8a	1.5	.0	.0
MT 691	Yogo/RSC//Marmin/3/TD	39.04	59.5	170a	45.3a	5.0	.0	.0
1442	Kharkof	38.14	61.5	171a	47.8a	9.0	.3	.8
MT 6827	Burt/PI 178383 14-1202	37.81	58.5	169a	35.5	.0	.0	.0
ID 5010	178383/Cnn//3*Tendoy	37.71	61.0	170a	41.5a	1.5	.0	.0
MT 6828	Burt/PI 178383 13-1201	37.49	60.0	168a	37.8	.3	.0	.0
ID 0031	IT*2/UT*2//ID/B/3/13438	37.21	62.5	167a	43.0a	4.0	.0	.0
ID 0030	It*2/UT*2//ID/B/3/13438	36.06	62.5	168a	43.8a	1.5	.3	.5
ID 0027	WRR//KO/PI 178383	35.99	62.0	165	39.8	.0	.0	.0
8885	Cheyenne	34.29	61.5	170a	39.8	4.0	.0	.0
ID 0038	Cnn*2/PI 178383	34.01	60.0	172a	42.3a	.0	.0	.0
ID 5011	178383/Cnn//3*Tendoy	33.49*	59.0	175a	45.0a	2.5	.0	.0
13846	Itana 65	32.79*	61.0	171a	40.3	5.3	.0	.0
14580	Bridger	32.04*	63.0	169a	41.0	.0	.3	1.3
WA 5835	Bez-1//Bnk1205/CI 13438	31.66*	60.5	173a	31.0	7.5a	.0	.0
10061	Rio	31.61*	62.0	171a	40.8	5.3	.0	.0
WA 5836	Bez-1//CI 13438/Burt	31.31*	61.0	168a	26.0a	7.5a	.0	.0
12933	Itana	30.76*	61.0	171a	40.8	12.5a	1.3	2.3
ID 5012	Sonora 37/Cln//2*Tendoy	30.51*	60.0	168a	30.5a	.5	.0	.0
MT 6535	Rego/Cnn 39-7-4	30.36*	60.5	171a	44.8a	8.8a	.0	.0
ID 0010	Cnn/Utah 175A-53	30.36*	61.5	170a	39.0	1.0	.3	1.8
UT 697010	IT/DM//TD/UT 225-15-6	27.26*	60.0	172a	43.0a	10.0	.0	.0
UT 755029	DM/178383//Columbia	26.53*	62.0	168a	36.0	.0	.5	2.5
	$\bar{x}$	36.6	59.2	169.3	39.8	4.3	.1	.3
	F-value for variety comparison	1.74*	0.0	11.01*	8.21*	3.44*	1.0	1.1
	S.E.$\bar{x}$	4.57	0.0	.70	1.65	2.47	.25	.65
	L.S.D. (.05)	12.82	0.0	1.97	4.64	6.95	N.S.	N.S.
	C.V. %	12.49	0.0	.41	4.15	57.65	277.54	225.50

1/ January 1 to heading
2/ Check variety
* Varieties yielding significantly lower in yield than the check (.05)
a Values significantly different from the check

Table 4. Agronomic data from the Western Regional White Winter Wheat nursery grown on the Northwestern Agricultural Research Center, Kalispell, Montana in 1971. Experimental Design - random block, four replications.

Planting date: September 21, 1970 Harvest date: August 17, 1971 Size of plot: 16 sq. ft.

C.I. or State #	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Heading[1] Date	Plant Height	Lodging Prev %	Lodging Sev 0-9	Dwarf Smut	Stripe Rust Sev. %	Stripe Rust Type 0-9
14564	Nord Desprez/2*Sel.101	113.06	59.5	163	35.5	24.8	.3	2.5	.0	.0
14565	Nord Desprex/2*Sel. 101	111.91	59.5	161a	37.8	99.0a	1.0	2.5	.3	.5
WA 5828	PI 178383*2//Omar/1834	106.89	60.5	162a	35.3	.0	.0	6.5	1.8	2.5
WA 5829	S.Helvia//Suwon 92/3645	104.48	60.0	163	36.5	49.5a	.5	7.5	.3	1.0
14586	Luke	103.11	59.5	168a	39.5a	89.3a	2.8a	.3	.0	.0
13968	Nugaines[2]	102.83	61.0	164	36.3	.0	.0	5.0	2.8	1.5
14485	Suwon 92/4*Omar	101.21	60.5	165	43.0	57.0	3.5a	7.5	.0	.0
14483	Suwon 92/4*Burt	100.43	61.5	160a	35.8	.0	.0	4.0	.3	.3
ID 5013	Gaines*2/Swedish Type	99.53	58.5	165	37.3	.0	.0	1.8	.0	.0
WA 5827	C 59287//(Omar/1834-3)	98.98	57.0	168a	37.8	64.8a	4.3a	.0	.0	.0
WA 5826	Om/1834-3//178383/13431	98.46	57.9	170a	39.0a	1.3	.8	.0a	.0	.0
14563	Yamhill	97.86	59.4	169a	44.5a	74.3a	.8	11.3a	.0	.0
OR 6739	178383/2*Omar//13438	97.61	60.5	161a	39.8a	49.5a	.8	3.8	.0	.0
OR 6857	27-15//Rio/Rex/3/Eg/4/Mo	93.33	61.5	168	45.3a	86.8a	2.3a	.0a	.0	.0
12385	Brevor	80.93	61.0	164	47.8a	86.8a	6.5a	2.5	30.0	2.3
12696	Burt	80.28	62.0	161a	47.0a	99.0a	1.8	10.0a	10.0	2.3
OR 6882	Oam/3/178383/2*Omar//101	74.30	60.0	167	51.0a	81.8a	8.0a	.0a	.0	.0
11755	Elgin	72.95	61.0	168a	49.5a	84.3a	7.5a	11.3a	57.5a	9.0a
13072	Omar	72.22	59.5	168a	50.0a	99.0a	8.5a	2.8	32.5a	6.5a
13740	Moro	68.32	57.0	168a	47.8a	99.0a	9.0a	.0a	.0	.0
WA 5572	Omar Mutant 642026-197	62.97	60.0	167	45.8a	99.0a	7.3a	.3a	1.5	.8
1442	Kharkof	62.10	60.5	162	51.5a	99.0a	8.3a	12.5a	.0	.0
10063	Golden	61.85	57.5	167	50.5a	99.0a	8.8a	3.8	31.3a	9.0a
5408	Triplet	59.79	61.0	161a	49.3a	99.0a	8.3a	12.5a	18.5a	9.0a
WA 5353	Omar Mutant	59.67	60.5	168a	47.5a	47.5a	6.3a	6.3a	1.3	1.5
	$\bar{x}$	87.4	59.5	169.9	43.2	63.6	3.9	4.6	7.5	1.8
	F-Value for variety comparison	20.60*	0.0	11.11*	46.19*	8.51*	18.41*	6.49*	6.91*	18.63*
	S.E.$\bar{x}$	4.00	0.0	.92	.85	13.07	.82	1.67	5.64	.71
	L.S.D. (.05)	11.28	0.0	2.60	2.40	36.86	2.30	4.72	15.92	1.99
	C.V. %	4.58	0.0	.56	1.97	20.56	21.10	36.61	75.15	38.41

1/ Days from January 1 2/ Check variety a/ Values significantly different than the check (.05)

* Varieties yielding significantly less than the check (.05)

Table 5. Summary of uniform white winter wheat nursery grown at the Northwestern Agricultural Research Center, Kalispell, Montana from 1962 - 1971.

C.I. or State #	Variety	1962	1963	1964	1966	1967	1968	1969	1970	1971	Sta. Yrs.	$\bar{x}$	% Omar
13072	Omar	60.2	36.0	51.2	58.7	51.4	73.9	71.0	75.0	72.2	9	61.1	100
12385	Brevor	68.5	61.7	67.7	71.0	60.0	87.9	68.4	75.8	80.9	9	71.3	117
10063	Golden	50.6	43.5	42.3	55.0	46.3	70.4	67.2	64.2	61.9	9	55.7	91
12696	Burt	60.0	58.7	54.6	62.2	46.0	86.5	66.0	71.6	80.3	9	65.1	107
1442	Kharkof	48.8	50.1	49.2	52.1	47.4	58.5	58.9	56.4	62.1	9	53.7	87
5408	Triplet	50.2	49.8	51.1	59.5	47.4	71.3	57.2	63.6	59.8	9	56.6	93
11755	Elgin	59.3	41.6	57.3	52.3	49.6	80.5	51.2	74.1	73.0	9	59.9	98
13740	Moro			50.1	85.9	57.2	86.3	65.7	75.4	68.3	7	69.8	108
13968	Nugaines				79.7	58.7	85.8	63.2	77.6	102.8	6	78.0	116
14485	Suwon92/4*Omar (Paha)						98.1	65.4	87.0	101.2	4	87.9	120
14564	Nord Desprez/2*Sel. 101						90.1	62.7	87.3	113.1	4	88.3	121
14483	Suwon 92/4*Burt						84.5	55.4	73.1	100.4	4	78.4	107
14563	Heines VII/Redmond(Yamhill)							69.6	78.4	97.9	3	82.0	112
OR 6739	178383/2*Omar//13438							63.3	80.7	97.6	3	80.5	111
14586	(59287/101 (Luke)								93.1	103.1	2	98.1	133
14565	Nord Desprez/2*Sel. 101								88.8	111.9	2	100.4	136
OR 6857	27-15//Rio/Rex/3/EA/4/Moro								74.7	93.3	2	84.0	114
Or 6882	Omar Mutant/3/178383/2*Omer//101								67.4	74.3	2	70.9	96
WA 5572	Omar Mutant 642026-197								64.9	63.0	2	64.0	87

Table 6. Agronomic data from off station winter wheat nursery grown in Missoula County on the Al Goodan farm, Missoula, Montana, in 1971. Experimental design - random block, four replications.

Planting date: September 22, 1970
Harvest date: August 11, 1971
Size of plot: 16 sq. ft.

C.I. or State No.	Variety	Yield Bu/A	Plant Height	Lodging Prev. %	Lodging Sev. 0-9	Stand %
13880	Crest 1/	27.76	22.0	45.0	2.8	91.3
14586	Luke	27.28	23.3	11.3a	.5a	83.8
13740	Moro	25.48	25.0	13.8	.5a	90.0
MT 6829	Burt/PI 178383 101-1200	24.06	23.0	25.0	1.5a	88.5
13072	Omar	23.93	25.3	32.5	1.5a	88.5
13842	McCall	23.71	25.8a	18.8	.8a	86.0
MT 6827	Burt/PI 178383 14-1202	23.56	24.8	43.8	1.0a	80.0
MT 6826	Burt/PI 178383 4-1192	22.68	25.5	80.0a	1.8	73.8
8885	Cheyenne	21.66	25.8	60.0	2.3	92.5
MT 6828	Burt/PI 178383 13-1201	21.61	22.8	18.8	1.8	87.5
13968	Nugaines	21.26	20.0	32.5	.5a	81.3
13442	Delmar	20.41	29.0a	1.5	.8a	87.3
12930	Westmont	19.41	22.5	42.5	1.3a	93.8
UT 646001	Delmar/Columbia	19.11	25.8a	65.0	2.0	88.8
13670	Winalta	18.98	25.8a	50.0	2.3	86.3
13844	Wanser	18.96	24.5	16.3	1.3a	82.5

1/ Check variety
a Values significantly different from the check

$\bar{x}$	22.5	24.4	34.8	1.4	86.3
F-value for variety comparison	1.14*	2.98*	3.61*	3.71*	.84
S.E.$\bar{x}$	2.65	1.21	11.48	.36	5.60
L.S.D. (.05)	N.S.	3.45	32.69	1.04	N.S.
C.V. %	11.78	4.97	33.0	26.16	6.48

Table 7. Agronomic data from off station winter wheat nursery grown in Ravalli County on the L. B. McFadgen farm, Stevensville, Montana, in 1971. Experimental design - random block, four replications.

Planting date: September 23, 1970
Harvest date: August 11, 1971
Size of plot: 16 sq. ft.

C. I. or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height	Stand %
8885	Cheyenne	41.34	62.0	31.3	97.0
13072	Omar	40.96	59.0	31.8a	92.3
13844	Wanser	38.29	62.0	32.5a	95.0
13842	McCall	37.36	62.5	31.0	92.3
13968	Nugaines	35.74	60.5	24.5a	91.3
13880	Crest 1/	35.51	65.0	28.3	93.8
MT 6827	Burt/PI 178383 14-1202	35.29	56.0	29.5	90.0
13740	Moro	35.21	59.0	32.0a	92.3
MT 6829	Burt/PI 178383 101-1200	33.51	59.0	30.3	93.8
14586	Luke	33.44	59.5	24.3a	92.3
MT 6826	Burt/PI 178383 4-1192	32.59	59.0	30.3	88.8
12930	Westmont	32.31	62.0	29.3	94.8
MT 6828	Burt/PI 178383 13-1201	32.16	58.0	29.5	92.5
13442	Delmar	31.99	61.0	32.8a	94.8
13670	Winalta	31.04	61.5	34.3a	94.8
UT 646001	Delmar/Columbia	30.08	62.0	31.0	84.8

1/ Check variety
a Values significantly different from the check

$\bar{x}$	34.8	60.5	30.1	92.5
F-value for variety comparison	2.37*	0.0	5.94*	1.07
S.E.$\bar{x}$	2.17	0.0	1.11	2.82
L.S.D. (.05)	6.18	0.0	3.16	N.S.
C.V. %	6.24	0.0	3.68	3.05

Table 8. Agronomic data from off station winter wheat nursery grown in Lake County on the William Hughes farm, Ronan, Montana, in 1971. Experimental design - random block, four replications.

Planting date: September 23, 1970
Harvest date: August 12, 1971
Size of Plot: 16 sq. ft.

C.I. or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height	Lodging Prev. %	Lodging Sev. 0-9
MT 6829	Burt/PI 178383 101-1200	69.70	61.0	39.5	60.0	3.0a
13968	Nugaines	68.90	62.0	32.0a	0.0a	0.0a
13740	Moro	68.35	59.5	40.3	28.8a	4.3a
13072	Omar	68.10	62.0	43.0	2.8a	1.0a
13842	McCall	66.60	61.5	41.0	7.8a	1.5a
MT 6827	Burt/PI 178383 14-1202	65.77	59.5	40.3	70.8	2.5a
MT 6828	Burt/PI 178383 13-1201	64.25	60.5	39.3	61.0	4.0a
14586	Luke	64.15	59.0	30.0	50.0a	1.0a
13880	Crest 1/	62.95	61.0	38.5	88.3	6.5
MT 6826	Burt/PI 178383 4-1192	61.42	60.5	36.3	75.0	4.3a
13844	Wanser	61.30	61.0	41.5	32.3a	2.8a
UT 646001	Delmar/Columbia	59.22	63.0	43.0	80.0	3.0a
8885	Cheyenne	56.84	62.0	45.3	66.3	3.8a
12930	Westmont	54.59	61.5	38.0	46.3a	4.3a
13670	Winalta	52.92	63.0	45.0a	92.0	2.8a
13442	Delmar	49.87	61.0	40.5	19.3a	1.8a
	$\bar{x}$	62.2	61.1	39.6	48.8	2.9
	F-value for variety comparison	1.17	0.0	5.99*	5.61*	7.25*
	S.E.$\bar{x}$	5.59	0.0	1.69	12.85	.60
	L.S.D. (.05)	N.S.	0.0	4.81	36.60	1.72
	C.V.%	8.99	0.0	4.27	26.35	20.84

1/ Check variety
a Values significantly different from the check

Table 9. Yield summeries of winter wheat varieties grown in Western Montana in 1970-71.

McFADGEN STEVI

C.I.or State #	Variety	Yield bu/a Locations by counties Lake	Missoula	Ravalli	$\bar{x}$	Rank
CI 8885	Cheyenne	56.8	21.7	41.3	39.9	5
CI 13072	Omar	68.1	23.9	41.0	44.3	1w 1/
CI 13844	Wanser	61.3	19.0	38.3	39.5	6
CI 13842	McCall	66.6	23.7	37.4	42.6	1
CI 13968	Nugaines	68.9	21.3	35.7	42.0	3w
CI 13880	Crest	63.0	27.8	35.5	42.1	3
MT 6827	Burt/PI178383 14-1202	65.8	23.6	35.3	41.6	4
CI 13740	Moro	68.4	25.5	35.2	43.0	2w
MT 6829	Burt/PI178383 101-1200	69.7	24.1	33.5	42.4	2
CI 14586	Luke	64.2	27.3	33.4	41.6	4w
MT 6826	Burt/PI178383 4-1192	61.4	22.7	32.6	38.9	8
CI 12930	Westmont	54.6	19.4	32.3	35.4	10
MT 6828	Burt/PI178383 13-1201	64.3	21.6	32.2	39.4	7
CI 13442	Delmar	49.9	20.4	32.0	34.1	12
CI 13670	Winalta	52.9	19.0	31.0	34.3	11
UT646001	Delmar/Columbia	59.2	19.1	30.1	36.1	9

1/ w = white wheat ranking

$\bar{x}$	62.2	22.5	34.8
F value for variety comparison	1.17	1.14	2.37*
S.E. $\bar{x}$	5.59	2.65	2.17
L.S.D. (.05)	N.S.	N.S.	6.18
C.V. %	8.99	11.78	6.24

TITLE: Spring Wheat

PROJECT: Small Grains Investigations MS 756

YEAR: 1971

PERSONNEL: Leader - Vern R. Stewart
Cooperator - F. H. McNeal and M. A. Berg

LOCATION: Northwestern Agricultural Research Center - Field No. Y-1.
Off station locations as listed in the manuscript.

DURATION: Indefinite

OBJECTIVES:

1. To determine the adaptability of new introduced spring wheat varieties and selections by comparisons with recommended varieties.
2. Study the semi-dwarf strains of spring wheat for use under irrigated conditions.
3. To aid in basic genetics research in spring wheat and the overall breeding program.

SIGNIFICANT FINDINGS:

1. Semi-dwarf types are the higher yielding entries generally and have good to excellent straw strength.
2. ID 0044 and ID 0046, head 10 days earlier than Twin and were significantly higher in yield.
3. Fungicide treatments of seed did not affect yield of spring wheat.
4. Captam, Vatavax and Maneb reduced the severity of stripe rust significantly, however this needs further evaluation.

FUTURE PLANS: To continue to evaluate spring wheat varieties. To aid in the total breeding program in Montana. To study semi-dwarf strains of spring wheat for irrigated conditions.

MATERIALS AND METHODS:

Standard nursery procedures were used in a variety testing program. Nurseries were grown in four row plots, four replications. A randomized block design was used for all nurseries. All station nurseries this season were located in Field No. Y-1 at the Northwestern Agricultural Research Center. Yield nurseries grown were: Advanced Yield Nursery, containing 32 entries; and the Western Regional White Spring Wheat Nursery, containing 21 entries.

One off station yield nursery was grown in Lake County and contained 6 entries.

Two fungicide nurseries were planted in the spring of 1971. One was located on the research center, the other in Lake County. These nurseries contained three varieties, four chemicals for seed treatment and an untreated check. Plant counts

were made just following emergence by Dr. Mathre. Twelve feet of row from each plot was counted. Additional agronomic data secured from the studies, depending on location were; yield, bushel weight, heading date and disease readings. A factoral analysis of the various types of data was done by the computing laboratory at Bozeman.

All studies were harvested with a small power harvester and threshed with a nursery type thresher (Vogel).

Advanced Yield Nursery

Twelve entries in this years nursery were significantly higher in yield than Sheridan, the variety used as the check. Eleven of these were of the semi-dwarf type. Lodging resistance was excellent in most of the semi-dwarf's except Pitic 62 and Era which are quite susceptible to lodging. Cargills Bounty and World Seeds selections have earliness in their favor. Bounty's straw maybe somewhat weak, but not serious. I would suggest further evaluation of MT 7042, WO 1651, Bonanza, WO 1616, MT 6830, Bounty and FB 406, based on date of heading and other agronomic characteristics. The performance of Shortana was somewhat disappointing this season. Stripe rust was quite heavy in this entry and in our larger field plots this season. Table 1, gives complete data of this nursery.

Table 2, contains a ten year summary of spring wheat varieties grown in the Advanced Yield Nursery. Thatcher is the long time check (100%). Sheridan has been dropping below Thatcher in the last few years, because of a degree of susceptibility to stripe rust and a very weak straw under the rather high fertile conditions the nurseries are grown. Shortana is 114% of Thatcher, however in 1971 Thatcher was 2 bushels higher in yield. This can no doubt be attributed to the stripe rust that occurred on Shortana. Most of the new entries of the semi-dwarf lines are far superior in yield to Thatcher over a 1 to 3 year period.

Western Regional White Wheat Nursery

This nursery was changed considerably in 1971, when many of the long time checks were dropped as entries. The only long time check left in the nursery is Federation which is super susceptible to stripe rust and lodging.

Twin is used as a check in this nursery and only two entries were significantly higher in yield, namely ID 0044 and ID 0046. These two entries head ten days earlier than Twin which could be an advantage, however ID 0044 has a somewhat weak straw and somewhat susceptible to stripe rust. The following entries should have more evaluation because of potential use in Western Montana, ID 0046, Fremont, ID 0042, OR 6713 and ID 0035.

Test weights were low in this nursery because of a heavy rain prior to harvest. The material was harvested, bundled, but could have been dryer when it was threshed and weighed for yield. However, the variety Twin has always had a low test weight in our plots.

In Table 4, is found a ten year summary of varieties grown in the Western Regional Spring Wheat Nursery. Action by the Western Wheat Improvement group in February 1971 resulted in the removal of many of the historic checks, leaving only Federation as a long time check. Only Twin has been in four years, all other en-

tries are one to three years. It is difficult to make any judgements from this table, as to the preformance of any one variety in relationship to Twin.

Off Station

This nursery was grown under very good dryland conditions. Yields were above average for the area with a mean of 42.5 bu/a. Twin (soft white) was the highest yielding entry, followed by Era (hard red). These two entries were significantly higher in yield than Sheridan which was used as a check. Table 5.

FUNGICIDE STUDIES:

Research Center

Yield difference between varieties was found to be highly significant, but there were no significant difference in yield because of the fungicide used. It should be noted however, that a difference of 3.6 bu/a was recorded between the check and Ceresan. Vatavax reduced yields below the check, which has been noted in previous work. Thatcher is the highest yielding entry, and is probably due to the rather high level of stripe rust found in Shortana this season.

Bushel weights were not analyzed statistically. A tabulation of these data did not indicate significant difference in test weight as a result of fungicide or because of the variety.

Varieties were found to be significantly different in heading date. Thatcher being the earliest and little or no difference between Shortana and Sheridan. Fungicide treatments had no effect on heading date.

Plant counts made following emergence were found to be significantly different because of variety with Shortana having the most plants per 12 feet of row. This difference probably exsists because of the seed size of Shortana, which is smaller than either Sheridan or Thatcher.

Stripe rust readings were made on an arbitrary scale. Type,on a scale of 0-9 and severity based on the amount of the leaf covered by spores. Varieties were found to differ in type and severity. Sheridan had the highest reading for severity with a 5.25 reading for type, moderately resistant. Fungicide treatment did not significantly affect the type of stripe rust infection, there were significant differences in severity of infection (number of spores on leaf surface). Vatavax, Maneb and Captam treatments resulted in lower severity readings than the check and the Ceresan treatment which had the highest severity reading. Table 6.

Lake County

This location was in an area with light soil, but rain fall was fair which resulted in above average yields for spring wheat in this location.

Varieties were found to be significantly different statistically. Shortana is the high yielding entry and Thatcher the lowest. This is just the opposite of the study on the research center. Yields because of fungicide treatment were not significantly different, however the check (no treatment) did result in the highest yield.

Plant counts were found to be significantly different between varieties with Shortana having the highest number, which was also true at the research center location. The fungicide treatment did not result in statistical significance however, in plant counts the highest was obtained in the check (no treatment). This was also true in the study located at the research center.

In summary it can be said variety differences were significant as was expected. Some fungicide treatments resulted in a significant difference in the severity of stripe rust with Vatavax, Maneb and Captam reducing the severity. Not significant, but yield reductions were noted in the Vatavax treatment at the Kalispell location (research center)

Plant counts were highest in the check plots in both locations. Looking at these data one would question the value of seed treatment for spring wheat when these varieties are used, as it related to yield.

Table 1. Agronomic data from the advanced yield nursery grown at the Northwestern Agricultural Research Center Route 4, Kalispell, Montana in 1971. Experimental design - random block. Four replications.

Planting date: May 3, 1971 Harvest date: September 6, 1971 Size of plot: 16 sq. ft.

C.I. or State #	Variety	Yield Bu/A	Test Wt Lbs/Bu	Heading Date	Plant Height	Sheaf Wt Grams	Lodging Prev.	Lodging Sev.	Stripe Rust Prev %	Stripe Rust Type	Straw/Grn Ratio	Straw Weight
CI 13927	Pitic 62	91.66*	55.5	195.00a	39.75b	2684.00a	99.00	8.25a	20.00b	6.25	.52	1767.75
MT 7042	Si/3/Nrn10/Bvr14//5*Cnt	90.78*	59.5	190.50	37.75b	2324.75	24.75b	.25b	38.75	3.75b	.64a	1417.25
CI 13986	Era	90.00*	57.1	193.25a	37.75b	2239.50	80.50	5.75	13.75b	3.00b	.68a	1339.75b
WO 1651	World Seeds 1651	89.53*	59.0	185.75b	35.25b	2353.00	24.75b	1.75b	1.75b	1.00b	.61a	1458.00
CI 14077	Bonanza	86.08*	59.0	189.25b	35.25b	2211.50	31.00b	1.00b	.75b	.75b	.64a	1351.00b
WO 1616	World Seeds 1616	85.85*	60.4	185.25b	36.50b	2211.50	6.25b	2.00b	2.00b	2.00b	.63a	1353.25b
MT 6830	Si/3/Nrn10/Bvr14//5*Cnt	84.95*	57.2	189.75	38.50b	2154.50	49.50b	1.00b	15.25b	3.50b	.65a	1305.25b
CG 208	Cargill,S Bounty 208	84.23*	58.0	186.00b	38.25b	2183.25	43.50b	6.75	5.75b	1.25b	.63a	1341.25b
WO 1809	World Seeds 1809	83.78*	57.1	184.00b	33.00b	2069.50b	.00	.00b	13.25b	2.25b	.68a	1232.00b
MT 705	Swiss61Z69116/Cnt	83.58*	59.5	191.50	53.00	2438.00	99.00	2.75b	1.00b	2.00b	.52	1602.50
FB 406	Funk Brother,S W-406	83.00*	57.5	186.00b	31.00b	2041.00b	5.00b	1.25b	.75b	.75b	.68a	1211.25b
CI 14587	Peak - ID0018	82.93*	58.1	187.00b	39.50b	2239.50	96.75	.75b	22.50b	6.00	.59a	1410.50b
MT 6868	B52-91/3/N10/B14//4*Cnt	81.45	55.1	189.25	37.25b	2268.25	.00	.00b	5.25b	2.00b	.56a	1454.00b
CI 13985	Fletcher	80.50	53.2	193.75a	36.25b	2126.25	55.75b	2.00b	8.75b	3.25b	.62a	1321.50b
MT 6903	Si/3/Nrn10/Bvr14//5*Cnt	78.53	58.4	189.50	39.50b	2069.75b	24.75b	.25b	29.00	4.25b	.61a	1284.75b
MT 6839	Ftr/3/Nrn10/Bvr14//5*Cnt	78.35	53.8	194.00a	43.00b	2296.25	99.00	2.50b	30.00	5.50	.52	1513.00
DK 8	Dekalb,S SB8	78.03	59.9	187.00b	37.25b	2211.25	.00	.00b	4.00b	2.25b	.55a	1431.25
CI 13596	Fortuna	76.75	60.2	189.50	47.00b	2211.25	99.00	5.00	17.50b	3.25b	.53	1444.00
MT 6901	Ceres/3/N10/Bvr14//4*Cnt	76.70	51.0	191.50	40.75b	2126.00	74.25	2.75b	35.00	4.25b	.58a	1359.25b
WO 1812	World Seeds 1812	76.00	59.5	186.00b	32.50b	1871.00b	99.00	1.00b	2.00b	1.50b	.68a	1111.25b
FB 408	Funk Brother,S W-408	73.37	57.3	185.00b	31.00b	1927.75b	.00	.00b	5.25b	3.00b	.63a	1194.25b
CI 13586	Sheridan 1/	73.30	60.9	190.25	55.25	2324.75	96.75	5.75	40.00	6.75	.46	1592.00
CI 10003	Thatcher	72.55	57.0	189.25	48.75b	2126.25	99.00	4.75	6.50b	2.00b	.53	1401.00
ND 6579	Fta/61-107,S6579	71.80	58.0	187.75b	42.25b	2069.50b	99.00	1.00b	45.00	6.50	.53	1351.75b
CI 12974	Centana	71.12	59.0	194.25a	52.00b	2268.00	99.00	4.00	63.75a	6.75	.46	1557.00
CI 15233	Shortana	70.57	57.0	193.25a	38.50b	2182.75	74.25	.75b	57.50a	5.50	.48	1477.25
CI 13773	Polk	68.95	60.1	191.50	51.75b	2239.50	95.50	5.00	.75b	2.00b	.45	1550.25
CI 13775	Manitou, R.L. 4159	67.07	58.0	189.00	49.25b	2041.25b	86.75	2.00b	4.25b	2.25b	.49	1370.75b
CI 13333	Wells	66.77	59.0	192.00a	53.75	2126.25	86.75	5.50	50.00	6.25	.46	1458.75
CI 13958	Waldron	66.60	57.5	187.00b	45.25b	2183.00	.00	.00b	5.25b	2.00b	.44	1517.25
CI 13768	Leeds	61.37	60.6	190.00	52.75	2268.00	99.00	1.75b	30.00	6.50	.37b	1654.50
MT 6905	B59-3/Sheridan	55.64	54.1	189.75	42.25b	1899.25b	99.00	3.00b	80.00a	6.75	.41	1343.00b

1/ Check Variety

a/ Values significantly more than the check

* Varieties yielding significantly more than the check

b/ Values significantly less than the check

Table 1 . (Con't.)

	Yield Bu/A	Test Wt Lbs/Bu	Heading Date	Plant Height	Sheaf Wt Grams	Lodging Prev.	Lodging Sev.	Stripe Rust Prev.%	Stripe Rust Type	Straw/Grn Ratio	Straw Weight
$\bar{x}$	77.6	57.7	189.5	41.6	2187.1	60.8	2.5	20.5	3.6	.60	1411.8
F - Value for variety comparison	6.67**	0.0	34.96**	56.16**	3.09**	8.36**	8.05**	15.23**	11.21**	7.43**	3.84**
S.E. $\bar{x}$	3.42	0.0	.51	.95	89.48	13.93	.80	5.43	.61	.03	71.20
L.S.D. (.05)	9.59	0.0	1.43	2.67	250.81	39.05	2.25	15.23	1.71	.09	199.57
C. V. %	4.41	0.0	.27	2.29	4.09	22.90	32.77	26.54	16.97	5.80	5.04

Table 2. Summary of dryland, hard red spring wheat yields for the Advanced Yield Nursery grown at the Northwestern Agricultural Research Center, Route 4, Kalispell, Montana 1962-71.

C.I. or State #	Variety	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	Ave.	Sta. Yrs.	% of Thatcher
CI 10003	Thatcher	49.7	34.7	46.7	65.4	62.2	60.6	63.4	69.5	55.5	72.5	58.0	10	100.0
CI 13333	Wells	52.6	33.7	57.1	58.4	67.9	62.8	63.1	64.8	53.7	66.8	58.1	10	100.1
CI 13586	Sheridan	59.4	36.9	50.6	76.8	50.9	54.5	54.4	71.7	45.7	73.3	57.4	10	99.0
CI 12974	Centana	59.1	34.3	47.8	61.1	50.4	54.5	66.1	61.9	52.8	71.1	55.9	10	96.4
CI 13775	Manitou, R.L.			50.8	62.2	67.5	57.5	57.6	70.7	66.9	67.1	62.5	8	100.9
CI 13596	Fortuna			62.9		66.2	56.4	74.7	88.9	41.9	76.8	66.8	7	108.7
CI 13768	Leeds					55.8	58.1	58.2	49.4	64.0	61.4	57.8	6	90.4
CI 13773	Polk					51.4	52.3	57.2	64.3	50.2	68.9	57.4	6	89.7
CI 15233	Shortana							71.8	71.9	80.2	70.6	73.6	4	112.9
CI 13958	Waldron								62.0	67.1	66.6	65.2	3	99.1
ND 6579	Fta/61-107,S								90.9	71.3	71.8	78.0	3	118.5
MT 6839	Ftr/3/Nrn10/								80.9	80.3	78.4	79.9	3	121.3
MT 6830	Si/3/Nrn10/B								87.0	74.0	85.0	82.0	3	124.6
CI 13986	Era								93.1	82.2	90.0	88.4	3	134.3
CI 13927	Pitic 62								101.1	82.5	91.7	91.8	3	139.4
MT 6903	Si/3/Nrn10/B									87.7	78.5	83.1	2	129.8
MT 6868	B52-91/3/N10									84.1	81.5	82.8	2	129.4
CI 13985	Fletcher									78.0	80.5	79.3	2	123.8
MT 6901	Ceres/3/N10/									75.5	76.7	76.1	2	118.9
CI 14077	Bonanza									79.7	86.1	82.9	2	130.0
WO 1809	World Seeds									60.6	83.8	72.2	2	112.8
WO 1812	World Seeds									65.9	76.0	70.9	2	110.9
DK 8	Dekalb,S SB8									77.2	78.0	77.6	2	121.7
MT 6905	B59-3/Sherid									66.2	55.6	60.9	2	95.2
MT 7042	Si/3/Nrn10/B										90.8	90.8	1	125.2
WO 1651	World Seeds										89.5	89.5	1	123.4
WO 1616	World Seeds										85.9	85.9	1	118.5
CG 208	Cargill,S BO										84.2	84.2	1	116.1
MT 705	Swiss61z6911										83.6	83.6	1	115.3
FB 406	Funk Brother										83.0	83.0	1	114.5
CI 14587	Peak									85.7	82.9	80.3	2	131.7
FB 408	Funk Brother										73.4	73.4	1	101.2

Table 3. Agronomic data from the Western Regional Spring Wheat nursery grown at the Northwestern Agricultural Research Center in 1971. Experimental design, random block, four replications.

Planting date: May 3, 1971 Harvest date: September 8, 1971 Size of plot: 16 sq. ft.

C. I or State #	Variety	Yield Bu/A	Test Wt Lbs/Bu	Heading Date[1/]	Plant Height	Stripe Rust Sev.	Stripe Rust Type	Lodging Prev.	Lodging Sev.
ID 0044	Aberdeen 6535S-128-6-1	106.01*	56.4	186.00b	40.00	5.50	7.00a	99.00	6.75
ID 0046	Yt54A*4//N10/B/3/A63166S	99.01*	55.5	185.25b	36.00b	2.00	3.00	44.75	3.50
MN 206248	Era SIB 1	89.50	57.6	193.00	38.75	6.50	3.00	99.00	6.00
ID 0045	Aberdeen 6535S-128-7-1	89.43	55.0	195.50	40.00	16.25a	6.00a	99.00	7.25
ID 0043	58/TC//TC/KF/3/FTN/3*TC	89.23	58.0	185.75b	35.00b	3.00b	3.00	49.50	2.25
WA 5652	Henry/Burt, Sel. 65-2	83.03	58.0	194.50	51.25a	36.25a	2.00	99.00	3.00
CA 6907	Opal[2/]	82.78	54.5	197.25	48.50a	1.00	2.00	49.50	.50b
CI 14588	Twin[2/]	82.63	56.0	195.25	38.50	2.00	2.75	57.25	4.75
CI 14056	Fremont - UT256006	80.63	59.0	187.75b	37.50	3.00	1.75	49.50	.50b
ID 5022	IDD/178383//3*LMH/3/Lm66	79.88	54.4	194.00	53.75a	11.25	7.50a	99.00	5.75
CI 14587	Tzpf/Sonora 64	79.80	56.0	188.00b	40.25	16.25a	3.25	99.00	2.50
OR 672	Idaed x Burt, 19-1	79.70	58.6	188.25b	42.00a	1.00	3.00	24.75	.25b
ID 0043	58/TC//TC/KF/3/FTN/3*TC	79.45	56.0	187.50b	36.50b	2.00	1.00	99.00	2.75
WA 5866	1750/TST//PI 187383	76.75	56.9	192.50	52.25a	.75	.75b	99.00	7.00
WA 5651	Marfed Mutant 6278	74.35	59.5	196.00	49.25a	28.75a	4.25	99.00	5.00
OR 6713	Idaed/Burt//Idaed 59	73.75	59.5	188.00b	44.75a	7.50	2.50	99.00	1.00
WA 5658	Marfed Mutant X6135-1	73.42	59.5	196.00	51.00a	35.00a	5.50a	99.00	6.00
MN 206264	Era Sib 2	72.17	54.9	192.75	36.50b	3.25	3.00	76.75	2.75
ID 0035	Tzpp/Sonora 64	70.90	58.9	188.25b	37.50	1.00	3.00	49.50	.75b
WA 5488	K337/AO//Koelz7941S66-9	65.77	56.5	191.75	51.50a	2.00	1.75	99.00	7.00
CI 4734	Federation	51.32	53.9	197.00	50.25a	99.00a	9.00a	99.00	4.75
$\bar{x}$		80.0	56.9	191.4	43.4	13.5	3.6	80.4	3.8
F value for variety comparison		9.23**	0.0	3.96**	101.21**	40.62**	37.74**	2.70**	6.22**
S.E. $\bar{x}$		3.77	0.0	2.05	.65	3.54	.36	15.66	.96
L.S.D. (.05)		10.66	0.0	5.19	1.83	10.01	1.01	44.28	2.73
C.V. %		4.71	0.0	1.07	1.49	26.24	10.08	19.47	25.25

1/ Days from January 1.
2/ Check variety
* Varieties yielding significantly more than the check (.05)
a/ Values significantly more than the check (.05)
b/ Values significantly less than the check (.05)

Table 4. Summary of regional spring wheat variety yields grown at Northwestern Agricultural Research Center, Route 4, Kalispell, Montana 1961-71.

C.I. or State #	Variety	1961	1962	1963	1964	1966	1967	1968	1969	1970	1971	Sta. Yrs.	% of Twin
4734	Federation	24.9	44.1	27.2	29.5	36.6	43.7	54.1	55.2	18.4	51.3	10	57
14588	Twin							71.9	95.5	64.3	82.6	4	100
OR 672	Idaed x Burt 19-1								82.0	57.1	79.7	3	90
WA 5488	K337/AO/Koelz7941S66-9								69.0	29.6	65.8	3	60
14587	Peak									70.4	79.8	2	102
ID 0035	Tzpp/Sonora 64									67.9	70.9	2	94
OR 6713	Idaed/Burt//Idd 59									64.9	73.8	2	94
CA 6907	Opal									59.4	82.8	2	97
WA 5652	Henry/Burt, Sel. 65-2									56.7	83.0	2	95
WA 5651	Marfed Mutant 6278									38.2	74.4	2	77
WA 5658	Marfed Mutant x 6135-1									33.3	73.4	2	73
ID 0044	Aberdeen 6535S-128-6-1										106.0	1	128
ID 0046	Yt54A*4/Nrn10//Bvr/3/A63166S										99.0	1	120
MN 206248	Era SIB 1										89.5	1	108
ID 0045	Aberdeen 6535S-128-7-1										89.4	1	108
ID 0043	No58/Tc//Tc/KF/3/Ftn/3*Tc										89.2	1	108
14056	Fremont										80.6	1	98
ID 5022	Idd/178383//3*Lmh/3/Lmh66										79.9	1	97
ID 0042	No58/Tc//Tc/KF/3/Ftn/3*Tc										79.5	1	96
WA 5866	1750/Tst//PI 178383										76.8	1	93
MN 206264	Era Sib 2										72.2	1	87

Table 5. Agronomic data from off station spring wheat nursery grown in Lake County on the George Synder farm, Pablo, Montana in 1971. Experimental design - random block, four replications.

Planting date: May 5, 1971
Harvest date: August 26, 1971
Size of plot: 16 sq. ft.

C.I. or State #	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height	Lodging Prev.	Lodging Sev.
14588	Twin - ID 0015	53.64*	58.5	29.75b	.00b	.00b
13986	Era	51.89*	61.5	28.75b	.00b	.00b
MT 6830	Si/3/Nrn10/Bvr14//5*Cnt	47.34	60.0	30.00b	.00b	.00b
MT 6834	Si/3/Nrn10/Bvr14//5*Cnt	45.39	60.2	32.25b	.00b	.00b
10003	Thatcher	43.76	59.7	38.50b	22.50b	.50b
13586	Sheridan 1/	42.99	60.2	42.75	99.00	2.25
WO 1809	World Seeds 1809	40.21	60.0	26.75b	.00b	.00b
13596	Fortuna	40.14	60.0	35.50b	41.25b	.50b
DK 1	Bonanza	40.11	60.5	29.25b	.00b	.00b
15233	Shortana	39.91	59.5	28.75b	.00b	.00b
DK 8	Dekalb,S SB8	39.71	61.0	30.25b	.00b	.00b
14056	Fremont - Ut256006	39.51	60.0	31.25b	.00b	.00b
13775	Manitou, R.L. 4159	35.96	59.5	36.25b	2.50b	.50b
CG 208	Cargill, S Bounty 208	34.59	62.0	25.75b	.00b	.00b

1/ Check variety
* Varieties yielding significantly more than check (.05)
a Values significantly more than the check (.05)
b Values significantly less than the check (.05)

$\bar{x}$	42.5	60.2	31.8	11.8	.3
F-value for variety comparison	4.74**	0.0	22.60**	10.60**	8.80**
S.E.$\bar{x}$	2.52	0.0	1.00	8.55	.20
L.S.D (.05)	7.18	0.0	2.86	23.34	.58
C.V.%	5.93	0.0	3.15	72.40	76.52

Table 6. Agronomic data from variety x fungicide nursery grown on the Northwestern Agricultural Research Center, Kalispell, Montana in 1971.

Planting date: May 3, 1971
Harvest date: September 8, 1971
Size of plot: 16 sq. ft.

Variety	Check	Ceresan	Vatavex	Maneb	Captan	Variety $\bar{x}$
			Yield Bu/A			
Thatcher	65.92	75.42	69.92	67.15	66.60	69.00
Sheridan	66.30	63.90	60.34	66.95	64.60	64.41
Shortana	59.54	63.30	52.94	65.17	61.75	60.54
Treatment $\bar{x}$	63.92	67.54	61.07	66.42	64.31	
			Test wt.-Lbs/bu			
Thatcher	56.90	57.10	56.50	56.80	56.50	56.76
Sheridan	58.40	57.50	54.50	58.10	57.80	57.26
Shortana	56.10	55.20	59.20	57.20	56.80	56.90
Treatment $\bar{x}$	57.13	56.60	56.73	57.37	57.03	
			Heading Date			
Thatcher	186.25	187.25	187.50	186.75	186.75	186.90
Sheridan	190.50	190.50	190.50	190.75	190.25	190.50
Shortana	191.25	191.00	191.00	191.00	191.25	191.10
Treatment $\bar{x}$	189.33	189.58	189.67	189.50	189.42	
			Plants/12 ft of row			
Thatcher	223.25	224.25	204.00	208.50	216.75	215.35
Sheridan	249.50	248.25	245.25	237.00	241.75	244.35
Shortana	273.25	252.50	243.00	248.00	265.00	256.35
Treatment $\bar{x}$	248.67	241.67	230.75	231.17	241.17	
			Stripe Rust-Severity			
Thatcher	2.00	3.00	2.00	1.00	2.00	2.00
Sheridan	17.50	21.25	10.00	12.50	13.75	15.00
Shortana	6.25	5.25	5.00	3.00	2.00	4.30
Treatment $\bar{x}$	8.58	9.83	5.67	5.50	5.92	
			Stripe Rust-Type			
Thatcher	2.00	2.00	2.00	2.00	2.25	2.05
Sheridan	5.75	5.25	4.75	5.00	5.50	5.25
Shortana	3.25	3.00	3.25	3.00	3.00	3.10
Treatment $\bar{x}$	3.67	3.42	3.34	3.34	3.58	

Table 6. (con't)

ANOVA for the variety x fungicide nursery grown on the Northwestern Agricultural Research Center.

		Yield		Heading Date		Stripe Rust Type	
Source	D.F.	Mean Square	F.	Mean Square	F.	Mean Square	F.
Replication	3	207.213	4.77	1.35556	5.13	1.51111	4.87
Variety	2	358.913	8.26**	103.200	389.43**	53.2167	171.68**
V x R	6	51.8898	1.19	.355556	1.34NS	1.26111	4.06**
Treatment	4	74.8333	1.72	.208333	.78NS	.275000	.89NS
R x T	12	75.5267	1.74	.119444	.45NS	.497222	1.60NS
V x T	8	51.0015	1.17	.470833	1.78NS	.237500	.77NS
Error	24	43.4443		.265278		.309722	
Total	59						

		Stripe Rust Severity		No. of Plants	
Replication	3	24.1111	2.34	1086.46	3.17
Variety	2	962.600	93.55**	8886.67	25.90**
V x R	6	36.2444	3.52**	111.378	.32NS
Treatment	4	47.0583	4.57**	702.517	2.05NS
R x T	12	11.6806	1.14NS	406.239	1.34NS
V x T	8	22.6208	2.20NS	171.667	.50NS
Error	24	10.2931		343.072	
Total	59				

Table 7. Agronomic data from variety x fungicide nursery grown in Lake County on the George Synder farm, Pablo, Montana in 1971.

Planting date: May 5, 1971
Harvest date: August 26, 1971
Size of Plot: 16 sq. ft.

Variety	Treatment					$\bar{x}$
	Check	Ceresan	Vatavax	Maneb	Captan	Variety $\bar{x}$
			Yield bu/A			
Shortana	45.01	42.11	44.46	36.81	39.14	41.51
Sheridan	40.44	42.09	41.54	38.71	39.24	40.40
Thatcher	38.24	38.24	34.29	38.61	36.81	36.46
Treatment $\bar{x}$	41.23	39.52	40.10	38.05	38.40	
			Plant/12 ft. of row			
Shortana	272.75	235.00	211.00	228.50	246.25	238.70
Sheridan	215.75	206.75	209.75	195.75	187.50	203.10
Thatcher	205.50	196.00	188.75	190.00	212.75	198.60
Treatment $\bar{x}$	231.33	212.58	203.17	204.75	215.50	
			Test Wt. lbs/bu			
Shortana	58.2	61.0	60.5	59.0	58.9	59.5
Sheridan	60.7	60.5	60.5	61.0	61.0	60.7
Thatcher	59.7	59.5	59.2	59.5	59.5	59.5
Treatment $\bar{x}$	59.5	60.3	60.1	59.8	59.8	59.9

ANOVA for plant number and yield in variety x fungicide study.

Source	D.F.	Plant Number		Yield	
		Mean Square	F.	Mean Square	F.
Replication	3	490.533	.50	77.6597	4.26
Varieties	2	9652.07	9.91**	140.740	7.71**
R x V	6	859.000	.88NS	4.73723	.26NS
Treatment	4	1518.61	1.56NS	20.0227	1.10NS
R x T	12	911.519	.94NS	11.8176	.65NS
V x T	8	761.671	.78NS	27.2216	1.49NS
Error	24	974.049		18.2518	
Total	59				

TITLE: Fertilizers on spring and winter annuals

PROJECT: Small Grains Investigations MS 756

YEAR: 1971

PERSONNEL: Vern R. Stewart

LOCATION: Rotation R-1 thru R-16. Northwestern Agricultural Research Center

MATERIALS AND METHOD:

All applications of fertilizers were made with field equipment. Seeding and harvesting was done with field equipment. Rates used are found in Table 1

RESULTS AND DISCUSSION:

Beginning in 1972 this rotation will be used for cropping sequence study. Thus in the future it will be reported under a special project. Spring crops were made part of the cropping sequence and a continuous cropping sequence in field R-7 was initiated in 1971.

Yields in 1971 were about average in the overall picture. Oats grown in R-13 were quite high (110 bu/a). This is the third small grain crop from this field. Yields in R-1a and R-2a are compared. R-1a was fertilized, yield was 63.1 bu/a, R-2a non-fertilized, yield was 44.3 bu/a. Part of that difference can be due to soil difference in these two fields.

Nugaines and Crest were fertilized at the same rate. (See Table 1, field R-3a and R-4a). Nugaines out yielded Crest by 23.9 bu/a. This we would expect with the average rainfall in 1970-71.

Protein levels are low in R-7a, as they were in R-7b in 1971. To date I do not have an explanation for this continued low protein level in this field. In all other cases where fertilizer was applied the protein levels were increased over the non-fertilized wheat in R-2a.

Table 1. Yield of spring and winter annuals grown in rotation R, Northwestern Agricultural Research Center, Kalispell, Montana 1971.

Field Number	Fertilizer Formulation	Rate #/A	Pounds/Acre N	P	K	S	Crop	Variety	Yield Bu/A	Protein
R-1a	16-20- 0	200	32.0	40	0	28	W Wheat	Crest	63.1	12.2
R-1b	27-14- 0	150	40.5	21	0	0	S Wheat	Sheridan	29.6	
R-1c	27-14- 0	150	40.5	21	0	0	S Wheat	Sheridan	29.6	
R-2a	0- 0- 0	0	0	0	0	0	W Wheat	Crest	44.3	9.3
R-2b	27-14- 0	150	40.5	21	0	0	S Barley	Piroline	76.4	
R-3a	16-20- 0	200	32.0	40	0	28	W Wheat	Nugaines	72.0	
	34- 0- 0	135	45.0	0	0	0				
R-4a	16-20- 0	200	32.0	40	0	28	W Wheat	Crest	48.1	12.1
	34- 0- 0	135	45.0	0	0	0				
R-4b	27-14- 0	150	40.5	21	0	0	S Barley	Piroline	67.2	
R-5c	16-20- 0	200	32.0	0	0	28	W Wheat	Crest	57.2	13.3
R-7a	16-20- 0	200	32.0	40	0	28	W Wheat	Delmar	42.0	10.0
R-7b	27-14- 0	150	40.5	21	0	0	S Wheat	Sheridan	30.1	
R-8a	16-20- 0	200	32.0	40	0	28	W Wheat	Delmar	41.1	
R-13	16-20-0	200	32.0	40	0	28	S Oats	Cayuse	110.0	
R-14							S Barley	Ingrid	79.0	
R-15	17-17-17		74	84	34	35	W Wheat	Nugaines	52.7	
R-16	17-17-17	200	34	34	34	0	W Barley	Alpine	60.1	

"NOT FOR PUBLICATION"

TITLE: Potato Evaluation

PROJECT: Potato Investigations MS 757

PERSONNEL: Leader - A. J. Jarvi
Cooperator - J. W. Dunse

LOCATION: Northwestern Agricultural Research Center

DURATION: Undetermined

OBJECTIVES: 1. Evaluation of virus-free gems with other grower stocks.

2. Evaluation of some commercial varieties and Montana selections.

PROCEDURE: All trials were planted in field X-4 with 300#/A of 16-20-0 applied at planting. Twenty pounds of Di-Syston was applied with the fertilizers. A RCB design was used with six replications. Plots were three rows 20 feet long with 40 inches between rows and 9 inch spacing between drops. Trials were planted on May 26, 1971.

RESULTS AND DISCUSSION:

Gem seed sources. Table 1. The virus-free Gem was the highest yielding of the seven entries. No significant differences were observed in stand counts. Significance was obtained in the 1½ - 4 oz. yield, 4 - 16 oz. yield, total yield of No. 1's and specific gravity. There was a range of 62 cwt/A in the yield of No. 1's.

Table 2, illustrates the distribution of various classes of tubers from the different seed stocks. The Heterogeneity Chi-square indicates that there is no significant differences in the distributions.

Potato Variety Trial. Table 3. The virus-free gem yielded significantly better than the varieties and selections. The three lowest yielding entries this year were the Montana selections. Norland, Chiefton, Norgold and Norchip yields were not significantly different. The virus-free Gem also had the highest specific gravity readings.

Distribution of tuber types of the different varieties are present in Table 4. As one would expect the Heterogeneity Chi-square indicates the distributions of different varieties are significantly different.

Table 1. Potato yield trial comparing various sources of Gems, grown at Northwestern Agricultural Research Center in 1971.

Source	Stand Counts Plants/ 66.7 sq.ft.	Mean of Six Replications: Yield Tuber Size, #1's 1½ - 4oz	4 - 16oz	16oz+	Sum 1½ thru 16oz + yield [1/]	#2's	Culls	Specific Gravity	Total Yield
	No.	Cwt/A	Cwt/A	Cwt/A	Cwt/A	Cwt/A	Cwt/A	Units	Cwt/A
Virus Free	23.2	191.5	173.2	0.0	364.7a	1.1	3.3	1.093	369.1
Skone + Connors	23.0	173.2	177.1	1.1	351.6ab	0.0	15.0	1.089	366.6
Jacobson	21.3	165.4	179.1	3.3	348.4ab	1.1	4.4	1.091	353.9
Schutter	23.7	158.2	177.8	1.1	336.7ab	4.4	12.4	1.089	353.4
Mangles	23.3	162.1	168.0	2.2	332.0ab	1.1	22.2	1.088	355.3
Smalls	22.7	177.8	147.1	1.1	325.5 b	1.1	15.0	1.089	341.6
Treweek	23.8	216.3	86.3	0.0	302.6 b	0.5	4.9	1.089	308.0
L.S.D. (.05)	2.24plants	25.2cwt	38.2cwt	-	33.6cwt	-	-	0.0027units	
C.V. $s\bar{y}/\bar{y}$	3.4%	4.9%	8.4%	-	3.4%	-	-	0.9%	
MEAN SQUARE:									
Variety	4.167NS	57.943**	159.525**	-	57.608*	-	-	0.0000188**	
Replications	3.828NS	7.734NS	17.700NS	-	28.854NS	-	-	0.0000042NS	
Error	3.662	16.973	24.564	-	19.062	-	-	0.0000053	

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

Table 2. Distribution of tuber types from various Gem seed sources. Northwestern Agricultural Research Center in 1971.

Seed Source	Distribution of Tuber Types				
	# 1's			# 2's	Culls
	1½ - 4oz	4 - 16oz	16oz +		
	%	%	%	%	%
Virus Free	51.9	46.9	0.0	0.3	0.9
Skone + Conner	47.2	48.3	0.3	0.0	4.1
Jacobson	46.7	50.6	0.9	0.3	1.2
Schutter	44.8	50.3	0.3	1.2	3.5
Mangles	45.6	47.3	0.6	0.3	6.2
Small	52.0	43.1	0.3	0.3	4.4
Treweek	70.2	28.0	0.0	0.2	1.6
$\bar{x}$	51.2	44.9	0.3	0.4	3.1

Heterogeneity Chi-square = 25.39 @ 24df. Prob. = .25 - .50

Table 3. Potato variety trial grown at Northwestern Agricultural Research Center in 1971.

Line	Stand Counts Plants/ 66.7 sq.ft.	Yield Tuber Size, #1's 1¼ - 4oz	4 - 16oz	16oz+	Sum 1½ thru 16oz + yield [1/]	#2's	Culls	Specific Gravity	Total Yield
	Mean of Six Replications								
	No.	Cwt/A	Cwt/A	Cwt/A	Cwt/A	Cwt/A	Cwt/A	Units	Cwt/A
Virus Free Gem	21.2	165.0	201.0	0.0	366.0a	1.1	2.2	1.091	369.3
Norland	21.0	62.6	251.1	2.2	315.7 b	0.0	0.0	1.076	315.7
Chiefton	18.0	51.8	255.4	0.0	307.2 bc	0.0	7.1	1.080	314.3
Norgold	19.2	82.8	215.7	1.1	299.3 bcd	0.0	0.0	1.086	299.3
Norchip	20.5	63.2	232.5	0.0	296.1 bcd	0.0	0.5	1.088	296.6
M-35939-5	18.2	140.0	129.6	0.0	263.4 cde	0.0	1.1	1.083	264.5
M-55963-3	16.5	47.4	207.5	0.0	254.9 de	0.0	1.1	1.085	256.0
M-5908-1	18.3	130.7	116.0	0.0	247.1 e	0.0	1.6	1.082	248.7
L.S.D. (.05)	2.98plants	26.4cwt	49.1cwt	-	44.6cwt	-	-	0.0033units	
C.V. $s\bar{y}/\bar{y}$	5.4%	1.0%	8.5%	-	5.3%	-	-	1.1%	
MEAN SQUARE:									
Variety	16.521*	278.021**	382.129**	-	211.866**	-	-	0.00013264**	
Replications	9.022NS	15.558NS	350.746**	-	506.038**	-	-	0.00000322NS	
Error	6.449	11.873	41.053	-	33.887	-	-	0.00000784	

1/ Means followed by the same letters are not significant at the .05 probability level.

Table 4. Distribution of tuber types of five varieties and three experimental lines. Northwestern Agricultural Research Center in 1971.

Line	Distribution of Tuber Types				
	# 1's			# 2's	Culls
	1½ - 4oz	4 - 16oz	16oz +		
	%	%	%	%	%
Virus Free Gem	44.7	54.4	0.0	0.3	0.6
Norland	19.8	79.5	0.7	0.0	0.0
Chiefton	16.5	81.3	0.0	0.0	2.3
Norgold	27.7	72.1	0.4	0.0	0.0
Norchip	21.3	78.4	0.0	0.0	0.2
M-35939-5	52.9	47.2	0.0	0.0	0.4
M-55963-3	18.5	81.1	0.0	0.0	0.4
M-5908-1	52.6	46.6	0.0	0.0	0.6
$\bar{x}$	31.8	67.6	0.1	0.0	0.6

Heterogeneity Chi-square = 89.82 @ 28df. Prob. $<.005$