TWENTY-SECOND ANNUAL REPORT

1970

Northwestern Montana Branch
of the
Agricultural Experiment Station
Montana State University

Route 4
Kalispell, Montana

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TABLE OF CONTENTS

Project No.		Page No.
	PUBLICATIONS and TALKS	1
750	ADMINISTRATION	3
	Activities	4
	Visitors	5
751	PHYSICAL PLANT	8
752	GENERAL FARM	9
	CLIMATOLOGY	10
754	WEED INVESTIGATIONS	13
	Chemical Control of Weeds in Sugar Beets	13
	Chemical Weed Control in New Seeding of Legumes	35
	Control of Spring & Winter Annuals in Winter Wheat	56
755	FORAGE INVESTIGATIONS	66
	Sainfoin Seeding Rate, Row Spacing & Competition	66
	Interstate Sainfoin Variety Trial	69
	Sainfoin Inoculation Strains USDA	72
	Evaluation of Eski Sainfoin in Irrigated Pasture Mixtures	74
	A Comparison of Eski and a Rapid Regrowth Sainfoin for Irrigated Pastures	79
	Intrastate Legume Nursery	83
	Intrastate Cicer Trial	85
	Alfalfa Nutrient Preservation	87
	Silage Corn and Sorghum Evaluation	90
	Annual Dryland Forages	93
	Animal Evaluation of Forages	95
756	SMALL GRAINS INVESTIGATIONS	96
	Spring Barley	96
	Winter Barley Trials	108
	Spring Oats	113
	Winter Wheat	117
	Spring Wheat	131
	Triticale - Rye	144
	Fertilizer on Winter Annuals	147
757	POTATO INVESTIGATIONS	149
	Potato Yield Trials & Seedling Evaluations	149
	MISCELLANEOUS CROPS	152
759	FARM FLOCK INVESTIGATIONS	154

PUBLICATIONS and TALKS 1970

1. Roath, C. W. 1970 Scientific Solutions (talk given at Ag. Council Meeting Kalispell, February 10)

2. Roath, C. W. 1970 Looking Ahead (talk given at Advisory Committee Meeting Polson, February 18)

3. Roath, C. W. 1970 Scientific Solutions (talk given at Lake County Conservation Day, Polson, March 3)

4. Roath, C. W. 1970 Looking Ahead (talk given at Western Montana County Agents Up-dating Meeting, Missoula, March 11)

5. Roath, C. W. 1970 Polution Control (guest editorial Radio station KGEZ, Kalispell, April 7)

6. Roath, C. W., A. J. Jarvi 1970 Research at Northwestern Montana Branch Sta. (TV Program KGVO, Missoula, April 6)

7. Roath, C. W. 1970 Scientific Solutions (talk given at Earth Day Program, Flathead High School, April 22)

8. Roath, C. W. 1970 Polution Control (talk given at 8th Grade Conservation Tours, Flathead County, May 11-13)

9. Roath, C. W. 1970 On a Clear Day (talk given at Field Day at Northwestern July 23)

10. Shaw, F.A., V. R. Stewart and Charles Crowell 1970 Cayuse Oats (Cooperative Extension Service MSU Bozeman Folder 107)

11. Stewart, V. R. 1970 Effect of certain herbicides on the production of alfalfa (Medicago sativa) and sainfoin (Onobrychis viciaefolia Scop) Proceedings Western Society of Weed Science 23:42

12. Stewart, V. R. 1970 Sugar Research Report (talk given at Great Western and Holly Sugar Companies, Billings, Montana, January 13, 1970.

13. Stewart, V. R. 1970 Recommended Varieties (KGVO-TV, Missoula, January 27)

14. Stewart, V. R. 1970 Why Control Weeds? (talk given at Weed Control School, Missoula, February 2)

15. Stewart, V. R. 1970 Research Highlights (talk given at Advisory Committee Meeting, Polson, February 18)

16. Stewart, V. R. 1970 Agriculture in the environment (talk given at Eastside Grange Meeting, February 27)

17. Stewart, V. R. 1970 Research Highlights (talk given at Western Montana County Agents Up-dating Meeting, Missoula, March 11)

Publications and talks (con't)

18. Stewart, V. R. 1970 Agriculture in our environment (talk give for Earth Day program at FVCC, Kalispell, April 16)

19. Stewart, V. R. 1970 Research, the wheels of progress (KGVO-TV, Missoula, July 14)

20. Stewart, V. R. and A. J. Jarvi, 1970 C. W. Roath Field Day (KGVO-TV, Missoula, July 14)

21. Stewart, V. R. and A. J. Jarvi, 1970 C. W. Roath Field Day (KCFW-TV Kalispell, July 20)

22. Stewart, V. R., 1970 Research wheels of progress (Talk given at Western Montana Stockman Association, Rollins, September 5)

23. Welsh, J. R., V. R. Stewart, E. L. Sharp, G. A. Taylor and E. R. Hehn 1970 Registration of Crest Wheat Crop Science 10:462

FISCAL PROJECT REPORT FOR 1970

ADMINISTRATION - 750

The primary purpose of the administrative project is to provide general overseeing of research projects. In the past this project has included the travel funds for all research projects. This has been transfered form the administrative project to the projects concerned.

Personnel:

As of June 30, 1970, Mr. C. W. Roath, Superintendent of this experiment station for 22 years terminated his tenure as superintendent and went on terminal leave for a period of six months which will end December 31, 1970.

Dr. Alvin Jarvi joined the staff as an assistant agronomist April 1, 1970. Dr. Jarvi is a graduate of Montana State University having received both Bachelors degree and a PhD degree from that institution. Dr. Jarvi will be working in the area of forage research, potatoes and winter barley breeding. Dr. Jarvi and his family consisting of his wife, Maxine, three young sons, Trent 6, Craig 3 and Keane 5 months old, moved into Residance #2, August 1, 1970. More about this residance will occur in the physical plant report.

Mr. Vern R. Stewart was promoted to the superintendents job and retained his position as Associate Agronomist. He will direct the activities of the Northwestern Montana Branch Station. This appointment was effective July 1, 1970. Mr. Stewart has been with the station since April 1, 1952 when he joined the staff as an Assistant in Agronomy.

Mr. Paul Boss is continuing as farm foreman having begun his employment with the station in 1954. Mrs. Jeanette S. Calbick who is secretary of the station, began her appointment here in September 1963.

All permanent employees continued to perform in their usual efficient manner resulting in a lot of work being done in the calendar year 1970.

Funds were budgeted for a total of five Work Study student employees for the past season, however we were unable to fill our complimnet and had only three Work Study plus one man who was ineligible for Work Study this year and was placed on state funds. The four part time employees were Dale Mahugh, state funds, Steve Flagg, Steve Schumacher and Larry DeLong, all Work Study. Steve Flagg has worked four seasons. Steve will be a Senior in college this year, so this will be his last year with us. It was Steve Schumacher's and Larry DeLong's third season with us and Dale Mahugh's second.

By having these young men return from year to year makes our work a little more efficient. It is our plan to hire a young man and retain him at least three or four years until he completes his college education. This has been quite successful over the past few years.

Many activities were participated in during the calendar year 1970. These are made a part of this report.

ACTIVITIES:

DATE	ACTIVITY	STAFF	LOCATION
Jan. 13	Sugar Beet Research Meeting	Stewart	Billings
26	Advisory Committee for FVCC	Stewart	Kalispell
27	TV Program	Stewart	Missoula
29	Montana Wheat Quality Council	Stewart	Bozeman
Feb. 2	Weed School	Stewart	Missoula
10	Ag Council Meeting	Roath Stewart	Kalispell
16-17	Wheat Variety & Quality Conference	Stewart	Great Falls
18	Advisory Committee Meeting	Roath Stewart	Polson
27	Eastside Grange Meeting (guest speaker)	Stewart	Creston
Mar. 2	Branch Station Association Meeting	Stewart	Bozeman
3	Lake County Conservation Day	Roath	Polson
3- 6	Annual Planning Conference	Roath Stewart	Bozeman
11	Agents Up-dating Meeting	Roath Stewart	Missoula
16-19	Western Society of Weed Science	Stewart	Sacramento, Calif.
30	Work Study Meeting	Stewart	Missoula
30	4-H Club Tour (10 members)	Roath	Station
Apr. 1	TAP and Farmer Soils Meeting	Stewart	Kalispell
2	Kindergarten to see lambs (20 students)	Roath	Station
3	Kindergarten to see lambs (25 students)	Roath	Station
14	AG Council Meeting	Roath Stewart Jarvi	Kalispell
16	State Water Board & Kalispell Optimist Meet.	Stewart	Kalispell
22	Earth Day Program at FVCC	Stewart	Kalispell
22	Earth Day Program at Flathead High School	Roath	Kalispell
May 5-11	8th Grade Conservation Day	Roath	Flathead Co.
12	Potato Meeting	Roath Stewart Jarvi	Ronan
July 8	Branch Station Association Meeting	Stewart Jarvi	Huntley
9	Summer Staff Meeting	Stewart Jarvi	Huntley
14	TV Program	Stewart	Missoula
20	TV Program	Stewart Jarvi	Kalispell
21	TV Program	Stewart Jarvi	Missoula
23	Field Day at Northwestern	Roath Stewart Jarvi	Station
Sept. 5	Western Montana Livestock Association	Stewart	Lakeside

Activities (con't)

DATE	ACTIVITY	STAFF	LOCATION
Oct. 6	Rural Area Development Comm. Meeting	Stewart	Kalispell
19-23	Annual Staff Conference	Stewart Jarvi	Bozeman
Nov. 5	4-H Banquet	Stewart	Kalispell
11-12	Potato Seminar	Roath Stewart Jarvi	Deer Lodge
16	Montana Resource Board Meeting	Stewart	Kalispell

VISITORS:

The following persons visited the station in 1970.

DATE	NAME	REPRESENTING	ADDRESS
Jan. 9	R. K. Wade	Student	Marion, Mont.
19	R. K. Wade	Student	Marion, Mont.
19	Les Cooper	Farmer	Kalispell
Feb. 4	Darrell Peterson	County Extension Agent	Kalispell
	Henry Ficken	Farmer	Kalispell
	Ray Zimmerman	Farmer	Kalispell
12	Carl Schrade	Farmer	Kalispell
18	Dr. M. J. Burris	Associate Direct, College of Ag.	Bozeman
	R. F. Eslick	Plant and Soil Science Dept.	Bozeman
	Harold Tutvedt	Farmer	Kalispell
	Larry Curtis	Farmer	Fortine
	Don Weydemeyer	Farmer	Fortine
21	Al & Maxine Jarvi	Job Applicant	Bozeman
Mar. 26	Sig Heinz	International Harvester	Portland, Ore.
27	Don Graham	Western Mont. Branch Station	Corvallis
Apr. 7	Leland Kade	Farmers Stockman	Great Falls
8	Leland Kade	Farmers Stockman	Great Falls
9	Merle Lyda	County Extension Agent	Kalispell
	Don Graham	Western Mont. Branch Station	Corvallis
21	Mike Jackson	Plant and Soil Science Dept.	Bozeman
	Frank Phipps	Thompson-Hayward	Portland, Ore.
	Jack Hillman	Thompson-Hayward	Yakima, Wash.
May 2	Lark Carter	Directors Office	Bozeman
4	Mr. Johnson & 34 students	Biology Class	Columbia Falls
5	80 students & 2 teachers	Biology Class	Columbia Falls
6	40 students & 2 teachers	Biology Class	Columbia Falls
7	Burton Isch	Farmer	Kalispell
	Henry Ficken	Farmer	Kalispell

Visitors (con't)

DATE	NAME	REPRESENTING	ADDRESS
May 9	Bill Ambrose	Farmer	Kalispell
12	Mr. Downs	Weather Bureau	Helena
13	G. A. Taylor	Plant and Soil Science Dept.	Bozeman
	E. L. Sharp	Botany & Microbiology	Bozeman
	Earl Bates	Contractor	Kalispell
	Don Fry	Contractor	Kalispell
26	Jack Warren	Chem-agro	Yakima, Wash.
June 12	Al Carlton	Plant and Soil Dept.	Bozeman
	Boyd Hartman	Grad Student	Bozeman
	Charles Strailley	Grad Student	Bozeman
	Bill Knight	Grad Student	Bozeman
	John Sheets	Grad Student	Bozeman
	Bob Wagner	Grad Student	Bozeman
16	Dan Brenneman	Farmer	Kalispell
18	Alden Beller	Teacher	Kalispell
	Doug Fox	Teacher	Kalispell
	Don Neu	Teacher	Kalispell
	Bertha Gillman	Student Teacher	Kalispell
	Wanda Sudan	Student Teacher	Kalispell
	15 Biology Students	Flathead High School	Kalispell
19	Dr. W. W. Roath	DeKalb Seed Company	Fargo, N. Dak.
20	Art Dubbs & family	Central Mont. Brnach Sta.	Moccasin
	Doug Warren & family	Office of Information, MSU	Bozeman
	Dr. J. A. Asleson	Director, Ag. Exp. Sta.	Bozeman
	Dr. M. J. Burris	Assoc. Dir., Ag. Exp. Sta.	Bozeman
	Don Baldridge & family	Huntley Branch Station	Huntley
	Art Post & family	Plant and Soil Science Dept.	Bozeman
	Bob Eslick	Plant and Soil Science Dept.	Bozeman
25	Ken Dunster	Amchem Products	Loveland, Colo.
July 1	Mrs. Smith & Class	Kalispell Jr. High School	Kalispell
6	Dr. Ed. Donaldson	Wasington State University	Pullman, Wn.
13	Gene Schear	Schear Cattle Corp.	Dayton, Ohio
	Henry Albert	Real Estate	Bigfork
	Homer Metcalf	Plant and Soil Science Dept.	Bozeman
20	Jim Hoffman	USDA	Pullman, Wash.
23-24	Dr. M. J. Burris	Assoc. Dir. Ag. Exp. Sta.	Bozeman
	Al Carleton	Plant and Soil Science Dept.	Bozeman
23	Dan Brenneman	Farmer	Kalispell
24	Steve Chapman	Plant and Soil Science Dept.	Bozeman
	Bruce & Kay Wood	Farmers	E. Haddan, Conn.
27	Joe Pender	Farmer	Maries Lake, Sask.
29	Jess Hodgson	Plant and Soil Science Dept.	Bozeman
	Gordon Gier	Farmer	Bigfork
Aug. 13	Lee Janni	Farmer	Kalispell
	Joe Kauffman	Teacher-farmer	Kalispell
13-14	John Dunse	Plant and Soil Science Dept.	Bozeman

Visitors (con't)

DATE	NAME	REPRESENTING	ADDRESS
Sept. 4	Jim Boles	Professional Writer	California
	Roger Scott	Giegy Chemicals	Twin Falls, Id.
	Carl Johnson	Stauffer Chemical	Billings
11	Floyd Hill	Elanco Products	Spokane, Wn.
	John Dunse	Plant and Soil Science Dept.	Bozeman
	Orville McCarver	Plant and Soil Science Dept.	Bozeman
25	Bill Wheeler	Farmer	Missoula
28	Roy Nugent	Farmer - Sheepman	Kalispell
Oct. 6	Andrew Schmit	Pacific Power & Light	Portland
	Everrett Burns	Pacific Power & Light	Kalispell
Nov. 6	Charles Siderius	Farmer-Contractor	Kalispell
	Jim Hoffman	Washington State University	Pullman, Wn.
	Ralph Sanders	Farmer	Kalispell
10	Gilbert Passmore	Farmer	Kalispell
16-17	John Dunse	Plant and Soil Science Dept.	Bozeman
17	Jim Snell	Farmer - Potato grower	Kalispell
Dec. 28	Ted Stiles	Farmer	Polson
	Glen Vergerant	Farmer	Polson

PHYSICAL PLANT - 751

Reported in this project are changes or improvements made in the physical plant.

The big change on the station in 1970 was the remodeling of Residence #2. The remodeling included a new kitchen, removal of a wall on the first floor, construction of a closet in the upstairs area, some refinishing and repair work in the upstairs portion of the house. Some rewiring had to be done to accomodate the remodeling of the kitchen. New sinks in the bathrooms,and the shower in the upstairs bathroom was replaced. In addition, the utility room on the first floor was remodeled.

The Crops Research building was repaired in 1970. Old paint was removed by a commercial sand blasting technique. Where necessary siding and soffits were replaced. Painting was done by station employees.

An over flow water line was installed from the pump to the creek to handle excess water from the well. This has eliminated an undersirable "mud hole" in the garden areas and machinery parking area.

To provide safer access to the newly purchased land a 20 foot tile was placed along the west line of the station. This allows passage of vehicles without traveling on Highway #35. The tile was provided by the station and installed by the county at no cost to the station.

A new forage dryer was built by the Agricultural Engineering Dept., MSU and it is now in use at the station. This replaces the dryer that was removed from the Crops Research building to conform to the state fire marshal's request. The new dryer has been set up in the Forage Livestock building. It is a 220 volt, 4000 watt unit and has been wired into the electrical circuit in that building. It is engineered to dry 100 four pound samples in 24 hours.

GENERAL FARM - 752

This project is a supporting project for all other research projects. In this report will be included general farm activities and purchase of all equipment.

The forage harvester built in 1969 was repaired and modified to make it work in a more efficient manner. The hammer knife had to be rebalanced and a new hopper constructed.

New equipment secured this year was a 12 foot press drill which we hope will enhance our seeding program and probably increase our yields on the Creston fine sandy soils. We also secured a 10 foot tandem disk which makes our large tractor a little more efficient than it did with the 8.5 foot tandem disk.

A new well engineered irrigation system would enhance the research work at Northwestern Montana Branch Station. This system should be engineered in such a way that it can be added to as funds become available. At the present it is the thinking of the author that an irrigation well should be drilled and a sprinkling system engineered for our research needs here on the main part of the station. The irrigation well should be of such a compacity that it will support the 100 acres of the new purchase for irrigation if this was desirable. An irrigation system for the station is a must in the very near future.

Note: Not this year but in years future we might include a report of yields by fields in this section.

A short piece of fence was replaced on the station in 1970 and a quarter of a mile of new fencing has been purchased for repair and replacement of exsisting fencing that is in need of repair.

CLIMATOLOGY

The 1969-70 crop year had a frost free period of 122 days. Fourteen days longer than the long time average of 108 days. June moisture was above the average with 4.37 inches, as was July with 3.08 inches. August was below the long time average, which resulted in ideal harvest conditions for winter wheat. Precipitation for the crop year was 1.63 inches above the 21 crop year average.

Temperature extremes were -14°F January 15, 1970 and the high was 92 F on July 21 and August 25. In table 1 are the climatic data for the crop year September 1969 thru August 1970.

In table 2, is tabulation of data on a calendar year basis with the years of 1969, 1970 and the long time average. Precipitation on a calendar year basis 1950-70 is 19.42 inches. Precipitation in 1970 was 22.01 inches or 2.59 inches above the 1950-70 average. Temperature variation in 1970 from the long time average is not great.

Table 1. Summary of climatic data by months for the 1969-70 crop year (September to August) and averages for the period 1949-70 at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana.

	Month and Year												Total or Average Growing Season
	Sept. 1969	Oct. 1969	Nov. 1969	Dec. 1969	Jan. 1970	Feb. 1970	Mar. 1970	Apr. 1970	May 1970	June 1970	July 1970	Aug. 1970	
Precipitation (inches) Current Year	1.54	1.90	.31	1.14	3.10	.89	1.49	.76	1.97	4.37	3.08	.44	20.99
Ave. 1949 to 1969-70	1.54	1.54	1.49	1.66	1.70	1.11	1.02	1.25	2.06	3.08	1.34	1.57	19.36
Mean Temperature (°F) Current Year	56.0	40.0	35.2	27.7	21.9	29.9	33.5	40.2	53.2	62.2	64.4	62.7	43.9
Ave. 1949 to 1969-70	54.3	44.0	32.8	26.5	22.1	28.1	32.5	43.1	51.9	58.6	64.3	64.2	43.5

Last killing frost in spring*
1970 - May 11 (32°)
Ave. 1949 to 1969-70 - May 26

First killing frost in fall*
1970 - Sept. 10 (31°)
Ave. 1949 to 1969-70 - Sept. 13

Frost-free period
1970 - 122 days
Ave. 1949 to 1969-70 - 108 days

Maximum summer temperature - 92° on July 21 and August 25

Minimum winter temperature - 14° below zero on January 15, 1970

* In this summary 32° is considered a killing frost.

Table 2. Comparison of monthly averages for 1969 - 70 and 1950 - 70 for Northwestern Montana Branch Station, Route 4, Kalispell. (Creston)

	Air Temperature (Fahrenheit)									Precipitation		
	Average 1969			Average 1970			Average 1950-70					Average
Month	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	1969	1970	1950-70
January	13.1	20.8	5.4	21.9	28.5	15.3	22.1	29.2	15.1	3.05	3.10	1.70
February	24.0	32.5	15.4	29.8	36.2	23.4	28.1	36.2	19.7	.75	.89	1.11
March	29.6	40.9	18.2	32.8	42.5	23.0	32.5	42.4	22.4	.69	1.49	1.02
April	47.1	59.5	34.6	43.2	49.7	36.7	43.1	54.9	31.5	1.39	.76	1.25
May	53.9	68.7	39.0	53.2	67.9	38.5	51.9	65.7	38.1	1.19	1.97	2.06
June	58.8	72.0	45.5	62.2	76.3	48.2	58.6	72.3	44.8	5.21	4.37	3.08
July	62.3	78.9	45.7	64.4	78.0	50.7	64.3	81.2	47.5	.70	3.08	1.34
August	63.3	83.0	43.5	62.7	80.9	44.5	69.0	79.4	46.3	.09	.44	1.57
September	56.0	70.4	41.6	48.7	62.5	34.9	54.1	69.0	39.1	1.54	1.79	1.57
October	40.0	49.7	30.3	40.4	52.2	28.6	43.8	55.5	32.7	1.90	1.38	1.56
November	35.4	43.0	27.8	31.4	40.0	22.9	32.7	40.1	25.2	.31	1.75	1.50
December	27.7	32.8	22.6	26.1	33.8	18.5	26.5	32.8	20.3	1.14	.99	1.66
Total	511.0	652.2	369.6	516.8	648.5	385.2	526.7	658.7	382.7	17.96	22.01	19.42
Average	42.6	54.4	30.8	43.1	54.0	32.1	43.9	54.9	31.9			

	Frost Free Period		
	1969	1970	1950-70
Last Freeze Date:	June 13	May 11	May 26
First Freeze Date:	Sept. 6	Sept. 10	Sept. 13
Frost Free Season:	85 days	122 days	108 days

TITLE Chemical control of weeds in sugar beets

PROJECT Weed Investigation MS 754

YEAR 1970

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: Indefinite

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: This is being written before the research planning conference, therefore the plans are somewhat indefinite. However, work level will no doubt be the same as last year.

SIGNIFICANT FINDINGS

1. Cycloate at 3#/A pre plant incorporate was best over all treatment in 1970 for weed control injury and sugar production.
2. No advantage was obtained with post emergence use of herbicide following pre plant incorporate Cycloate.
3. BAS 3502 shows promise as a pre plant incorporate product, some injury to beets, but did not result in significant yield reduction.
4. Herbicides do not affect sucrose content.

MATERIALS AND METHODS

Two experiments were conducted in 1970. One in cooperation with Great Western Sugar Company to secure data for registration of the combination of cycloate and diallate. The second experiment consisted of herbicides used in various combination 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 per plant 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 44.5 gpA aqueous mixture.

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.

Materials and Methods (con't)

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 weeds 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.) 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 indentical to untreated plants and 10 means all beets treated were dead. One injury evaluation was made 13 days following application of post emergence herbicides. Further evaluations of plant vigor were planned, but a hail storm July 27th made additional readings impossible.

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:

The hail storm occurring July 27th, estroyed 25 to 50% of foliage growth. The plants seemed to recover, but resulted in lower tonage and sugar percentage than in previous years.

Experiment I

The products used in this study were all preplant incorporated. No significant reductions were noted in sugar beet stands in the study. Diallate did not effectively control any weeds in the study. The combination of cycloate and diallate was not any more effective than cycloate alone. Cycloate was not effective on mustards, but was very good on all other broadleafed species. Table 2.

Some injury was noted with the higher combination of cycloate and diallate. Yields, sucrose percentage and total sugar produced were found to be non-significant when analyzed statistically. Tables 4 thru 7.

Experiment II

Table 8 gives the raw data obtained for plant counts of sugar beets and weeds by individual species.

Beet stands were significantly reduced using BAS 3502 at 4lbs/A as a pre plant incorporated herbicide. The other treatments in the pre plant group did not reduce stands of beets significantly.

The combination of cycloate 3lbs/A pre plant incorporated and phenmedipham 2lbs/A post emergence, significantly reduced stands of beets. Cycloate 3lbs/A pre plant incorporate plus phenmedipham 1.5lbs/A and pyrazon 3lbs/A with a wetting agent, 5% by volume, post plant reduced beet stands by 30% or more.

All of the treatments including cycloate were very effective in the control of nightshade. The combination of cycloate and diallate was not any more effective in nightshade control than cycloate alone, at 4lbs/A. BAS 3502 was just as effective on nightshade as cycloate as a 3lbs/A pre plant incorporated treatment. The combination of cycloate 3lbs/A + BAS 3502 3lbs/A was not as effective in the control of nightshade as they were individually. Cycloate pre plant incorporated plus post emergence herbicides did not provide any additional control of nightshade.

BAS 3502 was probably the most effective in controlling pigweed. The combination of cycloate and H283 was also very effective in the control of pigweed. Pyrazon + H283 was not too effective in controlling pigweed. The combination of cycloate pre plant incorporate and pryazon + dalapon as a post emergence gave effective control of pigweed. Phenmedipham was effective as a post emergence treatment on lambsquarter and the only post emergence treatment that was. Cycloate gave effective control of lambsquarter as did BAS 3502. Cycloate was weak on mustard whereas BAS 3502 was very effective at 4lbs/A. The combination of cycloate and diallate was not effective on mustard. Table 8.

The number of beets per 100 feet of row were reduced significantly by the combination of cycloate 3lbs/A pre plant + phenmediphan 1.5lbs/A and pyrazon 3lbs/A with a wetting agent post emergence. Cycloate 3lbs/A + BAS 3502 3lbs/A pre plant incorporated also resulted in stand loss at harvest. Other comparisons may be made in Table 9.

Significant yield reductions were found in the weedy check; pyrazon + dalapon 1.25 gal/A + phenmedipham 1lb/A; pyrazon + dalapon 1.5 gal/A + phenmedipham 1.5 lbs/A as post emergence applications; and the combinations of cycloate per plant plus phenmediphan and pyrazon with a wetting agent post emergence. Table 10.

There were no significant differences in sucrose content because of herbicide treatment. Table 11.

Gross sugar production is directly related to yield as can be seen in Tables 10 and 12.

A summary of data is found in Table 13 for Experiment II.

The pre plant incorporated treatments would have to be rated superior to the other two systems. There, weed control was 95% on an average compared to post emergence which is 65%. The pre plant incorporate plus post emergence gave 99% weed control, but at an added cost and operation. Injury to sugar beets was much less with the pre plant treatments, than the other two systems.

Table 1. Herbicides used in sugar beet study.

Common Name	Trade Name or Other	Chemical Name	Company
cycloate	Roneet	S-ethyl N-ethylthio-cyclohexanecarbarmate	Stauffer
pyrazon	Pyramin	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone	BASF
diallate	Avadex	S-(2,3-dichloroallyl) diisopropylthiocarbamate	Monsonto
dalapon	Dowpon	2,2 dichloropropionic acid	Dow
phenmedipham	Betanal	methyl m-hydroxycarbanilate methyl carbanilate	Nor-Am Agri
	BASF 3502	not available at writing	BASF

Table 2. Data from sugar beet study conducted on the Homer Bailey farm, Corvallis, Montana in 1970.

Treatment	Rate/A in Lbs	Plot No.	Plant Counts[1] Sugar Beets	Night-shade	Pig-weed	Lambs-quarter	Mustard	Other Broad-leaves	Grasses
Cycloate	3	1	121	1	0	3	9	0	0
		11	128	0	0	2	29	0	0
		14	128	1	0	6	17	0	0
	Total		377	2	0	11	55	0	0
	$\bar{x}$		126	.7c[2]	0b	4bc	18	0	0
Diallate	1	2	126	7	9	18	23	3	0
		12	124	49	3	7	30	1	0
		15	136	81	2	12	13	2	0
	Total		386	137	14	37	66	6	0
	$\bar{x}$		129	46b	5a	12ab	22	2	0
Cycloate + diallate	2.25	3	129	1	1	4	6	0	0
	.75	8	113	1	0	2	18	2	0
		13	123	2	1	4	27	0	1
	Total		365	4	2	10	51	2	1
	$\bar{x}$		122	1c	.7b	3c	27	.7	.3
Cycloate + diallate	3	4	109	1	1	0	10	0	0
	1	10	118	4	0	0	24	1	0
		17	104	0	0	0	9	1	0
	Total		331	5	1	0	43	2	0
	$\bar{x}$		110	2c	.3b	0c	14	.7	0
Check	0	5	122	62	2	21	25	7	0
		9	107	84	5	20	37	3	0
		18	132	99	2	8	21	1	0
	Total		361	245	9	49	83	11	0
	$\bar{x}$		120	82a	3ab	16a	28	4	0
Cycloate + diallate	3.75	6	121	2	0	0	4	0	0
	1.25	7	114	0	0	0	21	0	0
		16	120	6	1	0	22	0	0
	Total		355	8	1	1	47	0	0
	$\bar{x}$		118	3c	.3b	.3c	16	0	0

1/ Eight counts made per plot with a quadrant 3" x 48".
$\bar{x}$ based on 8 square feet per plot

$\bar{x}$	120.8	22.3	1.56	6.0	19.17	1.1
F	2.20	14.66**	3.33*	8.98**	1.49	2.90
S.E. $\bar{x}$	4.29	8.89	1.03	2.25	4.02	.84
L.S.D.	N.S.	28.02	3.27	7.10	N.S.	N.S.
C.V. %	3.55	39.89	66.73	37.51	20.98	71.71

2/ Items having common letters are not significantly different one from another .05 Duncans Multiple range test.

Table 3. Number of sugar beets from forty liner feet of row at harvest time at Bailey farm in 1970. Exp. I

Herbicide	Rate/A in lbs	Number of beets I	II	III	Total	$\bar{x}$	No. Beets/ 100' of row
Cycloate	3	58	53	50	161	54	135
Diallate	1	50	46	38	134	45	113
Cycloate + diallate	2.25 .75	58	53	42	153	51	128
Cycloate + diallate	3 1	58	42	59	159	53	133
Check	0	59	51	63	173	58	145
Cycloate + diallate	3.75 1.25	60	61	44	165	55	138

$\bar{x}$	131
F	1.23
S.E.$\bar{x}$	9.96
L.S.D.(.05)	N.S.
C.V. %	7.60

Table 4. Yield of sugar beets treated with various herbicides grown on the Homer Bailey farm, Corvallis, Montana in 1970. Exp. I
Plot zise: 73.3 sq. ft. - Randomized block design.

Herbicide	Rate/A in lbs	Yield #/plot I	II	III	Total	Yield Tons/A
Cycloate	3	55.5	43.2	45.1	143.8	14.2
Diallate	1	50.4	46.8	39.7	136.9	13.6
Cycloate + diallate	2.25 + .75	65.0	60.3	44.2	169.5	16.8
Cycloate + diallate	3 + 1	56.8	49.4	53.5	159.7	15.8
Check	0	56.0	55.9	59.0	170.9	16.9
Cycloate + diallate	3.75 + 1.25	62.6	53.6	44.6	160.8	15.9

$\bar{x}$	15.5
F(.05)	2.48
S.E.$\bar{x}$	.88
C.V. %	5.66

Table 5. Effect of herbicides on the sucrose content of sugar beets. Grown on the Homer Bailey farm, Corvallis, Montana 1970. Exp. I

Herbicide	Rate/A in lbs	% Sucrose I	II	III	Total	x̄
Cycloate	3	15.6	15.5	16.2	47.3	15.8
Diallate	1	17.2	16.3	16.0	49.5	16.5
Cycloate + diallate	2.25 + .75	15.9	16.1	16.2	48.2	16.1
Cycloate + diallate	3 + 1	15.9	15.5	15.7	47.1	15.7
Check	0	16.6	16.5	16.2	49.3	16.4
Cycloate + diallate	3.75 + 1.25	15.3	16.1	16.6	48.0	16.0

$\bar{x}$	16.1
F.05	1.59
S.E.$\bar{x}$	.263
C.V.%	1.63

Table 6. Effect of herbicides on gross sugar production. Conducted on the Homer Bailey farm, Corvallis, Montana in 1970. Exp. I

Herbicide	Rate/A in lbs	Yield #/Plot I	II	III	Total	x̄
Cycloate	3	5145	3979	4342	13466	4489
Diallate	1	5152	4533	3775	13460	4487
Cycloate + diallate	2.25 + .75	6142	5769	4255	16166	5389
Cycloate + diallate	3 + 1	5367	4550	4992	14909	4970
Check	0	5524	5481	5680	16685	5562
Cycloate + diallate	3.75 + 1.25	5692	5128	4400	15220	5073

$\bar{x}$	4994
F.05	2.73
S.E.$\bar{x}$	270.4
C.V.%	5.41

Table 7. Summary of weed control and yield data from sugar beet study conducted on the Homer Bailey farm, Corvallis, Montana in 1970. Exp. I

Herbicide	Rate/A in lbs	% Beet Stand	% Weed Control	Crop Injury 0-10	# Beets/ 100' or row	Yield Tons/A	% Sucrose	Gross Sugar Lbs/A
Cycloate	3	105	83	2.3	135	14.2	15.8	4489
Diallate	1	106	34	0.0	113	13.6	16.5	4487
Cycloate + iallate	2.25 + .75	102	82	1.0	128	16.8	16.1	5389
Cycloate + diallate	3 + 1	92	87	2.7	133	15.8	15.7	4970
Check	0	100	0	0.0	145	16.9	16.4	5562
Cycloate + diallate	3.75 + 1.25	98	86	3.7	138	15.9	16.0	5073
				$\bar{x}$	131	15.5	16.1	4994
				F	1.23	2.48	1.59	2.73
				S.E.$\bar{x}$	9.96	.88	.263	270.4
				C.V.%	7.60	5.66	1.63	5.41

Table 8. Data from sugar beet herbicide study conducted on the Homer Bailey farm, Corvallis, Montana in 1970. Sugar and weed counts.

Treatment			Plant Counts[1]					Other	
Herbicide	Rate/A in Lbs	Plot #	Sugar Beets	Night-shade	Pigweed	Lambs-quarter	Mustard	Broad-leaves	Grasses
			Pre plant incorporate						
Cycloate	3	101	130	1	1	2	3	0	0
		215	114	0	5	7	4	0	0
		321	122	0	0	1	3	1	0
	Total		366	1	6	10	10	1	0
	$\bar{x}$		122abc[2]	.3e[2]	2 b[2]	3 c[2]	3 bc[2]	.3b[2]	0
Cycloate	4	102	123	0	1	0	10	1	0
		211	121	0	3	1	4	0	0
		302	127	2	0	1	9	0	0
	Total		371	2	4	2	23	1	0
	$\bar{x}$		124ab	.7e	1 b	.7d	8 b	.3b	0
BAS 3502	3	103	110	1	1	0	0	0	1
		216	95	0	1	0	0	0	1
		308	123	3	0	0	2	2	0
	Total		328	4	2	0	2	2	2
	$\bar{x}$		109abcde	1 e	.7b	0 d	.7bc	.7b	.7
BAS 3502	4	104	95	1	2	0	0	0	0
		219	80	0	0	0	0	0	0
		307	86	3	0	0	0	1	0
	Total		261	4	2	0	0	1	0
	$\bar{x}$		87f	1 e	.7b	0 d	.0c	.3b	0
Cycloate + diallate	3	105	122	0	1	2	9	0	0
	1	212	109	0	22	2	2	0	0
		320	127	1	1	1	14	0	0
	Total		358	1	24	5	25	0	0
	$\bar{x}$		119abcd	.3e	8 b	2 d	8 b	0	0

Table 8 . (con't)

Treatment			Plant Counts						
Herbicide	Rate/A in Lbs	Plot #	Sugar Beets	Night-shade	Pigweed	Lambs-quarter	Mustard	Other Broad-leaves	Grasses
Cycloate +	3	106	126	0	0	2	1	0	0
H 283	2	226	134	0	0	1	1	0	0
		315	104	2	1	3	0	0	0
	Total		364	2	1	6	2	0	0
	$\bar{x}$		121abcd	.7e	.3b	2 d	.7bc	0b	0
Cycloate +	3	107	117	2	0	2	4	0	0
H 283	1	232	109	8	3	8	2	1	0
		303	126	0	0	2	9	0	0
	Total		352	10	3	12	15	1	0
	$\bar{x}$		117abcde	3 de	1 b	4 c	5 bc	.3b	0
Cycloate +	3	108	115	0	0	0	2	1	0
BAS 3502	3	227	98	2	0	0	0	1	0
		231	92	8	1	3	1	0	0
	Total		305	10	1	3	3	2	0
	$\bar{x}$		102cdef	9 cde	.3b	1 d	1 bc	.7b	0
Diallate +	1	109	95	0	0	0	0	0	0
BAS 3502	3	228	91	3	0	0	0	2	0
		301	106	3	0	0	0	1	0
	Total		292	6	0	0	0	3	0
	$\bar{x}$		97ef	2 de	0 b	0 d	0 c	1 ab	0
Pyrazon +	3	110	133	1	5	0	3	0	0
H 283	1	208	122	3	12	2	1	0	0
		329	128	5	2	4	1	0	1
	Total		383	9	19	6	5	0	1
	$\bar{x}$		128a	3 de	6 b	2 d	2 bc	0 b	.3
Pyrazon +	3	111	121	0	8	3	4	0	0
H 283	2	222	119	2	0	1	0	0	0
		312	116	7	1	2	0	0	0
	Total		356	9	9	6	4	0	0
	$\bar{x}$		119abcd	3 de	3 b	2 d	1 bc	0 b	0

Table 8 . (con't)

Treatment: Herbicide	Rate/A in lbs	Plot #	Plant Counts: Sugar Beets	Night-shade	Pigweed	Lambs-quarter	Mustard	Other Broad-leaves	Grasses
			Pre plant incorporate + post emergence						
Cycloate[a] + Pyrazon + dalapon[b]	3	112	121	0	2	0	1	0	0
	10[3]	224	132	2	0	0	2	0	0
		305	123	0	0	0	0	1	0
	Total		376	2	2	0	3	1	0
	$\bar{x}$		125ab	.7e	.7b	0 d	1 bc	.3b	0
Cycloate[a] + pyrazon + dalapon[b]	3	113	132	0	2	0	0	0	0
	12[3]	231	117	8	1	0	0	0	0
		310	124	1	1	0	0	0	0
	Total		373	9	4	0	0	0	0
	$\bar{x}$		124ab	3 de	1 b	0 d	0 c	0 b	0
Cycloate[a] + Phenmedipham[b]	3	114	106	0	1	0	0	0	0
	1	214	121	0	0	0	0	1	0
		306	131	1	1	0	0	0	0
	Total		358	1	2	0	0	1	0
	$\bar{x}$		119abcd	.3de	.7b	0 d	0 c	.3b	0
Cycloate[a] + phenmedipham[b]	3	115	103	0	0	0	0	0	0
	1.5	205	138	0	1	0	0	0	0
		314	100	0	1	0	0	0	0
	Total		341	0	2	0	0	0	0
	$\bar{x}$		112abcde	0 e	.3b	0 d	0 b	0	
Cycloate[a] + phenmedipham[b]	3	116	94	1	0	0	0	0	0
	2	230	83	1	0	0	0	1	3
		316	112	0	0	0	0	0	3
	Total		289	2	0	0	0	1	3
	$\bar{x}$		96ef	.7e	0 b	0 d	0 c	.3b	1

Table 8 . (con't)

Treatment			Plant Counts						
Herbicide	Rate/A in Lbs	Plot #	Sugar Beets	Night-shade	Pigweed	Lambs-quarter	Mustard	Other Broad-leaves	Grasses
Cycloate[a/] + phenmedipham[b/] (pyrazon + W/A.5%vol)	3	117	100	3	0	0	0	0	0
	1	217	109	0	0	0	0	0	0
	3	330	90	0	0	0	0	0	0
	Total		299	3	0	0	0	0	0
	$\bar{x}$		100def	1 e	0 b	0 d	0 c	0 b	0
Cycloate[a/] phenmedipham[b/] (pyrazon + W/A.5%vol)	3	118	34	0	0	0	0	0	0
	1.5	225	29	0	0	0	0	0	0
	3	313	57	0	0	0	0	0	0
	Total		120	0	0	0	0	0	0
	$\bar{x}$		40g	0 e	0 b	0 d	0 c	0 b	0
			Post emergence						
Phenmedipham	1	119	132	51	6	0	0	1	0
		221	116	89	5	3	0	1	0
		322	116	48	5	5	0	2	0
	Total		364	188	16	8	0	4	0
	$\bar{x}$		121abcd	63abcd	5 b	3 d	0 c	1 ab	0
Phenmedipham	1.5	120	128	15	3	0	0	2	0
		220	118	26	3	0	1	1	1
		332	126	4	9	3	0	0	0
	Total		372	45	15	3	1	3	1
	$\bar{x}$		124ab	15cde	5 b	1 d	.3c	1 ab	.3
Phenmediphan	2	121*	114	6	2	1	0	0	0
		223	114	8	4	0	0	0	0
		304	113	3	0	2	0	0	0
	Total		341	17	6	3	0	0	0
	$\bar{x}$		114abcde	6 cde	2 b	1 d	0 c	0 b	0

* Calculated missing plot

Table 8 . (con't)

Treatment			Plant Count											
Herbicide	Rate/A in lbs	Plot #	Sugar Beets		Night-shade		Pigweed		Lambs-quarter		Mustard		Other Broad-leaves		Grasses	
Pyrazon + dalapon	1.25 4/ gal	122	124		152		14		8		4		2		0	
		213	115		64		30		21		0		0		0	
		327	106		57		4		12		2		2		0	
	Total		345		273		48		41		6		4		0	
	$\bar{x}$		115	abcde	91	ab	16	a	14	c	2	bc	1	ab	0	
Pyrazon + dalapon	1.5 4/ gal	123	127		70		3		21		0		0		0	
		207	87		84		1		27		4		1		0	
		311	131		40		9		16		0		0		1	
	Total		345		194		13		64		4		1		1	
	$\bar{x}$		115	abcde	65	abc	4	b	31	a	1	bc	.3	b	.3	
Phenmedipham + pyrazon	1	124	124		18		3		19		0		0		0	
	3	206	124		57		9		29		0		1		0	
		318	138		31		5		10		0		1		0	
	Total		386		106		17		58		0		2		0	
	$\bar{x}$		129	a	35	abcde	6	b	19	b	0	c	.7	a	0	
Phenmedipham pyrazon	1.5	125	117		1		3		0		0		0		0	
	3	202	132		50		0		0		0		0		0	
		323	114		0		0		0		0		0		0	
	Total		363		51		3		0		0		0		0	
	$\bar{x}$		121	abcd	17	cde	1	b	0		0	c	0	b	0	
Pyrazon + dalapon	1.25 5/ gal	126	117		59		4		30		5		1		0	
		204	115		169		0		4		3		0		2	
		328	108		43		4		11		3		1		1	
	Total		340		271		8		45		11		2		3	
	$\bar{x}$		113	abcde	90	ab	3	b	15	bc	4	bc	.7	b	1	
Pyrazon + dalapon	1.5 5/ gal	127	120		48		4		27		4		1		0	
		218	129		78		2		11		7		0		0	
		324	116		33		3		7		0		1		0	
	Total		365		159		9		45		11		2		0	
	$\bar{x}$		122	abc	53	bcde	3	b	15	bc	4	bc	.7	b	0	

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Table 8. (con't)

Treatment			Plant Count						
Herbicide	Rate/A in lbs	Plot #	Sugar Beets	Night-shade	Pigweed	Lambs-quarter	Mustard	Other Broad-leaves	Grasses
Pyrazon + dalapon phenmedipham	1.25 4/ gal	128	104	4	3	2	0	0	1
	1	210	101	11	3	2	1	0	0
		326	111	3	0	0	0	0	0
	Total		316	18	6	4	1	0	1
	$\bar{x}$		105bcdef	6 cde	2 b	1 d	.3c	0 b	.3
Pyrazon + dalapon phenmedipham	1.50 4/ gal	129	88	5	1	0	0	0	1
	1.5	209	76	4	6	1	0	0	0
		317	65	0	0	0	0	0	0
	Total		229	9	7	1	0	0	1
	$\bar{x}$		76f	3 de	2 b	.3d	0 c	0 b	.3
Phenmedipham + dalapon	.5	130	116	16	9	38	0	0	0
	1.0	203	124	115	1	3	1	0	1
		309	120	0	0	1	0	0	0
	Total		360	131	10	42	1	0	1
	$\bar{x}$		120abcd	40 bcde	3 b	14 c	.3c	0 b	.3
Check (handweeded)	0	131	104	51	17	35	0	1	0
		201	130	276	0	6	38	1	0
		319	135	19	2	8	16	3	0
	Total		369	346	19	49	54	5	0
	$\bar{x}$		123abc	115 a	6 b	16 b	18 a	2 a	0
	$\bar{x}$		111.6	20.2	2.8	4.5	2.0	.4	
	F. (.05)		82.66**	3.26*	1.87*	3.69**	2.71**	1.96*	
	S.E.$\bar{x}$		6.293	18.012	2.413	3.519	2.24	.33	
	C.V.%		5.63	88.95	87.00	79.25	115.00	83.78	

a/ Prepland incorporated
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 (Ducans Multiple Range Test)
3/ Pyrazon - 27%, dalapon 21.2%.
4/ 3.7 lbs ai pyrazon + 2.2 lbs. ai dalapon + 1 qt of citowett/1.5gal.
5/ 3.7 lbs ai pyrazon + 2.2 ai dalapon + 1 qt of Biofilm/1.5 gal.

Table 9. Number of sugar beets from forty liner feet of beet row at harvest time in 1970.

Treatment Herbicide	Rate/A in lbs	Number of Beets I	II	III	Total	$\bar{x}$	# Beets/ 100' of row
Pre plant Incorporate							
Cycloate	3	63	69	45	177	59	148a[1]
Cycloate	4	51	54	48	153	51	128abcd
BAS 3502	3	57	44	52	153	51	128abcd
BAS 3502	4	51	33	45	129	43	108bcd
Cycloate + diallate	3 + 1	51	48	37	136	45	113bcd
Cycloate + H-283	3 + 2	55	56	37	148	49	123abcd
Cycloate + H-283	3 + 1	57	60	58	175	58	145ab
Cycloate + BAS 3502	3 + 3	45	38	40	123	41	103cd
Diallate + BAS 3502	1 + 3	52	42	46	140	47	118abcd
Pyrazon + H-283	3 + 1	58	51	42	151	50	125abcd
Pyrazon + H-283	3 + 2	62	60	48	170	57	143abc
Cycloate[a] + pyrazon[b] + dalapon[b]	3 +10[2]	49	57	53	159	53	133abcd
Cycloate[a] + pyrazon[b] + dalapon[b]	3 +12[2]	55	53	58	166	55	138abc
Pre plant Incorporate + Post Emergence							
Cycloate[a] + phenmedipham[b]	3 + 1	48	61	49	158	53	133abcd
Cycloate[a] + phenmedipham[b]	3 + 1.5	45	43	39	127	42	105cd
Cycloate[a] + phenmedipham[b]	3 + 2	47	44	48	139	46	115abcd
Cycloate[a] + phenmedipham[b] + pyrazon[b] #/A	3 + 1 + 3	43	48	38	129	43	108bcd
Cycloate[a] + phenmedipham + pyrazon #/A	3+1.5 + 3	26	33	22	81	27	68d
Post Emergence							
Phenmedipham	1	44	33	52	129	43	108abcd
Phenmedipham	1.5	52	40	58	150	50	125abcd
Phenmedipham	2	48	57	53	158	53	133abcd
Pyrazon + dalapon	1.25 gal[3]	46	44	47	137	47	118abcd
Pyrazon + dalapon	1.5 gal[3]	46	42	51	139	46	115abc
Phenmedipham + pyrazon	1 + 3	55	43	51	149	50	125abcd
Phenmedipham + pyrazon	1.5+ 3	51	54	54	159	53	133abcd
Pyrazon + dalapon	1.25 gal[4]	52	54	46	152	51	128abcd
Pyrazon + dalapon	1.50 gal[4]	38	55	51	144	48	120abcd
Pyrazon+dalapon+phenmedipham	1.25gal[3] +1	39	49	63	151	50	125abcd
Pyrazon+dalapon+phenmedipham	1.50gal[3] +1.5	45	48	37	130	43	108bcd
Phenmedipham + dalapon	.5 + 1.0	40	34	55	129	43	108bcd
Check (handweeded)	0	56	53	53	162	54	135abcd
Check (weedy)	0	45	51	47	143	48	120abcd
					$\bar{x}$		121
					F.05		2.53*
					S.E.$\bar{x}$		9.73
					C.V.%		8.04

a/ Pre plant incorporate
b/ Post emergence
1/ Items having a common letter are significantly different one from another .05 (Duncan Multiple Range Test)
2/ Pyrazon 27.0%; dalapon 21.2%
3/ 3.7 lbs ai pyrazon + 2.2 lbs ai dalapon + 1 qt of Citowett/1.5 gal.
4/ 3.7 lbs ai pyrazon + 2.2 lbs ai dalapon + 1 qt of Biofilm.

Table 10. Yield of sugar beets treated with various herbicides grown on the Homer Bailey farm, Corvallis, Montana in 1970.

Treatment		Pounds per Plot					
Herbicide	Rate/A in lbs	I	II	III	Total	$\bar{x}$	Tons/A
Pre plant Incorporate							
Cycloate	3	63.1	62.7	54.6	180.4	60.1	17.9a[4]
Cycloate	4	56.0	55.5	51.1	162.6	54.2	16.1abc
BAS 3502	3	56.4	55.2	21.7	163.3	54.4	16.2abc
BAS 3502	4	59.9	49.8	49.0	158.7	52.9	15.7abcd
Cycloate + diallate	3 + 1	49.0	57.8	44.9	151.7	50.6	15.0abcd
Cycloate + H 283	3 + 2	54.3	52.6	39.8	146.7	48.9	14.5abcd
Cycloate + H 283	3 + 1	67.8	56.1	37.1	161.0	53.7	16.0abcd
Cycloate + BAS 3502	3 + 3	52.2	49.6	41.2	143.0	47.7	14.2abcd
Diallate + BAS 3502	1 + 3	55.1	57.0	48.6	160.7	53.6	15.9abcd
Pyrazon + H-283	3 + 1	49.9	54.8	42.8	147.5	49.2	14.6abcd
Pyrazon + H-283	3 + 2	54.9	51.3	55.1	161.3	53.8	16.0abcd
Pre plant Incorporate & Post Emergence							
Cycloate[a] + (Pyrazon + dalapon[b])	3 + 10[1]	55.4	58.9	55.0	169.3	56.4	16.8ab
Cycloate[a] + (Pyrazon + dalapon[b])	3 + 12[1]	51.6	58.2	52.8	162.6	54.2	16.1abc
Cycloate[a] + phenmedipham[b]	3 + 1	45.7	51.9	46.6	144.2	48.1	14.3abcd
Cycloate[a] + phenmedipham[b]	3 + 1.5	51.1	49.8	40.1	141.0	47.0	14.0abcd
Cycloate[a] + phenmedipham[b]	3 + 2	48.8	53.5	38.8	141.1	47.0	14.0abcd
Cycloate[a] + phenmedipham[b] + pyrazon + W/A[b]	3 + 1 + 3	45.6	46.0	31.7	123.3	41.1	12.2cd
Cycloate[a] + phenmedipham[b] pyrazon + W/A[b]	3 + 1.5 + 3	43.4	49.9	28.1	121.4	40.5	12.0d
Post Emergence							
Phenmedipham	1.0	48.0	46.8	59.3	154.1	51.4	15.3abcd
Phenmedipham	1.5	58.6	46.4	66.3	171.3	57.1	17.0ab
Phenmedipham	2.0	53.2	51.4	50.7	155.3	51.8	15.4abcd
Pyrazon + dalapon	1.25g[2]	47.7	47.1	61.0	155.8	51.9	15.4abcd
Pyrazon + dalapon	1.5g[2]	69.0	56.9	54.8	180.7	60.2	17.9a
Phenmedipham + pyrazon	1 + 3	30.7	58.6	47.3	136.6	45.5	13.5bcd
Phenmedipham + pyrazon	1.5 + 3	53.2	46.7	59.9	159.8	53.3	15.8abcd
Pyrazon + dalapon	1.25g[3]	51.0	55.3	54.8	161.1	53.7	16.0abcd
Pyrazon + dalapon	1.50g[3]	45.2	56.0	51.9	153.1	51.0	15.2abcd
(Pyrazon + dalapon)+ phenmedipham	1.25g[2] + 1	45.7	40.1	39.1	124.9	41.6	12.4cd
(Pyrazon + dalapon) + phenmedipham	1.50g[2] + 1.5	46.2	38.4	40.4	125.0	41.7	12.4cd
Phenmedipham + dalapon	.5 + 1.0	55.0	44.9	49.2	149.1	49.7	14.8abcd
Check (hand weeded)	0	57.0	51.9	60.5	169.4	56.5	16.8ab
Check (weedy)	0	30.3	46.2	45.3	121.8	40.6	12.1d

Table 10 . (con't)

	Tons/A
$\bar{x}$	15.0
F. (.05)	1.95*
S.E.$\bar{x}$	1.158
C.V.%	7.72

a/ Pre plant incorporate
b/ Post emergence
1/ Pyrazon 27%, dalapon 21.2%
2/ 3.7 lbs ai pyrazon + 2.2 lbs ai dalapon + 1qt of Citowett/1.5gal.
3/ 3.7 lbs ai pyrazon + 2.2 lbs ai dalapon + 1qt of Biofilm/1.5gal.
4/ Items having common letters are not significantly different one from another .05. (Duncans Multiple Range Test)

Table 11. Effect of herbicides on the sucrose content of sugar beets. Grown on the Homer Bailey farm, Corvallis, Montana in 1970.

Treatment: Herbicide	Rate/A in lbs	% Sucrose: I	II	III	Total	x
Pre plant Incorporate						
Cycloate	3	15.7	16.0	15.9	47.6	15.9
Cycloate	4	15.7	14.6	15.8	46.1	15.4
BAS 3502	3	15.1	16.3	16.8	48.2	16.1
BAS 3502	4	16.1	16.0	16.5	48.6	16.2
Cycloate + diallate	3 + 1	15.9	15.7	15.8	47.4	15.8
Cycloate + H-283	3 + 2	16.3	16.4	16.2	48.9	16.3
Cycloate + H-283	3 + 1	16.0	16.2	16.5	48.7	16.2
Cycloate + BAS 3502	3 + 3	16.1	16.0	15.1	47.2	15.7
Diallate + BAS 3502	1 + 3	14.5	17.0	17.2	48.7	16.2
Pyrazon + H-283	3 + 1	16.3	16.0	16.6	48.9	16.3
Pyrazon + H-283	3 + 2	15.6	16.4	16.0	48.0	16.0
Pre plant Incorporate & Post Emergence						
Cycloate[a/] (Pyrazon+dalapon[b/])	3 + 10[1/]	16.2	15.9	16.8	48.9	16.3
Cycloate[a/] (Pyrazon + dalapon[b/])	3 + 12[1/]	16.4	16.7	15.7	48.8	16.3
Cycloate[a/] + phenmedipham[b/]	3 + 1	16.3	16.8	16.5	49.6	16.5
Cycloate[a/] + phenmedipham[b/]	3 + 1.5	15.8	15.6	16.1	47.5	15.8
Cycloate[a/] + phenmedipham[b/]	3 + 2	16.0	15.6	16.4	48.0	16.0
Cycloate[a/] (phenmedipham+pyrazon[b/] 1#/A)	3 + 1 + 3	16.4	16.2	15.4	48.0	16.0
Cycloate[a/] (phenmedipham+pryazon[b/] 1#/A)	3+1.5 + 3	15.7	16.6	15.5	47.8	15.9
Post Emergence						
Phenmedipham	1	15.7	14.1	15.6	45.4	15.1
Phenmedipham	1.5	15.3	15.2	15.2	45.7	15.2
Phenmedipham	2.0	14.4	16.4	16.4	47.2	15.7
Pyrazon + dalapon	1.25g[2/]	14.7	16.3	14.7	45.7	15.2
Pyrazon + dalapon	1.50g[2/]	15.9	18.0	16.0	49.9	16.6
Pyrazon + dalapon	1.25g[3/]	16.8	15.8	14.7	47.3	15.8
Pyrazon + dalapon	1.50g[3/]	15.3	17.0	18.1	48.4	16.1
Pyrazon+dalapon+phenmedipham	1.25g + 1	15.2	15.7	16.5	47.4	15.8
Pyrazon+dalapon+phenmedipham	1.50g[2/]+1.5	15.7	15.9	17.7	49.3	16.4
Phenmedipham + dalapon	.5 + 1.0	15.3	15.2	15.0	45.5	15.2
Check (hand weeded)	0	16.6	14.7	16.1	47.4	15.8
Check (weedy)	0	16.0	16.4	16.5	48.9	16.3
Phenmedipham + pyrazon	1 + 3	16.7	16.0	16.5	49.2	16.4
Phenmedipham + pyrazon	1.5 + 3	15.3	16.8	16.2	48.3	16.1

a/ Pre plant incorporate
b/ Post emergence
1/ Pyrazon 27%, dalapon 21.2%
2/ 3.7 lbs ai pyrazon + 2.2 lbs ai dalapon + 1 qt of Citowett/1.5 gal.
3/ 3.7 lbs ai pyrazon + 2.2 lbs ai dalapon + 1 qt of Biofilm/1.5gal.

$\bar{x}$	16.0
F. .05	N.S.1.04
S.E.$\bar{x}$	.39368
C.V.%	2.46

Table 12. Effect of herbicides on gross sugar production. Conducted on the Homer Bailey farm, Corvallis, Montana in 1970. Size of plot 73.3 square feet.

Treatment							
Herbicide	Rate/A in Lbs	Pounds per Plot I	II	III	Total	$\bar{x}$	# Sucrose per Acre
Pre plant Incorporate							
Cycloate	3	9.907	10.032	8.681	28.620	9.540	5240a[1]
Cycloate	4	8.792	8.103	8.074	24.969	8.323	4572abcde
BAS 3502	3	8.516	8.998	8.686	26.200	8.733	4797abcd
BAS 3502	4	9.644	7.968	8.085	25.697	8.566	4705abcde
Cycloate + diallate	3 + 1	7.791	9.075	7.094	23.960	7.987	4387abcde
Cycloate + H -283	3 + 2	8.851	8.626	6.448	23.925	7.975	4380abcde
Cycloate + H-283	3 + 1	10.848	9.088	6.122	26.058	8.686	4771abcde
Cycloate + BAS 3502	3 + 3	8.404	7.936	6.221	22.561	7.520	4131bcde
Diallate + BAS 3502	1 + 3	7.990	9.690	8.359	26.039	8.680	4768abcde
Pyrazon + H-283	3 + 1	8.134	8.768	7.105	24.007	8.002	4395abcde
Pyrazon + H-283	3 + 2	8.564	8.413	8.816	25.793	8.598	4722abcde
Pre plant Incorporate & Post Emergence							
Cycloate[a] (Pyrazon + dalapon[b])	3 + 10[2]	8.975	9.365	9.240	27.580	9.193	5049ab
Cycloate[a] (Pyrazon + dalapon[b])	3 + 12[2]	8.462	9.719	8.290	26.471	8.824	4847abc
Cycloate[a] + phenmedipham[b]	3 + 1	7.449	8.719	7.689	23.857	7.952	4368abcde
Cycloate[a] + phenmedipham[b]	3 + 1.5	8.074	7.769	6.456	22.299	7.433	4083bcde
Cycloate[a] + phenmedipham[b]	3 + 2	7.808	8.346	6.363	22.517	7.506	4123bcde
Cycloate[a] (phenmedipham + pyrazon + W/A[b])	3 + 1.0 + 3	7.478	7.452	4.882	19.812	6.604	3627de
Cycloate[a] (phenmedipham + pyrazon + W/A[b])	3 + 1.5 + 3	6.814	8.283	4.356	19.453	6.484	3562e
Post Emergence							
Phenmedipham	1	7.536	6.599	9.251	23.386	7.795	4282abcde
Phenmedipham	1.5	8.966	7.053	10.078	26.097	8.699	4778abcde
Phenmedipham	2.0	7.661	8.430	8.315	24.406	8.135	4468abcde
Pyrazon + dalapon	1.25g[3]	7.012	7.677	8.967	23.656	7.885	4331abcde
Pyrazon + dalapon	1.50g[3]	10.971	10.242	8.768	29.981	9.994	5489a
Phenmedipham + pyrazon	1 + 3	5.127	9.376	7.805	22.308	7.436	4084bcde
Phenmedipham + pyrazon	1.5 + 3	8.140	7.879	9.704	25.723	8.574	4709abcde
Phenmedipham + dalapon	.5 + 1.0	8.415	6.870	7.478	22.763	7.588	4168bcde
Check (hand weeded)	0	9.462	7.629	9.741	26.832	8.944	4913ab
Check (weedy)	0	4.848	7.577	7.475	19.900	6.633	3643cde
Pyrazon + dalapon	1.25g[4]	8.568	8.737	8.056	25.361	8.454	4644abcde
Pyrazon + dalapon	1.50g[4]	6.916	9.520	8.356	24.792	8.264	4539abcde
(Pyrazon + dalapon) + phenmedipham	1.25g[3] + 1	6.946	6.296	6.452	19.694	6.565	3606de
(Pyrazon + dalapon) + phenmedipham	1.50g[3] + 1.5	7.253	6.106	7.151	20.510	6.587	3618de

Table 12. (con't)

	# Sucrose per Acre
$\bar{x}$	4436
F .05	1.83
S.E.$\bar{x}$	352.58
C.V.%	7.95

a/ Pre plant
b/ Post emergence
1/ Items having common letters are not significantly different one from another .05(Duncans Multiple Range Test)
2/ Pyrazon 27%, dalapon 21.2%
3/ 3.7 lbs ai pyrazon + 2.2 lbs ai dalapon + 1 qt Citowett/1.5 gal.
4/ 3.7 lbs ai pyrazon + 2.2 lbs ai dalapon + 1 qt Biofilm/1.5 gal.

Table 13. Summary of weed control and yield data from sugar beet study conducted on the Homer Bailey farm, Corvallis, Montana in 1970.

Treatment Herbicide	Rate/A in lbs	% Beet Stand	% Weed Control	Crop Injury 0-10	# Beets/ 100' Row	Yield Tons/A	% Sucrose	Gross Sugar Lbs/A
Pre plant Incorporate								
Cycloate	3	99	94	1.7	148	17.9[1]/a	15.9	5240[1]/a
Cycloate	4	101	93	2.3	128	16.1abc	15.4	4572abcde
BAS 3502	3	89	97	2.7	128	16.2abc	16.1	4797abcd
BAS 3502	4	71	98	3.3	108	15.7abcd	16.2	4705abcde
Cycloate + diallate	3 + 1	97	88	2.3	113	15.0abcd	15.8	4387abcde
Cycloate + H-283	3 + 2	99	98	3.0	123	14.5abcd	16.3	4380abcde
Cycloate + H-283	3 + 1	95	91	3.3	145	16.0abcd	16.2	4771abcde
Cycloate + BAS 3502	3 + 3	83	96	5.3	103	14.2abcd	15.7	4131bcde
Diallate + BAS 3502	1 + 3	79	98	4.0	118	15.9abcd	16.2	4768abcde
Pyrazon + H-283	3 + 1	104	92	1.0	125	14.6abcd	16.3	4395abcde
Pyrazon + h-283	3 + 2	97	94	2.0	143	16.0abcd	16.0	4722abcde
Pre plant Incorporate & Post Emergence								
Cycloate[a]/(Pyrazon+dalapon)[b]/	3 + 10[2]/	102	98	4.3	133	16.8ab	16.3	5049ab
Cycloate[a]/(Pyrazon+dalapon)[b]/	3 + 12[2]/	101	97	5.7	138	16.1abc	16.3	4847abc
Cycloate[a]/+ phenmedipham[b]/	3 + 1	97	99	5.3	133	14.3abcd	16.5	4368abcde
Cycloate[a]/+ phenmedipham[b]/	3 + 1.5	92	100	4.7	105	14.0abcd	15.8	4083bcde
Cycloate[a]/+ phenmedipham[b]/	3 + 2	78	99	7.7	115	14.0abcd	16.0	4123bcde
Cycloate[a]/(phenmedipham+pyrazon+H/A)[b]/	3 + 1 + 3	81	99	8.0	108	12.2cd	16.0	3627de
Cycloate[a]/(phenmdeiphan+pyrazon+H/A)[b]/	3+1.5 + 3	33	100	9.3	68	12.0d	15.9	3562e
Post Emergence								
Phenmedipham	1	97	54	2.7	108	15.3abcd	15.1	4282abcde
Phenmedipham	1.5	101	86	3.3	125	17.0ab	15.2	4778abcde
Phenmedipham	2	92	94	3.0	133	15.4abcd	15.7	4468abcde
Pyrazon + dalapon	1.25g[3]/	94	21	3.7	118	15.4abcd	15.2	4331abcde
Pyrazon + dalapon	1.50g[3]/	94	41	5.7	115	17.9a	16.6	5489a
Phenmedipham + pyrazon	1 + 3	105	61	2.7	125	13.5bcd	16.4	4084bcde
Phenmedipham + pyrazon	1.5 + 3	98	89	3.0	133	15.8abcd	16.1	4709abcde
Pyrazon + dalapon	1.25g[4]/	92	28	5.0	128	16.0abcd	15.8	4644abcde
Pyrazon + dalapon	1.50g[4]/	99	52	5.3	120	15.2abcd	16.1	4539abcde

Ks VRS

TITLE: Chemical Weed Control in New Seedings of Legumes

PROJECT: Weed Investigations MS 754

YEAR: 1970

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

LOCATION: Northwestern Montana Branch Station; Field Nos. Y-4 & Y-5

DURATION: Three to four years

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:

The legumes seeded with a companion crop continue to run behind in overall yield except Cicer milk vetch.

FUTURE PLANS: This is the third year of this study. Plans are to harvest the 1968 seeding in 1970 and 1971, and harvest the 1969 seeding in 1970, 1971 and 1972. At this writing no additional herbicide treatments are planned.

MATERIALS AND METHODS:

Discription and procedure are found in the 1968 and 1969 Annual reports of the Northwestern Montana Branch Station located on pages 79 and 80, and 64 and 65 respectively for each study.

The plot size harvested in 1970 was 2 x 10 (20 square feet). This was done with a power flail type machine. In previous years they have been harvested with a sickle bar type machine. A 1000 gram green sample was weighed and dried to secure percent of dry matter. Six samples were secured from each replication. The average of the six was used for calculation of dry matter for all treatments in that replication.

Chemicals used in both studies are recorded in Table 1.

Data was analyzed using the analysis of variance technique.

Legume varieties used in this study were: Vernal alfalfa; Eski sainfoin; Cicer milk vetch and Altaswede Mammoth red clover.

RESULTS AND DISCUSSION

1968 Seeding

This is the third harvest on this study counting the seeding year. In general, yields are considerably lower than the two previous harvests. The reason for this the author cannot explain. Field yields were down from previous years also.

Alfalfa

Seeding with a companion crop treatment continues to be the lowest yielding treatment in the study. There were no significant differences between herbicide treatments, however the herbicide treatments were significantly higher in yield than the plots seeded with a companion crop. Mean yield for alfalfa was 3.6 tons per acre, about 1.7 tons per acre below last years yield. Table 3. Over the three years of harvest the bromoxynil $\frac{1}{4}$ lb/A treatment, has resulted in the highest total yield of alfalfa. This was also the least expensive treatment in the study. Table 3.

Sainfoin

There were no significant differences in yield in sainfoin in 1970. The yield range was 2.5 T/A to 3.5 T/A, with highest occurring in the hand weeded check, Table 4. Over the three year period the benefin 3 lb/A treatment has resulted in the highest total yield. Table 5.

Cicer milk vetch

The high C.V. in this part of the study can be attributed in part to the lack of uniformity in stand from plot to plot, plus a high weed population in those plots with poor stands. The mean yield for vetch was 1.5 T/A. Table 6. Table 7 give the yields from the three harvests. The greatest production over the period was from the handweeded check, which was 5.47 T/A. This demonstrates the inability of this crop to compete with other plants.

Clover

No significant yield differences were found in the 1970 harvest of Altaswede Mammoth red clover. It is interesting to note that the highest yield was from those plots seeded with a companion crop. Table 8. Over the three harvest periods the hand weeded check has resulted in the highest yield, followed with the bromoxynil treatment of 5/16 lbs/A. Table 9.

The 1968 seeding of this study will be completed in 1971, when a complete economic analysis of the data will be made.

1969 Seeding

Yields are below average in this study as they were in the study seeded in 1968. There are some differences due to replication which can be attributed in part to a different fertility level because of previous cropping.

Results and Discussion:(con't)

Alfalfa

When the data was analyzed statistically there was no significant differences found. However, the lowest yield was obtained from the plots where a companion crop was seeded in 1969 with the alfalfa. Table 10.

Sainfoin

Sainfoin yields were somewhat higher than alfalfa yields this season, but the treatments were not found to be significantly different. The lowest yielding treatment like alfalfa was where a companion crop had been seeded with sainfoin in 1969. Table 11.

Clover

Clover yields were not significantly different between treatments when analyzed statistically. The lower yields occurred, however in the plots treated with a combination of EPTC and bromoxynil and where the bromoxynil rate was 3/8 lb/A. This low yield reflects the injury to clover by the bromoxynil the seeding year. Table 12.

Table 1. Chemicals used were

Common Name	Trade Name or Other	Chemical Name	Company
	R 11914	3'N isopropylcarbarnoryloxy propionanilide	Stauffer
Chloroxynil		3,5-dichloro-4-hydroxybenzonitrile	Amchem
EPTC	Eptam	ethyl N,N-dipropylthiolcarbamate	Stauffer
Bromoxynil	Brominal	3,5-dibromo-4-hydroxybenzonitrile	Amchem
	Buctril		Chipman
Benefin	Balan	N-butyl-N-ethyl-alpha,alpha,alpha-trifluoro-2,6-dinitro-p-toluidine	Elanco
	VCS-438	chemistry not available	Velsicol
2,4DB	Butyrac 118	4-2(2 dichlorophenoxy) butric acid	Amchem

Table 1. Effect of certain herbicides on the yield of alfalfa. Two years following application. 1970.

Treatment Herbicide	Rate #/A	Cutting	Plot yield in lbs dry matter I	II	III	Total	Yield T/A
Seed w/comp crop[3]	0	1	.8492	1.4362	1.3671		
		2	.3672	1.5938	1.7922		
		Total	1.2164	3.0300	3.1593	7.4057	2.7
Clipping	0	1	1.2738	1.2381	1.2694		
		2	1.5912	1.9125	1.5450		
		Total	2.8650	3.1506	2.8144	8.8300	3.2
Eptam[1]	3	1	1.8576	1.6343	1.4647		
			1.5300	1.5938	1.3596		
		Total	3.3876	3.2281	2.8243	9.4400	3.4*
Eptam[1]	4	1	1.5922	1.5352	1.2206		
		2	1.9584	1.5938	1.6068		
		Total	3.5506	3.1290	2.8274	9.5070	3.5*
Eptam[1]	6	1	1.6984	1.5352	.9765		
		2	1.4688	2.1675	2.2866		
		Total	3.1672	3.7027	3.2631	10.1330	3.7*
Bromoxynil[2]	¼	1	1.8045	1.4362	1.6112		
		2	1.9584	2.1675	1.9158		
		Total	3.7629	3.6037	3.5270	10.8936	4.0*
Bromoxynil[2]	5/16	1	1.8576	1.8819	1.4159		
		2	1.8360	1.7213	1.6686		
		Total	3.6936	3.6032	3.0845	10.3813	3.8*
Bromoxynil[2]	3/8	1	1.2738	2.0305	1.3182		
		2	1.4688	2.6775	1.7304		
		Total	2.7426	4.7080	3.0486	10.4992	3.8*
Chloroxynil[2]	5/16	1	1.8045	1.3867	2.0018		
		2	2.0196	2.1038	1.7922		
		Total	3.8241	3.4905	3.7940	11.1086	4.0*
Chloroxynil[2]	3/8	1	2.0168	1.4362	1.6600		
		2	2.1420	2.1038	1.8540		
		Total	4.1588	3.5400	3.5140	11.2128	4.1*
Chloroxynil[2]	½	1	1.5391	1.5848	1.4159		
		2	1.7136	1.6575	1.6686		
		Total	3.2527	3.2423	3.0845	9.5795	3.5*
Chloroxynil[2]	3/4	1	1.1676	1.6838	1.8506		
		2	1.5912	1.5938	1.5450		
		Total	2.7588	3.2776	3.3956	9.4320	3.4*

Table 1. (con't)

Treatment Herbicide	Rate #/A	Cutting	Plot yield in lbs dry matter I	II	III	Total	Yield T/A
2,4-DB[2]	½	1	1.5391	1.2876	1.6600		
		2	1.2852	1.7213	2.0394		
		Total	2.8243	3.0089	3.6994	9.5326	3.5*
2,4-DB[2]	1	1	1.9637	1.9314	1.4159		
		2	1.5912	1.6575	1.7922		
		Total	3.5549	3.5889	3.2081	10.3519	3.8*
R-11914[1]	2	1	1.8045	1.5352	1.4647		
		2	1.5912	2.3588	1.9158		
		Total	3.3957	3.8940	3.3805	10.6702	3.9*
R-11914[1]	4	1	1.5922	1.6343	1.4647		
		2	1.5300	1.9763	2.1012		
		Total	3.1222	3.6106	3.5659	10.2987	3.7*
R-11914[1]	6	1	1.2207	1.3867	1.1229		
		2	1.5912	2.1038	1.6686		
		Total	2.8119	3.4905	2.7915	9.0939	3.3*
Benefin[1]	2	1	1.6453	1.6838	1.5624		
		2	1.6524	1.9125	1.7304		
		Total	3.2977	3.5963	3.2928	10.1868	3.7*
Benefin[1]	3	1	1.8045	1.6343	1.3671		
		2	1.8972	1.6575	1.8540		
		Total	3.7017	3.2918	3.2211	10.2146	3.7*
Benefin[1]	4	1	.9022	1.1886	1.0253		
		2	1.5300	1.0200	1.6068		
		Total	2.4322	2.2086	2.6321	7.2729	2.6
MCPB[2]	½	1	1.1676	1.1886	1.5624		
		2	1.7748	2.1038	2.2866		
		Total	2.9424	3.2924	3.8490	10.9038	3.7*
MCPB[2]	1	1	1.4330	1.3867	1.5624		
		2	1.1628	2.1675	2.2248		
		Total	2.5958	3.5542	3.7872	9.9372	3.6*
MCPB[2]	1½	1	1.3799	1.4362	1.8553		
		2	1.7748	1.8488	1.6686		
		Total	3.1547	3.2850	3.5239	9.9636	3.6*
Handweeded Check	0	1	1.3268	1.8819	1.5135		
		2	1.8360	1.9125	1.6068		
		Total	3.1628	3.7944	3.1203	10.0775	3.7*

Table 1 . (con't)

	Yield T/A
$\bar{x}$	3.6
F. value for treatment comparison	1.79*
S.E.$\bar{x}$	.2634
L.S.D. (.05)	.7
C. V.%	7.37

1/ Preplant incorporate
2/ Post emergence
3/ Used as a check
* Treatments yielding significantly more than the check (.05)

Table 3. Summary of three harvests from alfalfa treated with herbicides the seeding year.

Treatment		Yield Ton/Acre			
Herbicide	Rate #/A	1968	1969	1970	Total
Seed w/comp crop	0	.86[1/]	4.1	2.7	6.80
Clipping	0	.13	5.6	3.2	8.93
Eptam	3	1.04	6.2	3.4	10.64
Eptam	4	.89	6.6	3.5	10.99
Eptam	6	1.24	6.0	3.7	10.94
Bromoxynil	¼	1.56	6.5	4.0	12.06
Bromoxynil	5/16	1.40	6.2	3.8	11.40
Bromoxynil	3/8	.90	5.7	3.8	10.40
Chloroxynil	5/16	.83	6.3	4.0	11.13
Chloroxynil	3/8	1.34	6.8	4.1	12.24
Chloroxynil	½	1.54	6.2	3.5	11.24
Chloroxynil	3/4	1.82	6.2	3.4	11.42
2,4DB	½	.60	5.5	3.5	9.60
2,4DB	1	1.07	6.3	3.8	11.17
R-11914	2	.48	6.3	3.9	10.68
R-11914	4	.96	6.3	3.7	10.96
R-11914	6	.95	6.4	3.3	10.65
Benefin	2	1.21	6.3	3.7	11.21
Benefin	3	1.57	6.2	3.7	11.47
Benefin	4	1.30	5.5	2.6	9.40
MCPB	½	.84	6.1	3.7	10.64
MCPB	1	1.04	6.9	3.6	11.54
MCPB	1½	.93	6.9	3.6	11.43
Handweeded check	0	1.72	6.4	3.7	11.82

1/ Barley yields

Table 4. Effect of certain herbicides on the yield of sainfoin. Two years following application. 1970

Treatment			Plot yield in lbs dry matter				Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	T/A
Seed w/comp crop	0	1	1.2174	1.1787	1.6920		
		2	.7092	1.0816	.9640		
		Total	1.9266	2.2603	2.6560	6.8429	2.5
Clipping	0	1	1.4984	1.5559	1.3218		
		2	.7637	1.9125	.9640		
		Total	2.2621	3.4684	2.2858	8.0163	2.9
Eptam[1/]	3	1	2.1539	1.7917	1.9563		
		2	.9819	1.3093	1.1448		
		Total	3.1358	3.1010	3.1011	9.3379	3.4
Eptam[1/]	4	1	1.9198	1.2730	1.9035		
		2	.9274	.9108	1.3255		
		Total	2.8472	2.1838	3.2290	8.2600	3.0
Eptam[1/]	6	1	1.5452	1.6031	1.4276		
		2	1.0365	1.1954	1.1448		
		Total	2.5827	2.7985	2.5724	7.9536	2.9
Bromoxynil[2/]	1/4	1	2.2007	1.2730	1.7448		
		2	1.2547	.7970	1.1448		
		Total	3.4554	2.0700	2.8896	8.4150	3.1
Bromoxynil[2/]	5/16	1	1.4515	1.2259	1.9035		
		2	.8728	1.0816	1.1448		
		Total	2.3243	2.3075	3.0483	7.6801	2.8
Bromoxynil[2/]	3/8	1	1.6388	1.6502	1.9035		
		2	1.0365	1.1350	1.3858		
		Total	2.6753	2.7852	3.2893	8.7498	3.2
Chloroxynil[2/]	5/16	1	1.3579	1.6502	2.1150		
		2	1.0365	.9677	1.2050		
		Total	2.3934	2.6179	3.3200	8.3313	3.1
Chloroxynil[2/]	3/8	1	1.7793	1.3202	1.7977		
		2	1.2001	1.1954	1.0243		
		Total	2.9794	2.5156	2.8220	8.3170	3.0
Chloroxynil[2/]	1/2	1	2.0134	1.9803	2.1150		
		2	1.0910	1.1954	1.0845		
		Total	3.1044	3.1757	3.1995	9.4796	3.4
Chloroxynil[2/]	3/4	1	1.4515	1.9803	1.7448		
		2	1.2240	1.5938	1.0243		
		Total	2.6755	3.5741	2.7691	9.0187	3.3

Table 4 . (con't)

Treatment			Plot yields in lbs dry matter				Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	T/A
2,4-DB[2/]	½	1	2.0134	1.5559	1.6391		
		2	1.2001	1.1385	1.2050		
		Total	3.2135	2.6944	2.8441	8.7520	3.2
2,4-DB[2/]	1	1	1.6388	1.9331	1.6920		
		2	.9274	1.1954	.9038		
		Total	2.5662	3.1285	2.5958	8.2905	3.0
R-11914[1/]	2	1	1.6857	1.9331	2.4322		
		2	.9819	1.0247	1.0845		
		Total	2.6676	2.9578	3.5167	9.1421	3.3
R-11914[1/]	4	1	1.8261	1.3202	1.7977		
		2	1.0365	1.0852	1.1448		
		Total	2.8626	2.4054	2.9425	8.2105	3.0
R-11914[1/]	6	1	1.3111	1.1316	1.9563		
		2	1.1456	.8539	1.6686		
		Total	2.4567	1.9855	3.6249	8.0671	2.9
Benefin[1/]	2	1	1.3579	1.6974	2.1678		
		2	1.0365	.9108	1.5665		
		Total	2.3944	2.6082	3.7343	8.7369	3.2
Benefin[1/]	3	1	1.5920	1.6502	1.7448		
		2	1.2001	1.1954	1.0243		
		Total	2.7921	2.8456	2.7691	8.4068	3.1
Benefin[1/]	4	1	1.4984	1.9803	1.6920		
		2	.9274	1.2750	1.2050		
		Total	2.4258	3.2553	2.8970	8.5781	3.1
MCPB[2/]	½	1	1.5452	1.4616	1.7977		
		2	.9819	1.0247	1.3255		
		Total	2.5271	2.4863	3.1232	8.1366	3.0
MCPB[2/]	1	1	1.5920	1.3202	2.3265		
		2	1.0910	1.3662	1.1448		
		Total	2.6830	2.6864	3.4713	8.8407	3.2
MCPB[2/]	1½	1	1.5920	1.6974	1.7977		
		2	1.2001	.9677	.9640		
		Total	2.7921	2.6651	2.7617	8.2189	3.0
Handweeded Check	0	1	1.6388	1.6031	1.5862		
		2	1.5820	.9108	1.2653		
		Total	3.2208	2.5139	3.8515	9.5862	3.5

Table 4. (con't)

	Yield T/A
$\bar{x}$	3.1
F. value for treatment comparison	<1
S.E.$\bar{x}$	.2588
L.S.D. (.05)	N.S.
C.V.%	8.45

1/ Preplant incorporate
2/ Post emergence

Table 5. Summary of three harvests from sainfoin treated with herbicides the seeding year.

Treatment		Yield Ton/Acre			
Herbicide	Rate #/A	1968	1969	1970	Total
Seed w/Comp crop	0	.86[1/]	2.8	2.5	5.30
Clipping	0	.26	4.0	2.9	7.16
Eptam	3	.87	4.4	3.4	8.67
Eptam	4	.86	4.7	3.0	8.56
Eptam	6	.72	5.0	2.9	8.62
Bromoxynil	¼	1.26	5.6	3.1	9.96
Bromoxynil	5/16	1.02	5.3	2.8	9.12
Bromoxynil	3/8	1.42	5.1	3.2	9.72
Chloroxynil	5/16	1.10	5.3	2.7	9.10
Chloroxynil	3/8	1.59	5.4	3.0	9.99
Chloroxynil	½	1.53	5.5	3.4	10.43
Chloroxynil	3/4	1.13	5.1	3.3	9.53
2,4 DB	½	.51	4.5	3.2	8.21
2,4 DB	1	.71	4.2	3.0	7.91
R-11914	2	.63	3.8	3.3	7.73
R-11914	4	.72	4.7	3.0	8.42
R-11914	6	.87	5.4	2.9	9.17
Benefin	2	1.33	5.3	3.2	9.83
Benefin	3	1.97	5.5	3.1	10.57
Benefin	4	1.62	5.7	3.1	10.42
MCPB	½	.84	5.0	3.0	8.84
MCPB	1	.83	5.4	3.2	9.43
MCPB	1½	.89	5.0	3.0	8.89
Handweeded check	0	1.19	4.8	3.5	9.49

1/ Barley yield

Table 6. Effect of certain herbicides on the yield of vetch. Two years following application in 1970.

Treatment		Plot yield in lbs dry matter				Yield
Herbicide	Rate #/A	I	II	III	Total	T/A
Seed w/comp crop	0	3.4813	1.2117	1.1248	5.8178	2.1
Clipping	0	2.8095	1.3218	1.4800	5.6113	2.0
Eptam 1/	3	1.4658	1.2117	1.0656	3.7431	1.4
Eptam 1/	4	1.2215	1.3218	1.1840	3.7273	1.4
Eptam 1/	6	1.2215	1.3218	1.2432	3.7865	1.4
Bromoxynil 2/	¼	1.4658	1.0464	1.1840	3.6962	1.3
Bromoxynil 2/	5/16	1.8933	1.0464	1.7168	4.6565	1.7
Bromoxynil 2/	3/8	1.8323	.9914	2.0128	4.8365	1.8
Chloroxynil 2/	5/16	1.0383	1.6523	1.2432	3.9338	1.4
Chloroxynil 2/	3/8	1.5880	1.8175	.7696	4.1751	1.5
Chloroxynil 2/	½	1.4658	1.1015	1.2432	3.8105	1.4
Chloroxynil 2/	3/4	.8551	1.7624	1.1248	3.7423	1.4
2,4-DB 2/	½	2.0766	1.1015	1.3616	4.5397	1.7
2,4-DB 2/	1	1.6490	1.1015	1.5392	4.2897	1.6
R-11914 1/	2	1.8323	1.6523	1.6576	5.1422	1.7
R-11914 1/	4	1.4658	1.5972	.7104	3.7734	1.4
R-11914 1/	6	1.7712	1.2117	1.3616	4.3445	1.6
Benefin 1/	2	1.3437	1.7073	1.1248	4.1758	1.5
Benefin 1/	3	1.4047	.9914	1.0064	3.4025	1.2
Benefin 1/	4	.9772	1.2117	.7696	2.9585	1.1
MCPB 2/	½	1.4658	.8261	1.1248	3.4167	1.2
MCPB 2/	1	1.4658	1.4870	.7696	3.7224	1.4
MCPB 2/	1.5	1.3437	1.7073	1.1840	4.2350	1.5
Handweeded Check	0	1.5269	2.1479	1.0656	4.7404	1.7

1/ Preplant incorporated
2/ Post emergence

$\bar{x}$	1.5
F. value for treatment comparison	<.1
S.E.$\bar{x}$	.2687
L.S.D.	N.S.
C.V.%	17.71

Table 7. Summary of three harvests from vetch treated with herbicides the seeding year.

Treatment		Yield Ton/Acre			
Herbicide	Rate #/A	1968	1969	1970	Total
Seed w/comp crop	0	.86[1/]	2.5	2.1	4.50
Clipping	0	.02	2.7	2.0	4.72
Eptam	3	.09	2.4	1.4	3.89
Eptam	4	.16	2.1	1.4	3.66
Eptam	6	.05	1.6	1.4	3.05
Bromoxynil	¼	.21	2.3	1.3	3.81
Bromoxynil	5/16	.36	2.6	1.7	4.66
Bromoxynil	3/8	.05	3.0	1.8	4.85
Chloroxynil	5/16	.13	2.4	1.4	3.93
Chloroxynil	3/8	.16	2.9	1.5	4.56
Chloroxynil	½	.10	2.6	1.4	4.10
Chloroxynil	3/4	.08	2.5	1.4	3.98
2,4 DB	½	.03	2.7	1.7	4.43
2,4 DB	1	.40	1.9	1.6	3.90
R-11914	2	.02	2.5	1.7	4.22
R-11914	4	.09	1.8	1.4	3.29
R-11914	6	.17	2.0	1.6	3.77
Benefin	2	.23	2.9	1.5	4.63
Benefin	3	.21	2.4	1.2	3.81
Benefin	4	.28	2.5	1.1	3.88
MCPB	½	.04	1.7	1.2	2.94
MCPB	1	.04	1.8	1.4	3.24
MCPB	1½	.08	2.0	1.5	3.58
Handweeded Check	0	.67	3.1	1.7	5.47

1/ Barley yield

Table 8. Effect of certain herbicides on the yield of clover. Two years following application. 1970

Treatment		Plot yields in lbs dry matter				Yield
Herbicide	Rate #/A	I	II	III	Total	T/A
Seed w/comp crop	0	3.6265	1.6184	2.2050	7.4499	2.7
Clipping	0	2.4969	1.9652	1.8900	6.3521	2.3
Eptam 1/	3	3.2103	1.7340	2.2050	7.1493	2.6
Eptam 1/	4	2.3780	2.1964	2.3940	6.9684	2.5
Eptam 1/	6	3.4431	1.3294	2.0160	6.7935	2.5
Bromoxynil 2/	1/4	2.4969	1.7918	2.2680	6.5567	2.4
Bromoxynil 2/	5/16	3.0914	1.7340	1.8270	6.6524	2.4
Bromoxynil 2/	3/8	2.0213	1.3294	2.2680	5.6187	2.0
Chloroxynil 1/	5/16	3.0320	1.7918	1.7010	6.5248	2.4
Chloroxynil 1/	3/8	2.6158	1.8496	2.0790	6.5444	2.4
Chloroxynil 1/	1/2	1.8430	2.1386	1.1970	5.1786	1.9
Chloroxynil 1/	3/4	1.6646	1.9074	2.0790	5.6510	2.1
2,4-DB 1/	1/2	2.4375	1.7340	1.8900	6.0615	2.2
2,4-DB 1/	1	2.3780	1.5606	1.7010	5.6396	2.0
R-11914 2/	2	2.0808	2.1386	2.5200	6.7394	2.4
R-11914 2/	4	1.6052	1.9074	1.5120	5.0246	1.8
R-11914 2/	6	1.7835	1.5028	1.8270	5.1133	1.9
Benefin 2/	2	2.4375	1.7340	1.5750	5.7465	2.1
Benefin 2/	3	2.0213	1.6762	1.4490	5.1465	1.9
Benefin 2/	4	1.6646	1.5606	1.5120	4.7372	1.7
MCPB 1/	1/2	1.5457	2.0808	1.7010	5.3275	1.9
MCPB 1/	1	1.8430	2.0808	1.8900	5.8138	2.1
MCPB 1/	1.5	1.6646	1.3294	2.3940	5.3880	2.0
Handweeded Check	0	2.1402	1.6762	1.7640	5.5804	2.0

1/ Preplant incorporate
2/ Post emergence

$\bar{x}$	2.2
F. value for treatment comparison	1.06
S.E.$\bar{x}$	.26606
L.S.D.	N.S.
C.V.%	12.23

Table 9. Summary of three harvests from clover treated with herbicides the seeding year.

Treatment		Yield Ton/Acre			
Herbicide	Rate #/A	1968	1969	1970	Total
Seed w/comp crop	0	.86[1/]	4.9	2.7	7.60
Clipping	0	.25	5.6	2.3	8.15
Eptam	3	.41	4.9	2.6	7.91
Eptam	4	.30	5.6	2.5	8.40
Eptam	6	.39	5.3	2.5	8.19
Bromoxynil	¼	.37	4.9	2.4	7.67
Bromoxynil	5/16	.75	5.9	2.4	9.05
Bromoxynil	3/8	.54	5.5	2.0	8.04
Chloroxynil	5/16	.75	5.5	2.4	8.65
Chloroxynil	3/8	.75	5.1	2.4	8.25
Chloroxynil	½	.48	5.5	1.9	7.88
Chloroxynil	3/4	.43	5.4	2.1	7.93
2,4 DB	½	.36	5.8	2.2	8.36
2,4 DB	1	.18	5.8	2.0	7.98
R-11914	2	.23	5.5	2.4	8.13
R-11914	4	.41	5.6	1.8	7.81
R-11914	6	.61	5.6	1.9	8.11
Benefin	2	.66	5.8	2.1	8.56
Benefin	3	.79	5.4	1.9	8.09
Benefin	4	.54	5.4	1.7	7.64
MCPB	½	.28	5.6	1.9	7.78
MCPB	1	.56	5.4	2.1	8.06
MCPB	1½	.43	6.0	2.0	8.43
Handweeded Check	0	1.23	6.3	2.0	9.53

1/ Barley yield

Table 10. Effect of certain herbicides on the yield of alfalfa. One year following application. 1970 Plot size: 20 sq. ft.

Treatment Herbicide	Rate #/A	Cutting	Plot yield in lbs dry matter I	II	III	Total	Yield T/A
EPTC[1]	2	1	1.7545	1.6716	1.6296		
		2	1.2100	1.2716	1.4663		
		Total	2.9645	2.9432	3.0959	9.0036	3.3
EPTC[1]	4	1	1.3368	1.5938	1.4744		
		2	1.2705	1.2715	1.2113		
		Total	2.6073	2.8653	2.6857	8.1583	3.0
EPTC[1]	6	1	1.3785	1.3217	1.5132		
		2	1.5125	1.5743	1.3388		
		Total	2.8910	2.8960	2.8520	8.6390	3.1
EPTC[1] + Bromoxynil[2]	2 + ¼	1	1.2532	1.3217	1.3580		
		2	1.3310	1.5743	1.3388		
		Total	2.5842	2.8960	2.6968	8.1770	3.0
EPTC[1] + Bromoxynil[2]	4 + ¼	1	1.7127	1.0885	1.3968		
		2	1.5730	1.4532	1.2113		
		Total	3.2857	2.5417	2.6081	8.4355	3.1
EPTC[1] + Bromoxynil[2]	6 + ¼	1	1.5874	1.4383	1.1640		
		2	1.5300	1.5138	1.2113		
		Total	3.1174	2.9521	2.3753	8.4448	3.1
EPTC[1] + Bromoxynil[2]	2 + 5/16	1	1.9216	1.5550	1.6296		
		2	1.3915	1.3321	1.4663		
		Total	3.3131	2.8871	3.0959	9.2961	3.4
EPTC[1] + Bromoxynil[2]	4 + 5/16	1	1.6292	1.5161	1.7848		
		2	1.3915	1.3927	1.4663		
		Total	3.0207	2.9088	3.2511	9.1806	3.3
EPTC[1] + Bromoxynil[2]	6 + 5/16	1	1.6292	1.5161	1.3968		
		2	1.3310	1.3927	1.3388		
		Total	2.9602	2.9088	2.7356	8.6046	3.1
EPTC[1] + Bromoxynil[2]	2 + 3/8	1	1.9216	1.6716	1.5520		
		2	1.4520	1.3321	1.4025		
		Total	3.3736	3.0037	2.9545	9.3318	3.4
EPTC[1] + Bromoxynil[2]	4 + 3/8	1	1.5874	1.5550	1.4356		
		2	1.6940	1.6954	1.2750		
		Total	3.2814	3.2504	2.7106	9.2424	3.4
EPTC[1] + Bromoxynil[2]	6 + 3/8	1	1.5874	1.2828	1.5132		
		2	1.6335	1.3927	1.2750		
		Total	3.2209	2.6755	2.7882	8.6846	3.2

Table 10 . (con't)

Treatment			Plot yield in lbs dry matter				Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	T/A
Benefin[1/]	2	1	1.3368	1.1662	1.2416		
		2	1.3915	1.4532	1.2750		
		Total	2.7283	2.6194	2.5166	7.8643	2.9
Benefin[1/]	3	1	1.2114	1.5550	1.3580		
		2	1.2100	1.5743	1.4663		
		Total	2.4214	3.1293	2.8243	8.3750	3.0
Benefin[1/]	4	1	1.0861	1.3606	1.1252		
		2	1.5125	1.5138	1.4663		
		Total	2.5986	2.8744	2.5915	8.0645	2.9
Velsicol 438[3/]	2	1	1.0443	1.4772	1.4744		
		2	1.3915	1.5743	1.2750		
		Total	2.4358	3.0515	2.7494	8.2367	3.0
Velsicol 438[3/]	3	1	1.2950	1.6327	1.4356		
		2	1.3310	1.3321	.9563		
		Total	2.6260	2.9648	2.3919	7.9827	2.9
Velsicol 438[3/]	4	1	2.0469	1.1273	1.5132		
		2	1.5730	1.3321	1.4663		
		Total	3.6199	2.4594	2.9795	9.0588	3.3
Clipping	0	1	1.5874	1.4772	1.1252		
		2	1.6940	1.3321	1.3388		
		Total	3.2814	2.8093	2.4640	8.5547	3.1
Companion crop	0	1	1.0026	.8552	1.2416		
		2	1.3310	1.1505	1.3388		
		Total	2.3336	2.0057	2.5804	6.9197	2.5
Bromoxynil[2/]	1/4	1	1.7127	1.3606	1.7460		
		2	1.5730	1.5138	1.4025		
		Total	3.2857	2.8744	3.1485	9.3086	3.4
Bromoxynil[2/]	5/16	1	1.2532	1.3995	1.3580		
		2	1.6335	1.3321	1.2750		
		Total	2.8867	2.7316	2.6330	8.2513	3.0
Bromoxynil[2/]	3/8	1	1.0861	1.5161	1.3968		
		2	1.7545	1.4532	1.4025		
		Total	2.8406	2.9693	2.7993	8.6092	3.1
Bromoxynil[2/]	1/2	1	1.6292	1.1662	1.5908		
		2	1.8150	1.2716	1.3388		
		Total	3.4442	2.4378	2.9296	8.8116	3.2

Table 10 . (con't)

	Yield T/A
$\bar{x}$	3.1
F. values for treatment comparison	1.45
S.E.$\bar{x}$	.1713
L.S.D.	N.S.
C.V.%	5.52

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

Table 11 . Effect of certain herbicides on the yield of sainfoin. One year following application. 1970

Treatment			Plot yield in lbs dry matter				Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	T/A
EPTC 1/	2	1	1.8238	1.7080	1.4913		
		2	1.4702	1.5469	1.5675		
		Total	3.2940	3.2549	3.0588	9.6077	3.5
EPTC 1/	4	1	2.0409	1.6653	1.5327		
		2	2.0048	1.7944	2.1840		
		Total	4.0457	3.4597	3.7167	11.2221	4.1
EPTC 1/	6	1	1.7370	1.6653	1.9884		
		2	1.8711	1.5469	1.5698		
		Total	3.6081	3.2122	3.5582	10.3785	3.8
EPTC 1/ + Bromoxynil 2/	2 $\frac{1}{4}$	1	.9119	1.9642	1.4084		
		2	1.6038	1.9800	1.4333		
		Total	2.5157	3.9442	2.8417	9.3016	3.4
EPTC 1/ + Bromoxynil 2/	4 $\frac{1}{4}$	1	1.4764	1.9215	1.5327		
		2	1.4702	1.7944	1.5015		
		Total	2.9466	3.7159	3.0342	9.6967	3.5
EPTC 1/ + Bromoxynil 2/	6 $\frac{1}{4}$	1	1.9107	1.6226	1.4913		
		2	2.0048	1.5469	1.4333		
		Total	3.9155	3.1695	2.9246	10.0096	3.6
EPTC 1/ + Bromoxynil 2/	2 5/16	1	2.3449	1.3237	2.0712		
		2	2.0048	1.6088	1.6380		
		Total	4.3497	2.9325	3.7092	10.9914	4.0

Table 11 . (con't)

Treatment Herbicide	Rate #/A	Cutting	Plot yield in lbs dry matter I	II	III	Total	Yield T/A
EPTC[1]/ + Bromoxynil[2]/	4 5/16	1	1.8672	1.7934	1.5741		
		2	1.9379	1.6088	1.9793		
		Total	3.8051	3.4022	3.5534	10.7607	3.9
EPTC[1]/ + Bromoxynil[2]/	6 5/16	1	1.6501	1.4091	2.0298		
		2	1.1384	1.6706	1.5698		
		Total	2.7885	3.0797	3.5996	9.4678	3.4
EPTC[1]/ + Bromoxynil[2]/	2 3/8	1	1.9975	1.6226	1.8641		
		2	1.7375	1.7944	1.9793		
		Total	3.7350	3.4170	3.8434	10.9954	4.0
EPTC[1]/ + Bromoxynil[2]/	4 3/8	1	2.2146	1.4518	1.5327		
		2	1.8711	1.7325	1.8438		
		Total	4.0857	3.1843	3.3765	10.6465	4.0
EPTC[1]/ + Bromoxynil[2]/	6 3/8	1	2.6923	1.3664	2.3612		
		2	1.8043	1.4231	1.5015		
		Total	4.4966	2.7895	3.8627	11.1488	4.1
Benefin[1]/	2	1	1.4764	1.5372	1.5741		
		2	1.2697	1.4850	1.7745		
		Total	2.7461	3.0222	3.3486	9.1169	3.3
Benefin[1]/	3	1	2.0844	1.4091	2.0298		
		2	1.4702	1.5469	1.6380		
		Total	3.5546	2.9560	3.6678	10.1784	3.7
Benefin[1]/	4	1	1.7804	1.2810	2.4440		
		2	1.4033	1.5469	1.2968		
		Total	3.1837	2.8279	3.7408	9.7524	3.5
Velsicol 438[3]/	2	1	1.2593	1.6226	1.6570		
		2	1.6038	1.9181	1.4333		
		Total	2.8631	3.5407	3.0903	9.4941	3.5
Velsicol 438[3]/	3	1	1.3027	2.1350	1.9469		
		2	1.9379	1.9181	1.9793		
		Total	3.2406	4.0531	3.9262	11.2199	4.1
Velsicol 438[3]/	4	1	2.3015	2.0496	1.5741		
		2	2.0716	1.5469	1.6380		
		Total	4.3731	3.5965	3.2121	11.1817	4.1
Clipping	0	1	2.4318	1.3664	1.9884		
		2	1.8043	1.5469	1.4333		
		Total	4.2361	2.9133	3.4217	10.5711	3.8

Table 11 . (con't)

Treatment Herbicide	Rate #/A	Cutting	Ploy yield in lbs dry matter I	II	III	Total	Yield T/A
Companion crop	0	1	1.1290	.5978	1.2427		
		2	1.5370	.9900	1.0920		
		Total	2.6660	1.5878	2.3347	6.5885	2.4
Bromoxynil 2/	¼	1	2.0844	1.4945	2.2783		
		2	1.8043	1.9181	1.5698		
		Total	3.8887	3.4126	3.8481	11.1494	4.0
Bromoxynil 2/	5/16	1	1.2593	2.0069	1.9469		
		2	1.8043	1.7325	1.4333		
		Total	3.0636	3.7394	3.3802	10.1832	3.7
Bromoxynil 2/	3/8	1	2.5186	1.6226	1.9055		
		2	1.7375	1.7325	1.7745		
		Total	4.2561	3.3551	3.6800	11.2912	4.1
Bromoxynil 2/	½	1	2.2581	2.0496	1.5741		
		2	1.6038	1.6706	1.5015		
		Total	3.8619	3.7202	3.0756	10.6577	3.9

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

$\bar{x}$	3.7
F. value for treatment comparison	1.75
S.E.$\bar{x}$	.2861
L.S.D. (.05)	N.S.
C.V.%	7.70

Table 12 . Effect of certain herbicides on the yield of clover. One year following application. 1970

Treatment		Plot yield in lbs dry matter				Yield
Herbicide	Rate #/A	I	II	III	Total	T/A
EPTC 1/	2	3.4845	2.0637	2.2523	7.8005	2.8
EPTC 1/	4	2.1488	2.4650	2.0213	6.6351	2.4
EPTC 1/	6	2.6134	2.5796	2.3678	7.5608	2.8
EPTC 1/ + Bromoxynil 2/	2 + ¼	2.2069	1.8917	2.3100	6.4086	2.3
EPTC 1/ + Bromoxynil 2/	4 + ¼	2.1488	2.6943	2.1368	6.9799	2.5
EPTC 1/ + Bromoxynil 2/	6 + ¼	2.1488	2.6943	1.9058	6.7489	2.5
EPTC 1/ + Bromoxynil 2/	2 + 5/16	2.0326	2.2930	2.4833	6.8089	2.5
EPTC 1/ + Bromoxynil 2/	4 + 5/16	1.8584	2.0064	3.0000	6.8648	2.5
EPTC 1/ + Bromoxynil 2/	6 + 5/16	2.6715	2.8663	2.5988	8.1366	3.0
EPTC 1/ + Bromoxynil 2/	2 + 3/8	2.0326	2.1784	2.3100	6.5210	2.4
EPTC 1/ + Bromoxynil 2/	4 + 3/8	2.3811	2.1784	2.3100	6.8695	2.5
EPTC 1/ + Bromoxynil 2/	6 + 3/8	1.8003	2.2357	1.9058	5.9418	2.2
Benefin 1/	2	2.1488	2.1210	1.9058	6.1756	2.2
Benefin 1/	3	2.0907	2.3503	2.4255	6.8665	2.5
Benefin 1/	4	2.4392	2.2357	2.1368	6.8117	2.5
Velsicol 3/	2	2.6715	2.4077	2.1368	7.2160	2.6
Velsicol 3/	3	2.7876	2.2930	2.4833	7.5639	2.8
Velsicol 3/	4	2.8457	1.8917	2.5988	7.3362	2.7
Clipping	0	2.0326	2.3503	3.0030	7.3859	2.7
Companion crop	0	3.0199	1.9491	1.7903	6.7593	2.5
Bromoxynil 2/	¼	2.3230	3.0382	2.4833	7.8445	2.8
Bromoxynil 2/	5/16	2.4392	2.0637	2.8875	7.3904	2.7
Bromoxynil 2/	3/8	2.2069	2.5796	2.8875	7.6740	2.8
Bromoxynil 2/	½	2.8457	2.6943	3.2918	8.8318	3.2

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

$\bar{x}$	2.6
F. value for treatment comparison	1.05
S.E.$\bar{x}$	.2328
L.S.D.	N.S.
C.V.%	8.99

TITLE: Control of spring and winter annuals in winter wheat.

PROJECT: Weed Investigations MS 754

YEAR: 1970

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

LOCATION: Northwestern Montana Branch Station, Field No. R-3c, R-2b and Burton Isch farm, Route 4, Kalispell, Montana.

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 residule effectiveness of fall applied herbicides on spring emerging annuals.
3. To find herbicides that will effectively control red spurry (Spergularia ruba (L.)).
4. To determine the effectiveness of granular triallate for wild oat control in spring barley.

SIGNIFICANT FINDINGS:

1. Linuron, diuron and terbutryn did not provide effective control of spring emerging annuals when fall applied.

2. BAS 2440 was the most effective for control in downy brome grass.

3. Red spurry can be effectively controlled with maloran, linuron and terbutyrn when spring applied.

4. Granular formulation of triallate gave more effective control than EC formulation.

MATERIALS AND METHODS:

Five individual tests were conducted in 1969-70. A total of ten herbicides were used in the experiments and are found in Table 1.

The predominate weed species being studied were field gromwell (Lithospermum arvense (L.)); red spurry (Spergularia rubra (L.)); downy brome (Bromus tectorum (L.)) and wild oats (Avena fatua (L.)).

Herbicides were applied to established stands in winter wheat. Plots were 10' x 20' (200 sq. ft.) in the replicated studies; 10' x 110' (1100 sq. ft.) in the strip test. Applications were made at right angles to the grain rows. All herbicides were applied in an aqueous solution at 44.5 gpa, except the granular materials.

Materials and Methods (con't)

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

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

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 square feet being harvested to determine yields. The strip tests were harvested with a field combine.

RESULTS AND DISCUSSION

Experiment I

The products used in the experiment all provide fairly effective weed control of gromwell. Terbutryn did not control spring emerging mustard. Wild buckwheat which emerged in the spring was not adequately controlled with the combination of Bromoxynil and linuron or Bromoxynil and diuron. See table 3 for a discussion on each treatment. Stand loss occurred in the tracks where the tractor had traveled in the linuron and diuron treatment and combination. Stand loss was seen in the higher rate of linuron, diuron and terbutryn.

Yield data found in table 4 was not found to be statistically different, but there was a reduction in yield of the weedy check (39.8 bu/A) and linuron at 1 lb/A (45.6 bu/A). In other treatments the yields do vary little.

Experiment II

This study was established on a natural stand of downy brome, and the third replication extended in to an established stand of Nugaines winter wheat. The stand of downy brome was quite variable. Some of the area had been trippled harrowed and where the harrow missed, that is it did not "double over" there were large vigorous plants which were much too large for that herbicide to be effective.

BAS 2440 was the only product that provided a fair degree of control at about 70%. There was also no apparent visual wheat injury with the product. See table 5 for complete tabulation of the data.

Experiment III

Weed scores shown in table 6 are for red spurry. The other species present are considered under remarks in the table. Maloran, linuron and terbutyrn gave good control of red spurry. Maloran caused a reduction in stand at 1 lb/A.

Yields were found to be non significant, however the check yields (37.4 bu/A) was lower than the average (46.9 bu/A). Maloran at .5 lb/A was the highest yielding treatment (58.0 bu/A). Table 7.

Results and Discussion:(con't)

Experiment IV

This test compares packaged formulations and tank mixes of the same herbicides with a surfactant and with liquid fertilizer (N).

Amchem 69-386[1/] plus a surfactant treatment had a poor stand in one end of the strip and no doubt accounts for the lower yield (36.6 bu/A) than in the tank mix of Bromoxynil and diuron with the surfactant (45.0 bu/A). However, the weed control was somewhat better with the tank mix.

The addition of 21.2 lbs/A of nitrogen did not affect the check yields and the difference that appears between similar treatments are not significant. Table 8.

The most effective weed control was secured with a combination of bromoxynil .25 lbs/A plus diuron .3 lbs/A with a surfactant. Yields in this treatment were 45.0 bu/A compared with the average of 45.7 bu/A. Highest yields were from the treatment consisting of bromoxynil plus linuron plus N. (57.9 bu/A), however weed control was lower in this treatment.

Experiment V

Granular triallate was compared at various rates and with the EC formulation of triallate in this study. Granular material was applied with a "cyclone" type spreader. Up to 80% control of wild oats was secured with the granular form of triallate. No control was obtained with the EC formulation in this study. This is not readily explainable by the author. This plot also had the highest yield. Table 9 shows the tabulated data from this study.

Table 1. Herbicides used in the experiments.

Common Name	Trade Name or other	Chemical Name	Company
triallate	Fargo	2,3,3-trichloroallyl NN-dusopropyl-thiolcarbamate	Monsonto
bromoxynil	Brominal Buctril	3,5-dibromo-4-hydroxybenzonitrile(4-cyano-2,6-dibromophenol)	
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
	BASF 2440	1-phenyl-4-amino-s-bromo-pyridazon-6 plus N-[1-or 2-(3a,4,5,6,7,7a-hexahydro) 4,7-methano-indanyl]-N'-dimethyl-urea	BASF
	R 11913	3'-(N esopropylcarbamoyloxy propion-anilide	Stauffer
	Maloran	-3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea	CIBA
	CP 52223	2-chloro-N-(isobutoxymethyl)2',6' ace-toxylidide	Monsanto

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

Experiment	Temperature °F	Humidity %	Wind Velocity Mph	Cloud Cover	Date
1	46	85	Calm	Cloudy	10/31/69
2	46	50	Calm	Cloudy & Raining	10/10/69
3	40	54	Calm[1/]	Partly cloudy	4/10/70
4	40	40	Calm	Partly cloudy	4/16/70
5	42	53	Calm	Partly cloudy	5/21/70

1/ Wind 4-8 miles per hour when applying terbutryn.

Table 3. Weed scores and remarks on weed species from winter wheat (Nugaines) treated with herbicides for control of field gromwell (Lithospermum arvense) and other winter annuals. Northwestern Montana Branch Station, Route 4, Kalispell, Montana in 1970. Field No. R-3. Exp. I

Treatment		Weed Score				
Herbicide	Rate #/A	I	II	III	$\bar{x}$	Remarks
Bromoxynil	¼	9	7	7	8	Few gromwell, wild buckwheat, false flax, mustard, cheatgrass.
Bromoxynil	3/8	9	8	7	8	False flax, wildbuckwheat, few gromwell, purple mustard.
Linuron	¼	9	7	7	8	False flax, few gromwell, some mustard, wild buckwheat, purple mustard.
Linuron	½	9	8	8	8	Wild buckwheat, purple mustard, some gromwell blooming.
Linuron	1	9	8	9	9	Considerable reduction in stand. Purple mustard, gromwell & wild buckwheat.
Diuron	¼	8	7	7	7	Large gromwell, some mustard & buckwheat.
Diuron	½	9	8	8	8	Some gromwell, buckwheat & purple mustard.
Diuron	1	10	9	10	9	Good control, some wild buckwheat.
Terbutryn	½	7	7	8	7	Considerable wild buckwheat, gromwell & mustard, false flax.
Terbutryn	1	8	9	7	8	Few mustard, buck wheat, gromwell, some stand reduction.
Terbutryn	1.5	9	8	9	9	Buckwheat, some mustard, very little gromwell.
Bromoxynil + linuron	¼ + ¼	7	8	9	8	Gromwell, false flax, buckwheat, mustard.
Bromoxynil + linuron	¼ + ½	9	8	9	9	Wild buckwheat, few gromwell, mustard. Rep. 2, reduction in stand, almost 50%.
Bromoxynil + linuron	3/8 + ¼	9	9	7	8	Mustard & purple mustard, false flax, gromwell & wild buckwheat.
Bromoxynil + linuron	3/8 + ½	10	8	9	9	Wild buckwheat, purple mustard, some stand reduction.
Bromoxynil + diuron	¼ + ¼	9	8	8	8	Gromwell, mustard, false flax, purple mustard, buckwheat. Rep. 2, reduction in stand.
Bromoxynil + diuron	¼ + ½	8	7	8	8	Mustard, purple mustard, buckwheat, gromwell, false flax, Rep. 2, stand reduction noticeable.
Bromoxynil + diuron	3/8 + ¼	8	9	9	9	Some gromwell, wild buckwheat, mustard, false flax, Rep. 2, considerable reduction in stand.
Bromoxynil + diuron	3/8 + ½	9	9	9	9	Few buckwheat, some mustard, Rep. 2, reduction in stand.
Check	0	0	0	0	0	No control.

Table 4. Yield and weed control data from winter wheat (Nugaines) treated with various herbicides. Northwestern Montana Branch Station, Rt.4, Kalispell, Montana in 1970. Field No. R-3. Plot size 18.50 sq. ft. Experiment I.

Treatment		Yield Bu/A					Weed Control
Herbicide	Rate #/A	I	II	III	Total	$\bar{x}$	0-10 1/
Bromoxynil	1/4	43.9	75.0	54.6	173.5	57.8 ✓	8
Bromoxynil	3/8	42.7	57.6	66.1	166.4	55.5 ✓	8
Linuron	1/4	61.1	65.0	34.7	160.8	53.6	8
Linuron	1/2	54.8	59.7	55.7	170.2	56.7	8
Linuron	1	51.3	48.7	36.7	136.7	45.6	9
Diuron	1/4	53.9	65.6	59.8	179.3	59.8	7
Diuron	1/2	54.3	59.3	50.4	164.0	54.7	8
Diuron	1	39.8	58.9	68.4	167.1	55.7	9
Terbutryn	1/2	39.7	62.2	52.7	154.6	51.5	7
Terbutryn	1	58.6	51.3	57.7	167.6	55.9	8
Terbutryn	1.5	62.6	54.4	54.2	171.2	57.1	9
Bromoxynil + linuron	1/4 + 1/4	58.2	59.8	57.2	175.2	58.4	8
Bromoxynil + linuron	1/4 + 1/2	69.4	61.9	34.3	165.6	55.2	9
Bromoxynil + linuron	3/8 + 1/4	53.2	56.6	61.7	171.5	57.2	8
Bromoxynil + linuron	3/8 + 1/2	63.8	55.3	38.8	157.9	52.6	9
Bromoxynil + diuron	1/4 + 1/4	58.7	51.6	48.1	158.4	52.8	8
Bromoxynil + diuron	1/4 + 1/2	57.1	57.1	40.5	154.7	51.6	8
Bromoxynil + diuron	3/8 + 1/4	58.2	53.8	59.8	171.8	57.3	9
Bromoxynil + diuron	3/8 + 1/2	59.5	63.1	43.3	165.9	55.3	9
Check	0	44.0	36.9	38.5	119.4	39.8 ✓	0

1/ 0 = no control, 10= complete control

$\bar{x}$	54.2
S.E.$\bar{x}$	5.45112
L.S.D.	N.S.
C.V.%	10.06

Table 5. Effect of several herbicides on a natural stand of downy brome Bromus tectorum (L). On the Burton Isch Farm, Route 4, Kalispell, Montana in 1970. Experiment II.

Treatment		Weed Score				
Herbicide	Rate #/A	I	II	III	$\bar{x}$	Remarks
Terbutryn	.5	2	7	4	4	larger cheatgrass not controlled, small plants missing. No wheat injury.
Terbutryn	1.0	2	4	6	4	larger cheatgrass not controlled, small plants missing. No wheat injury.
R 11913	.5	2	7	0	3	small plants controlled, if larger not controlled, no wheat injury.
R 11913	1.0	2	6	5	4	small plants controlled, if larger not controlled, no wheat injury.
R 11913	1.5	2	2	3	2	no gromwell controlled, no wheat injury, no control of broadleaves.
Linuron	.5	3	6	3	4	no wheat injury.
Linuron	1.0	4	7	4	5	no wheat injury, fair control of broadleaves.
Diuron	.5	1	8	4	4	maybe some stand reduction, good control of broadleaves.
Diuron	1.5	4	2	8	5	no wheat injury, effective weed control.
BASF 2440	1.0	6	6	4	5	large cheatgrass not controlled, smaller ones controlled, fairly good control, no wheat injury.
BASF 2440	2.0	7	8	7	7	good control, no wheat injury.
Check	0	0	0	0	0	no control, no wheat injury.

Table 6. Weed scores and remarks on other species from winter wheat (Crest) treated with herbicides for control of red spurry (Spergularia ruba (L)). Northwestern Montana Branch Station, Route 4, Kalispell, Montana, 1970. Field No. R-2b.

Treatment		Weed Score				
Herbicide	Rate #/A	I	II	III	$\bar{x}$	Remarks
Bromoxynil	3/8	0	0	0	0	good to excellent control of broadleaves, but no control of red spurry.
Bromoxynil + MCP	3/8 3/8	5	7	6	6	good control of all broadleaves, fair to good control of red spurry.
BASF 2440	1.0	0	3	1	1	partial control of fanweed, leaves false flax and little reduction of spurry.
BASF 2440	2.0	4	4	6	5	leaves some fanweed, false flax and spurry, overall weed control.
CP 52223	1.5	5	1	0	2	leaves fanweed, false flax, some degree of spurry control.
CP 52223	2.5	7	0	0	2	no control of fanweed, gromwell, false flax or mustard, some control of red spurry.
Maloran	.5	8	6	6	7	fair reduction of all weeds, maybe some injury to grain.
Maloran	1.0	9	9	10	9	excellent control of weeds, perhaps some thinning of stand.
Linuron	.5	8	8	9	8	fairly good weed control, excellent control of fanweed, few red spurry.
Linuron	1.0	10	9	10	10	excellent control of all species, very clean.
Terbutryn	1.0	9.5	9	9	9	fairly good weed control, few wildbuckwheat and gromwell.
Terbutryn	1.5	9	10	10	10	few scattered weeds.
Check (weedy)	0	0	0	0	0	no control, check.

Table 7. Yield and weed control data from herbicide study on winter wheat (Crest) applied for the control of red spurry (Spergularia rubra (L) Northwestern Montana Branch Station, Route 4, Kalispell, Montana in 1970. Field No. R-2b. Plot size, 18.75 sq. ft. Experiment III.

Treatment		Yield in Grams				Yield	Weed Control
Herbicide	Rate #/A	I	II	III	Total	Bu/A	0-10[1]
Bromoxynil	3/8	594	475	555	1624	46.2	0
Bromoxynil + MCP	3/8 +3/8	335	645	589	1569	44.6	6
BASF 2440	1.0	474	537	586	1597	45.4	1
BASF 2440	2.0	534	592	637	1763	50.2	5
CP 52223	1.5	388	564	380	1332	37.9	2
CP 52223	2.5	500	577	590	1667	47.4	2
Maloran	.5	615	692	733	2040	58.0	7
Maloran	1.0	568	455	773	1796	51.1	9
Linuron	.5	660	478	694	1832	52.1	8
Linuron	1.0	680	533	616	1829	52.0	10
Terbutryn	1.0	368	474	682	1524	43.4	9
Terbutryn	1.5	610	330	600	1540	43.8	10
Check (weedy)	0	387	405	521	1313	37.4	0

1/ 0 = no control, 10 = complete control

$\bar{x}$	46.9
F.	1.50N.S.
S.E.$\bar{x}$	4.8122
C.V.%	10.26

Table 8. Yield and weed control data from stripe test using herbicides for weed control. Northwestern Montana Branch Station, Route 4, Kalispell Montana in 1970. Field No. R-2. Plot size, 1100 sq. ft. Exp. IV

Treatment			Dock-	Yield	Test	Weed
Herbicide	Rate #/A	Weight #/Plot	age %	Bu/A	Weight	Control 0-10[5]
Amchem 69-386[1]	1[2]	58	.6	44.7	59.1	0
Amchem 69-386[1] + surfactant	1[2] + .5%[3]	48	1.8	36.6	59.5	5
Amchem 69-386[1] + 32% N(L.)	1[2] + 6 g[4]	54	1.2	41.4	60.0	4
Bromoxynil + linuron	.25 + .25	60	1.4	46.0	60.5	3
Bromoxynil+linuron+surfactant	.25+.25+5%[3]	68	.2	52.7	60.0	7
Bromoxynil+linuron+32%N(L)	.25+.25+6g.	75	.6	57.9	59.7	4
Bromoxynil + diuron	.25 + .3	64	0.0	49.7	59.9	7
Bromoxynil+diuron+surfactant	.25+.3+5%[3]	58	0.0	45.0	60.0	8
Bromoxynil+diuron+32%N	.25+.3+6g.[4]	57	.2	44.2	60.1	7
32% N(L)	6 gal[4]	55	1.6	42.0	59.9	0
Check	0	55	.2	42.6	59.5	0
			$\bar{x}$	45.7		

1/ 30% diuron, 25% bromoxynil
2/ 3 lbs/A diuron, .25 lbs/A bromoxynil
3/ 5% by volume of surfactant
4/ 21.2 lbs of N/A

Table 9. Effect of various formulations of triallate in the control of wild oats (Avena fatua L.) in spring barley. Plot size 6520 sq. ft.

Herbicide	Formulation	Rate #/A	Yield #/plot	Yield #/A	% Weed Control
Triallate	granular	1.0	405	2705	80
Triallate	granular	1.25	380	2539	80
Triallate	granular	1.50	400	2672	65
Triallate	granular	2.00	415	2773	80
Triallate	EC	1.25	485	3240	0
Check	0	0.0	380	2539	0

TITLE: Sainfoin seeding rate, row spacing and competition

PROJECT: Forage Investigations MS 755

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

LOCATION: Northwestern Montana Branch Station

DURATION: Planted 1968 through 1971

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

PROCEDURE: 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. The trial was irrigated two times during the 1970 growing season.

RESULTS AND DISCUSSION:

The highest yielding entry was sainfoin at 15#/A with Oahe intermediate wheatgrass at 6#/A with a yield of 2.96 T/A, Table 1. The individual degrees of freedom test (Table 2) gives better insight on the influence of the various treatments and their interaction than the multiple range test. When sainfoin was seeded alone in 6" or 12" rows, seeding rates of 15#/A or 30#/A did not influence the 1970 yields significantly, whereas the 30#/A rate was significantly better in 1969 (comparison A). On the other hand, when sainfoin was seeded alone, the row widths of 6" or 12" did not influence the 1969 or 1970 yield significantly (comparison B). In 1970 the interaction of seeding rate X row spacing (comparison C) was significant with a considerable decrease in yield as the seeding rate was increased from 15#/A to 30#/A with the 6" spacing while there was a slight yield increase as the seeding rate was increased from 15#/A to 30#/A with the 12" spacing. The rate X row width interaction was not significant in 1969. The sainfoin grass mixtures yielded significantly more than sainfoin alone in the 1970 study, which is the reverse of the 1969 results (comparison H). 'Oahe' intermediate wheatgrass plus sainfoin yielded significantly more than 'Latar' orchardgrass plus sainfoin in 1970, while no significant difference was observed in 1969 (comparison E). The row types X grass species mixtures interaction (comparison G) was significant with the 'Latar' plus sainfoin yielding considerably more in 12" alternate rows than in 6" rows while Oahe plus sainfoin combinations yielded nearly the same in the two row types. There was no significant interaction in 1969. In 1970 and 1969 there was no significant difference between the sainfoin in 12" rows which had been seeded with a companion crop of Hypana barley and sainfoin seeded in 24" rows (comparison D). Also no significant difference was detected between sainfoin plus barley and 24" rows verus the other 8 combinations in 1970 while the sainfoin plus barley and sainfoin in 24" rows yielded significantly less than the other eight treatments (comparison I) in 1969.

Table 1. Sainfoin seeding rate, row spacing and competition influence on 1970 yields in T/A at 12% moisture. Planted in 1968 in Field Y-6.

Entry	Cut	Replications 1	2	3	4	x
Sainfoin in 1' rows at 15#/A	1	1.86	1.56	1.75	1.89	1.77
	2	.94	.88	.96	1.11	.97
	Total	2.80	2.44	2.71	3.00	2.74ab 1/
Sainfoin in 1' rows at 30#/A	1	1.66	1.41	1.70	1.44	1.55
	2	.90	.58	.74	.68	.73
	Total	2.56	1.99	2.44	2.09	2.27c
Sainfoin in 6" rows at 30#/A	1	1.68	1.57	1.60	1.73	1.65
	2	.73	.67	.69	.78	.72
	Total	2.41	2.24	2.29	2.51	2.36bc
Sainfoin in 6" rows at 15#/A with Latar at 3#/A	1	1.24	1.75	1.47	1.47	1.48
	2	.72	.76	.70	.68	.72
	Total	1.96	2.51	2.17	2.15	2.20c
Sainfoin in 6" rows at 15#/A with Oahe at 6#/A	1	2.17	2.14	2.17	2.14	2.16
	2	.73	.91	.68	.88	.80
	Total	2.90	3.05	2.85	3.02	2.96a
Sainfoin in 6" rows at 15#/A	1	1.61	1.52	1.46	1.22	1.45
	2	.81	.81	.78	.68	.77
	Total	2.42	2.33	2.24	1.90	2.22c
Sainfoin in 12" rows at 15#/A with Hypana barley in 12" rows at 30#/A	1	1.60	1.74	1.93	1.74	1.75
	2	.81	.91	.88	.84	.86
	Total	2.41	2.65	2.81	2.58	2.61abc
Sainfoin at 15#/A in alternate 12" rows with Latar at 3#/A	1	2.27	2.14	1.87	2.27	2.14
	2	.75	.76	.73	.78	.76
	Total	3.02	2.90	2.60	3.05	2.89a
Sainfoin at 15#/A in alternate 12" rows with Oahe at 6#/A	1	2.51	2.02	2.64	1.73	2.23
	2	.86	.79	.63	.51	.70
	Total	3.37	2.81	3.27	2.24	2.92a
Sainfoin in 2' rows at 15#/A	1	1.32	1.60	1.79	1.79	1.63
	2	.76	.84	.91	.75	.82
	Total	2.08	2.44	2.70	2.54	2.44bc

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

C.V. = 5.2%

ANOVA for 1970 Yields

Source	D.F.	M.S.
Treatments	9	0.3622**
Replications	3	0.0222 N.S.
Error	27	0.0711
Total	39	

** Significant at the .01 level of probability
N.S. Non-significant at the .05 level of probability

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	-1	+1	-1	+1						
B	-1	-1	+1	+1						
C	-1	+1	+1	-1						
D									-1	+1
E					-1	+1	-1	+1		
F					-1	-1	+1	+1		
G					-1	+1	+1	-1		
H	-1	-1	-1	-1	+1	+1	+1	+1		
I	-1	-1	-1	-1	-1	-1	-1	-1	+4	+4

ANOVA for Individual Degrees of Freedom

Source	D.F.	M.S. 1970	M.S. 1969
Treatments (9)			
A - Sainfoin 15#/A vs 30#/A	1	.1073	.5329**
B - Sainfoin 6" vs 12" row	1	.1785	.0100
C - Interaction seeding rate X row width	1	.3691*	.0484
D - Sainfoin plus barley vs 24" rows sainfoin	1	.0595	.0465
E - Sainfoin plus 'Oahe' vs sainfoin plus 'Latar'	1	.6202**	.0123
F - Sainfoin plus grass in 6" vs 12" alternate rows	1	.4389*	10.9560**
G - Interaction grass species X row type	1	.5293*	.0182
H - Sainfoin alone vs Sainfoin plus grass	1	.9453**	4.0045**
I - Sainfoin plus barley and sainfoin 24" rows vs others	1	.0123	14.9818**
Replications	3		
Error	27		
Total	39		

* Significant at the .05 level of probability
** Significant at the .01 level of probability

TITLE: Interstate sainfoin variety trial

PROJECT: Forage investigations MS 755

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

LOCATION: Northwestern Montana Branch Station

DURATION: Planted 1968 through 1971

OBJECTIVES: Determine the forage yielding ability 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. Water was applied twice to the irrigated trial during the growing season.

RESULTS AND DISCUSSION:

No significant difference in yield was observed in the irrigated trial (Table 1). Ladak 65 was the highest yielding entry followed closely by Canada and Persian sainfoins. Yields in this and all irrigated trials were extremely low this season which may have been due to expensive fall grazing of the irrigated fields the previous season.

Under dryland conditions, the highest yielding entry was Eski (Table 2). The entries Regrowth, Persian and Ladak 65 yielded significantly less than Eski.

Considerable bluegrass invasion was present in both nurseries.

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

	Cut	Yield T/A 1	2	3	4	$\bar{x}$
Eski	1	1.73	1.45	1.95	1.85	
	2	.44	.44	.46	.39	
	Season	2.17	1.89	2.41	2.24	2.18
Regrowth	1	1.50	1.60	1.43	2.03	
	2	.67	.70	.74	.39	
	Season	2.17	2.30	2.17	2.42	2.27
White	1	1.78	1.95	1.75	1.63	
	2	.37	.46	.53	.75	
	Season	2.15	2.41	2.28	2.38	2.31
Augusta	1	1.78	1.65	1.47	1.55	
	2	.28	.40	.40	.31	
	Season	2.06	2.05	1.87	1.86	1.96
Ladak	1	2.80	1.30	1.25	1.95	
	2	1.14	.55	.72	.93	
	Season	3.94	1.85	1.97	2.88	2.66
Canada	1	2.32	1.98	1.57	2.10	
	2	.45	.48	.71	.77	
	Season	2.77	2.46	2.28	2.87	2.60
Persian	1	1.33	1.42	2.33	2.40	
	2	.70	.66	.63	.73	
	Season	2.03	2.08	2.96	3.13	2.55

ANOVA for irrigated yield trial

Source	D.F.	M.S.
Entries	6	.2578 NS
Replications	3	.2242 NS
Error	18	.2015
Total	27	

C.V. = 9.5%
L.S.D. = N.S.

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

	Cut	Yield T/A 1	2	3	4	x
Eski	1	2.20	2.07	1.47	1.43	
	2	.73	.54	.47	.45	
	Total	2.93	2.61	1.94	1.88	2.34(check)
Regrowth	1	.97	.87	1.38	.88	
	2	.65	.45	.64	.48	
	Total	1.62	1.32	2.02	1.36	1.58*
White	1	2.25	1.32	1.55	1.95	
	2	.57	.35	.35	.43	
	Total	2.82	1.67	1.90	2.38	2.20N.S.
Augusta	1	1.43	1.57	1.70	1.60	
	2	.79	.57	.68	.57	
	Total	2.22	2.14	2.38	2.17	2.23N.S.
Ladak	1	1.42	.70	.87	.57	
	2	1.06	.55	.66	.77	
	Total	2.48	1.25	1.53	1.34	1.65*
Canada	1	1.68	1.27	1.55	1.95	
	2	.54	.60	.64	.51	
	Total	2.22	1.87	2.19	2.46	2.19*
Persian	1	1.65	.88	1.35	.73	
	2	.64	.44	.61	.27	
	Total	2.29	1.32	1.96	1.00	1.59*

* Significantly different than check at .05 probability level
NS Not significantly different than check at .05 probability level

ANOVA for dryland yield trial

Source	D.F.	M.S.
Entries	6	.4404*
Replications	3	.5633*
Error	18	.1338
Total	27	

C.V. = 9.3%
L.S.D. = .544

TITLE: Sainfoin inoculation strains USDA

PROJECT: Forage investigations MS 755

PERSONNEL: A. J. Jarvi and A. E. Carleton, cooperator

LOCATION: Northwestern Montana Branch Station

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 5 rows with the center row of each plot being inoculated and hand planted. The two border rows on each side of the inoculated row were planted with the nursery planter.

The trial 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 on June 22, 1970. Yields per 20 ft. of row are converted to tons dry matter per acre.

RESULTS AND DISCUSSION:

There was no significant difference between any of the inoculants and/or the non-inoculated check (Table 1). There was no significant difference between yield of Eski and Hall. The only significant variety x inoculation interaction found was with s3 which reduced the mean yield of Hall while increasing the yield of Eski. In general it appears that the inoculums may have been more effective in increasing yield with Hall than Eski (Table 2), although this is non-significant. The yield advantage of Hall over Eski in this test is contrary to results obtained from other tests.

Nodules were present on all plants examined but whether the relationship with the host is parasitic or symbiotic is open to question. No great differences in vigor or color were noted between inoculated and non-inoculated rows. It appears that no superior strains are present in this trial.

Table 1. Yields of Eski and Hall sainfoin when inoculated with six inoculums and non-inoculated, Northwestern Montana Branch Station in 1970.

Inoculum Strain	Sainfoin Variety	Replications T/A I	II	III	IV	$\bar{x}$
I-1 3G2ela	Eski	1.63	1.07	1.25	2.63	1.65
	Hall	2.69	1.57	2.07	2.44	2.19
I-2 3G2c2	Eski	2.19	1.69	1.88	2.13	1.97
	Hall	3.26	2.75	2.19	2.13	2.58
I-3 3G1c1(a)	Eski	2.75	1.69	1.75	2.63	2.21
	Hall	1.94	1.57	1.19	1.19	1.47
I-4 3I7a4	Eski	2.32	1.75	1.63	1.94	1.91
	Hall	2.38	2.57	1.57	1.50	2.01
I-5 eG2c4	Eski	2.19	1.57	.82	1.07	1.41
	Hall	3.19	1.38	1.69	2.57	2.21
I-6 3F6g3	Eski	1.69	1.19	1.84	1.00	1.43
	Hall	1.69	1.75	1.44	1.57	1.61
Non-inoculated check	Eski	.62	2.44	1.50	2.19	1.69
	Hall	1.12	2.94	1.94	1.00	1.75

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

Source of Variation	D.F.	Mean Square
Inoculums	6	0.4331 N.S.
Replications	3	0.5683 N.S.
Error (a)	18	0.4543
Varieties	1	0.6953 N.S.
Varieties x Inoculums	6	0.5130*
Error (b)	21	0.1853
Total	55	

* Significant at .05 level of probability

Table 2. Effects of inoculums on yield of Eski and Hall sainfoin in 1970.

Treatment	Yield in T/A			d-d 1/
	Eski	Hall	$\bar{x}$	
I-1 3G2ela	1.65	2.19	1.92	0.48
I-2 3G2c2	1.97	2.58	2.28	0.55
I-3 3G1c1(a)	2.21	1.47	1.84	0.80*
I-4 3I7a4	1.91	2.01	1.96	0.04
I-5 eG2c4	1.41	2.21	1.81	0.74
I-6 3F6g3	1.43	1.61	1.52	0.12
Non-inoculated	1.69	1.75	1.72	--
$\bar{x}$	1.75	1.97	1.86	

L.S.D. .05 for inoculums = NS CV = 18.1%
L.S.D. .05 for varieties = NS CV = 11.6%
L.S.D. .05 for varieties x inoculums = 0.80 CV = 11.6%
* Significant at .05 level of probability
1/ The difference between two differences (interaction calculations)
(Check Hall - Check Hall) - (I x Hall - I x Eski) = d-d in T/A.

TITLE: Evaluation of Eski sainfoin in irrigated pasture mixtures.

PROJECT: Forage Investigations MS755

PERSONNEL: A. J. Jarvi and C. S. Cooper, cooperator

LOCATION: Northwestern Montana Branch Station, 1970

DURATION: Terminated 1970

OBJECTIVES: Evaluate Eski sainfoin as a pasture legume both alone and in mixtures.

PROCEDURES: Plots were planted in 1967 in RCB design with four replications in field Y-3. In 1970 harvest area consisted of 36 square feet the first cutting and 40 square feet the other three. Four harvests were taken on the following dates: May 24, June 25, July 24 and August 21.

RESULTS AND DICUSSION:

At the first harvest date little or no sainfoin and Ladino clover were present in the stands. As a result sainfoin made no contribution to the seasons yield. Ladino clover came back and made some contribution to later harvests. Kentucky bluegrass, dandelion and other weeds were in place of sainfoin stands. Mixtures containing trefoil appeared to be better this season. Seasonal yields of all entries were exceptionally low this year (Table 1). Total yields for 1968, 1969 and 1970 as well as three year totals are summarized in Table 2. These plots were harvested for yield four times each year at the monthly intervals, then sheep were allowed to graze them in the fall. This amounts to five harvests with no control on intensity of the last harvest. It is doubtful if many perennial plants can withstand this type of management in which there is no opportunity for accumulation of root reserves.

Table 1. Yields[1/] of fifteen pasture mixtures at Northwestern Montana Branch Station in 1970.

Entry	Cutting	Replications T/A I	II	III	IV	$\bar{x}$
Orchardgrass	1	.45	.62	.67	.19	.48
	2	.28	.39	.46	.37	.38
	3	.15	.16	.21	.17	.17
	4	.15	.18	.20	.23	.19
	Season	1.03	1.35	1.54	.96	1.35abc[2/]
Orchard - Trefoil	1	.74	.57	.57	.70	.65
	2	.36	.38	.32	.43	.37
	3	.21	.25	.17	.29	.23
	4	.15	.23	.13	.19	.18
	Season	1.46	1.43	1.19	1.61	1.41abc
Orchard - sainfoin	1	.47	.53	.59	.60	.55
	2	.42	.36	.34	.42	.39
	3	.21	.19	.17	.19	.19
	4	.18	.16	.08	.18	.15
	Season	1.28	1.24	1.18	1.39	1.27abcd
Orchard - ladino	1	.61	.45	.71	.47	.56
	2	.27	.29	.27	.22	.26
	3	.18	.17	.19	.13	.17
	4	.21	.27	.24	.09	.20
	Season	1.27	1.18	1.41	.91	1.19bcde
Orchard - Trefoil - sainfoin	1	.54	.54	.81	.83	.68
	2	.42	.42	.47	.47	.45
	3	.18	.20	.24	.29	.23
	4	.15	.23	.21	.17	.19
	Season	1.29	1.39	1.73	1.76	1.54a
Orchard - Ladino - sainfoin	1	.43	.48	.58	.64	.53
	2	.22	.38	.32	.43	.37
	3	.12	.20	.20	.18	.18
	4	.08	.14	.22	.14	.15
	Season	.85	1.20	1.32	1.39	1.12cde
Bromegrass	1	.57	.76	.91	.76	.75
	2	.22	.22	.27	.23	.24
	3	.09	.17	.16	.20	.16
	4	.08	.09	.11	.06	.09
	Season	.96	1.24	1.45	1.25	1.22bcde
Brome - trefoil	1	.62	.79	.61	.98	.75
	2	.39	.45	.33	.43	.40
	3	.17	.19	.22	.18	.19
	4	.09	.20	.13	.16	.15
	Season	1.27	1.63	1.29	1.75	1.48ab

Table 1. (con't)

Entry	Cutting	Replications T/A I	II	III	IV	$\bar{x}$
Brome - sainfoin	1	.60	.54	.97	.67	.70
	2	.24	.20	.24	.29	.24
	3	.14	.18	.10	.17	.15
	4	.07	.04	.11	.09	.08
	Season	1.05	.96	1.42	1.22	1.16cde
Brome - ladino	1	.38	.45	.47	.50	.45
	2	.36	.32	.43	.33	.36
	3	.20	.24	.33	.27	.26
	4	.12	.11	.14	.09	.12
	Season	1.06	1.12	1.37	1.19	1.18bcde
Brome - trefoil - sainfoin	1	.83	.75	.77	.98	.83
	2	.35	.25	.34	.41	.34
	3	.16	.13	.16	.21	.17
	4	.07	.05	.02	.09	.06
	Season	1.41	1.18	1.29	1.69	1.39abc
Brome - ladino - sainfoin	1	.61	.19	.41	.28	.37
	2	.24	.35	.29	.20	.27
	3	.22	.28	.22	.30	.26
	4	.15	.25	.10	.08	.15
	Season	1.22	1.07	1.02	.86	1.03def
Sainfoin	1	.44	.62	.67	.19	.48
	2	.09	.28	.20	.15	.18
	3	.13	.28	.13	.38	.22
	4	.04	.06	.06	.03	.05
	Season	.70	1.09	1.06	.74	.93ef
Sainfoin - trefoil	1	.67	.84	.95	.57	.76
	2	.28	.24	.20	.21	.23
	3	.18	.29	.21	.24	.23
	4	.14	.10	.08	.12	.11
	Season	1.27	1.47	1.44	1.14	1.33abc
Sainfoin - ladino	1	.24	.14	.13	.27	.20
	2	.24	.37	.33	.33	.32
	3	.25	.25	.24	.25	.25
	4	.04	.05	.08	.10	.07
	Season	.77	.81	.78	.95	.83f

1/ All sainfoin stands essentially lost in 1970 from all mixtures, pure sainfoin plots contained mostly bluegrass, white clover, dandelions and Ladino clover.

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

Table 1. (con't)

Cuttings	L.S.D. (.05)	CV = sȳ/y
1	.19	11.4%
2	.08	8.4%
3	.06	10.6%
4	.06	17.0%
Season	.26	7.4%

ANOVA for 15 pasture mixtures, 1970

Source	D.F.	1st cut	2nd cut	3rd cut	4th cut	Season
Replications	3	.0398 N.S.	.00334N.S.	.00858**	.0236 N.S.	.088 N.S.
Mixtures	14	.1149**	.02308**	.00581**	.105**	.160**
Error	42	.0180	.00278	.00181	.0186	.0331
Total	59					

Table 2. Total season yields of 15 pasture mixtures at Northwestern Montana Branch Station in 1968, 1969 and 1970.

	Tons/Acre			
	Year			
Entry	1968	1969	1970	3 yr. Total
Orchardgrass	2.64	2.75	1.35	6.74
Orchard - trefoil	3.69	3.16	1.41	8.26
Orchard - sainfoin	2.70	2.78	1.27	6.75
Orchard - ladino	4.14	3.26	1.19	8.59
Orchard - trefoil - sainfoin	3.88	3.17	1.54	8.59
Orchard - ladino - sainfoin	4.74	3.32	1.12	9.18
Bromegrass	2.76	2.83	1.22	6.81
Brome - trefoil	3.63	2.93	1.48	8.04
Brome - sainfoin	2.96	2.58	1.16	6.70
Brome - ladino	4.63	3.52	1.18	9.33
Brome - trefoil - sainfoin	3.88	3.21	1.39	8.48
Brome - ladino - sainfoin	4.48	3.44	1.03	8.95
Sainfoin	3.18	2.67	.93	6.78
Sainfoin - trefoil	3.58	3.07	1.33	7.98
Sainfoin - ladino	4.65	3.18	.83	8.66
L.S.D. (.05)	.37	.52	.26	.68

TITLE: A comparison of Eski and a rapid regrowth sainfoin for irrigated pasture.

PROJECT: Forage Investigations MS 755

PERSONNEL: A. J. Jarvi and C. S. Cooper, cooperator

LOCATION: Northwestern Montana Branch Station, 1970

DURATION: Terminated 1970

OBJECTIVES: Evaluate Eski and a rapid regrowth sainfoin for irrigated pastures.

PROCEDURES: Plots were planted in 1968 in field Y-4 in a RCB design with four replications. Harvest area consisted of 36 square feet for the first cut and 40 square feet for the other three harvests. Four harvests were taken on the following dates: May, 24, June 25, July 24 and August 21.

RESULTS AND DISCUSSION:

As in the Eski pasture trial, at the first harvest date little or no sainfoin and Ladino were present. As a result sainfoin made little or no contribution to the seasons yields and Ladino clover came back and made some contributions to later harvests. Considerable Kentucky bluegrass and dandelion invasion also replaced the sainfoin in this study. In this study it appeared that the regrowth types presistance was no better than Eski. This seasons yields were extremely low. The 1970 seasons data is presented in Table 1 and the 1969-70 summary is presented in Table 2.

Table 1. Yields of Eski and regrowth sainfoins when grown alone and in simple mixtures at Northwestern Montana Branch Station in 1970.

Entry	Cutting	Replications T/A I	II	III	IV	$\bar{x}$
Eski	1	.30	.36	1.01	.51	.55
	2	.41	.39	.32	.24	.34
	3	.26	.24	.19	.22	.23
	4	.14	.20	.39	.32	.26
	Season	1.11	1.19	1.91	1.29	1.38bcd[1/]
Regrowth	1	.51	.81	.65	.76	.68
	2	.27	.21	.26	.22	.24
	3	.22	.21	.22	.20	.21
	4	.27	.25	.25	.20	.24
	Season	1.27	1.48	1.38	1.38	1.37cd
Eski - orchardgrass	1	.72	.89	.92	1.21	.94
	2	.20	.28	.22	.26	.24
	3	.20	.26	.22	.21	.22
	4	.32	.52	.43	.34	.40
	Season	1.44	1.95	1.79	2.02	1.80a
Regrowth - orchardgrass	1	1.09	1.06	.81	1.00	.99
	2	.20	.26	.17	.22	.21
	3	.20	.26	.17	.22	.21
	4	.27	.34	.22	.29	.28
	Season	1.76	1.92	1.37	1.73	1.69ab
Eski - ladino	1	.27	.30	.18	.10	.21
	2	.40	.38	.23	.34	.34
	3	.22	.23	.23	.27	.24
	4	.15	.15	.12	.08	.13
	Season	1.04	1.06	.76	.79	.92e
Regrowth - ladino	1	.27	.28	.36	.15	.27
	2	.37	.60	.34	.53	.46
	3	.20	.24	.21	.21	.22
	4	.23	.21	.21	.17	.21
	Season	1.07	1.33	1.12	1.06	1.16de
Eski - trefoil	1	.47	.69	.85	.87	.72
	2	.39	.39	.42	.39	.40
	3	.21	.16	.19	.18	.19
	4	.36	.41	.43	.36	.39
	Season	1.43	1.65	1.89	1.80	1.70ab
Regrowth - trefoil	1	.70	.74	.88	1.07	.76
	2	.30	.44	.45	.33	.38
	3	.18	.19	.22	.16	.19
	4	.24	.27	.31	.22	.26
	Season	1.42	1.64	1.86	1.78	1.59abc

Table 1 .(con't)

Entry	Cutting	Replications T/A I	II	III	IV	x
Eski - alfalfa	1	1.28	.60	.85	.81	.89
	2	.35	.35	.34	.38	.34
	3	.16	.22	.22	.20	.20
	4	.29	.18	.20	.13	.28
	Season	2.08	1.35	1.61	1.52	1.71ab
Regrowth - alfalfa	1	1.12	.93	.82	1.07	.99
	2	.31	.35	.36	.32	.36
	3	.19	.19	.22	.21	.20
	4	.32	.29	.27	.24	.20
	Season	1.94	1.76	1.67	1.84	1.75a
Ladino - orchardgrass	1	.85	.79	.56	.99	.80
	2	.27	.28	.32	.32	.30
	3	.23	.26	.25	.28	.26
	4	.41	.32	.27	.39	.35
	Season	1.76	1.65	1.40	1.98	1.71ab
Trefoil - orchardgrass	1	.91	1.14	.67	.79	.88
	2	.29	.36	.28	.26	.30
	3	.24	.22	.28	.21	.24
	4	.41	.38	.40	.31	.38
	Season	1.85	2.10	1.63	1.57	1.80a

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

Cuttings	L.S.D. (.05)	CV = $s_{\bar{y}}/y$
1	.28	13.3%
2	.08	8.6%
3	.04	5.8%
4	.08	10.3%
Season	.337	7.6%

ANOVA for Eski and regrowth pasture mixtures, 1970

Source	D.F.	1st cut	2nd cut	3rd cut	4th cut	Season
Replications	3	.0077 NS	.0063 NS	.0005 NS	.0040 NS	.0133 NS
Mixtures	11	.2727 **	.0216 **	.0018 *	.0288 **	.3273 **
Error	33	.0370	.0033	.0007	.0034	.0554
Total	47					

Table 2. Total season yields of Eski and regrowth sainfoin when grown alone and in simple mixtures at Northwestern Montana Branch Station in 1969 and 1970.

Entry	Tons/Acre		
	Year 1/		
	1969	1970	2 yr. Total
Eski	2.46	1.38	3.84
Regrowth	3.00	1.37	4.37
Eski - Orchardgrass	2.60	1.80	4.40
Regrowth - Orchardgrass	2.53	1.69	4.22
Eski - ladino	2.94	.92	3.86
Regrowth - ladino	3.52	1.16	4.86
Eski - trefoil	2.96	1.70	4.66
Regrowth - trefoil	2.85	1.59	4.44
Eski - alfalfa	3.23	1.71	4.94
Regrowth - alfalfa	3.40	1.75	5.15
Ladino - orchardgrass	3.56	1.71	5.27
Trefoil - orchardgrass	2.73	1.80	4.53
L.S.D. (.05)	.34	.34	--

1/ No yields taken seeding year 1968; sainfoin stands loss in 1970 and replaced by bluegrass and dandelion.

TITLE: Intrastate Legume Nursery

PROJECT: Forage Investigations MS 755

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

LOCATION: Northwestern Montana Branch Station

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 with four replications. Plots consisted of four rows with 12" between rows of 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 and was completed August 17. Three inches of water was applied August 18.

RESULTS AND DISCUSSION:

Significant differences in yield, tons/acre of dry matter were obtained the seeding year (Table 1). Tretana trefoil at 0.98 TDM/A was the highest yielding entry in the nursery. It is surprising that the trefoils with their poor seedling vigor were among the top yielding entries. The cicer milkvetch entries produced excellent stands and were showing a considerable amount of creeping between the rows, which should result in a very dense stand next year. This nursery revealed a possible explanation for some of the loss in sainfoin stands. Sheep have been allowed to graze the irrigated section of the station after all the crops have been harvested. It was evident that the sheep are very selective in grazing and managed to graze sainfoin and trefoil off at the soil surface and kept it at that level. This policy of fall grazing areas in which nurseries are located will be terminated.

Table 1. Intrastate legume trial grown at the Northwestern Montana Branch Station in 1970.

Variety	Yields in T/A dry matter				
	1	2	3	4	$\bar{x}$
Tretana trefoil	1.02	1.06	.76	1.06	.98a[1/]
ICA-6 sainfoin	.84	1.04	.95	.75	.96a
Viviloex alfalfa	1.02	.93	.93	.86	.94a
Ladak 65 alfalfa	1.05	.95	.73	.93	.92ab
Leo trefoil	1.07	.79	.90	.88	.91abc
Thor NK alfalfa	.88	.86	.86	.93	.88abcd
Melroes sainfoin	.93	.83	.86	.77	.85abcd
Tana trefoil	.83	.97	.78	.83	.85abcd
Haymor alfalfa	.93	.88	.68	.86	.84abcd
Regrowth sainfoin	1.36	.68	.57	.52	.78abcde
Lutana Cicer milkvetch	.87	.80	.70	.43	.70 bcde
PX Bridger Cicer milkvetch	.82	.73	.68	.57	.70 bcde
Sidney Cicer milkvetch	.80	1.00	.57	.39	.69 bcde
VIVA sainfoin	.65	.79	.61	.69	.67 cde
Eski sainfoin	.57	.68	.54	.68	.62 de
Persain NK-11 sainfoin	.54	1.02	.41	.41	.62 de
Creston composite sainfoin	.84	.50	.61	.43	.60 e
NK 3270 sainfoin	.61	.59	.59	.47	.57 e

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

C.V. = 9.3%

ANOVA for intrastate legume trial

Source of variation	D.F.	Mean Square
Replications	3	0.1467**
Varieties	17	0.0727**
Error	51	0.0209
Total	71	

** Significant at the .01 level of probability

TITLE: Animal Evaluation of Forage

PROJECT: Forage Investigations MS 755

PERSONNEL: C. W. Roath, report completed by A. J. Jarvi

LOCATION: Northwestern Montana Branch Station

DURATION: Through 1970

OBJECTIVES: To measure forage value by livestock response.

PROCEDURES: Six lots with nine lambs per lot were randomly assigned a wintering ration consisting of alfalfa hay or sainfoin hay. Another three lots had been fed clover hay but were discontinued on December 17, 1969. Feeding period began October 2, 1969 and continued for 145 days with the alfalfa and sainfoin ration.

RESULTS AND DISCUSSION:

Results from the first 76 days of the trial are reported in the 1969 Annual Report. The extended trial of 145 days comparing sainfoin and alfalfa hays indicated a higher rate of gain, higher feed consumption and a higher gain per ton of feed from the sainfoin hay. Table 1. It appears that sainfoin is superior to alfalfa hay as a wintering ration for lambs.

Table 1. Comparison of alfalfa and sainfoin hay as a wintering lamb ration for a period of 145 days, average of three lots of nine lambs. Northwestern Montana Branch Station, 1970.

	Alfalfa	Sainfoin
Total Gain (lb)	79	348
Gain per lot (lb)	26.3	116
Gain per head (lb)	2.9	12.9
Total hay (tons)	5.67	6.16
Hay per lot (lb)	3782	4104
Hay per head (lb)	420	456
Gain per ton of hay (lb)	13.9	56.5

ANOVA for gain per lot

Source	D.F.	Mean Square
Rations	1	12060.16**
Replications	2	404.17 N.S.
Error	2	90.17
Total	5	

L.S.D. (.05) = 33.3 # per lot
C.V. $s\bar{y}/\bar{y}$ = 7.7%

Table 1. Dry matter production of annual forages, 1st cut, 2nd cut and season's yields at Northwestern Montana Branch Station in 1970.

Entry	Cut	Yield Pounds Dry Matter/Acre I	II	III	IV	x̄
Terra Verdi Alfalfa	1	640	740	660	580	660
	2	1160	960	880	760	940
	Total	1800	1700	1540	1340	1600*
Forage Radish	1	880	1140	940	940	980
	2	280	40	140	180	160
	Total	1160	1180	1080	1120	1140*
Lona Wally Pod Vetch	1	720	700	920	760	780
	2	420	600	660	540	560
	Total	1140	1300	1580	1300	1340*
Common Vetch(59224)	1	600	640	900	680	700
	2	780	620	680	1180	820
	Total	1380	1260	1580	1860	1520*
Hairy Vetch(Madison)	1	500	400	360	280	380
	2	920	580	840	580	740
	Total	1420	980	1200	860	1120*
Horsford Barley (check)	1	1060	740	960	680	860
	2	60	20	20	40	40
	Total	1120	760	980	720	900 check
Austrian Peas	1	420	260	280	380	340
	2	160	160	200	200	180
	Total	580	420	480	580	520*
Huban Sweet Clover	1	420	440	520	480	460
	2	760	620	720	980	780
	Total	1180	1060	1240	1460	1240

LSD @ .05 = 274
C.V. = 8.1%

ANOVA for seasons yield of dry land annual forage

Source	D.F.	Mean Square
Varieties	7	0.1205**
Replications	3	0.0084NS
Error	21	0.0087
Total	31	

** significant at the .01 level of probability
NS not signifcant at .05 level of probability

TITLE: Annual Dryland Forages

PROJECT: Forage Investigations MS755

PERSONNEL: A. J. Jarvi, J. L. Krall, cooperator

LOCATION: Northwestern Montana Branch Station

DURATION: Undetermined

OBJECTIVE: Evaluation of given species for annual forage production.

PROCEDURE: The trial was planted, May 19, 1970 in field R-13 in a RCB design with four replications. 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.

RESULTS AND DISCUSSION

Stands of all species were slow to establish and appeared to be stunted throughout the growing season. Problems with the nursery seeder were encountered which were the cause of the poor stand establishment. Forage radish plots planted two weeks later in the same field produced considerable more growth than plots in this nursery. The trial was harvested July 30 and September 1. Terra Verdi alfalfa at 1600 lbs DM/A was the highest yielding entry in the trial. Vetches grew prostrate and leaves near the soil surface were covered with mildew and many leaves dropped free from the plant by harvest. Lowest yielding entries were Austrian peas and Horsford barley.

This years results don't appear to be very promising but at least another years data from a properly planted nursery should be obtained for a more realistic evaluation.

Table 2. Dryland corn and sorghum trial grown at the Northwestern Montana Branch Station in 1970.

Entry	Yield in T/A of D.M. I	II	III	IV	x	Maturity stage at harvest
NK KC-3	9.01	8.76	9.52	8.76	9.01 check	dough
NK PX-20	8.06	8.71	8.27	8.06	8.28 N.S.	milk
Pioneer 3956	7.62	7.19	8.71	8.93	8.11*	milk
Pioneer PXE-1	7.68	8.19	7.93	9.47	8.32 N.S.	dent
Funks G-5150	8.49	8.70	9.54	9.55	9.07 N.S.	soft dough
Trojan TX-68	6.17	7.09	7.77	8.69	7.43*	hard dough
Pioneer 931	12.35	11.92	12.35	14.05	12.67*	
Pioneer 894	4.46	4.84	4.07	3.68	4.26*	
NK MN54BR	5.80	5.83	4.93	6.05	5.65*	
Piper Sudan	6.74	7.77	7.00	7.26	7.19*	

L.S.D. = 0.849 C.V. = 3.7%

ANOVA for dryland corn and sorghum trial.

Source	D.F.	Mean Square
Variety	9	19.8228**
Replications	3	1.1454*
Error	27	0.3419
Total	39	

* Significant at the .05 level of probability
** Significant at the .01 level of probability

Table 3. Mean yields of corn and sorghum under irrigation and dryland.

Entry	Mean Yields T/A D.M. Irrigated	Dryland	Difference 1/ Irrig. - Dry
NK KC-3 (corn)	10.89	9.01	+1.88
NK PX-20 (corn)	9.80	8.28	+1.52
Pioneer 3956 (corn)	9.69	8.11	+1.58
Pioneer PXE-1 (corn)	8.19	8.32	-0.13
Funks G-5150 (corn)	9.61	9.07	+0.54
Trojan TX-68 (corn)	7.72	7.43	+0.29
$\bar{x}$	9.31	8.37	+0.94
Pioneer 931 (forage sorghum)	9.95	12.67	-2.72
Pioneer 894 (grain sorghum)	4.30	4.26	+0.04
NK MN54BR (grain sorghum)	4.68	5.65	-0.97
Piper Sudan	6.51	7.19	-0.68
$\bar{x}$	6.36	7.44	-1.08

1/ Influence of 6" of irrigation on yield. T/A D.M.

Table 1. Irrigated corn and sorghum trial grown at the Northwestern Montana Branch Station in 1970.

Entry	Yield in T/A of D.M. I	II	III	IV	$\bar{x}$	Maturity stage at harvest
NK KC-3	11.50	10.52	10.77	10.77	10.89	soft dough
NK PX-20	9.58	9.36	10.02	10.23	9.80*	milk
Pioneer 3956	10.45	8.49	9.58	10.23	9.69*	milk
Pioneer PXE-1	8.70	6.65	9.21	8.19	8.19*	dent
Funks G-5150	9.34	9.98	8.28	10.83	9.61*	Dough
Trojan TX-68	7.32	6.86	8.46	8.23	7.72*	hard dough
Pioneer 931	8.32	9.14	11.17	11.17	9.95N.S.	
Pioneer 894	4.09	4.50	4.09	4.50	4.30*	
NK MN 54BR	5.16	4.73	4.30	4.52	4.68*	
Piper Sudan	6.69	6.21	6.45	6.69	6.51*	

L.S.D. = 1.088
C.V. 4.6%

ANOVA for irrigated corn and shrghum trial.

Source	D.F.	Mean Square
Variety	9	21.2101**
Replications	3	1.3728 N.S.
Error	27	.5618
Total	39	

** Significant at the .01 level of probability
N.S. Non-significant at the .05 level of probability

TITLE: Silage Corn and Sorghum Evaluation

PROJECT: Forage Investigation MS 755

PERSONNEL: A. J. Jarvi, C. W. Crowell, cooperator

LOCATION: Northwestern Montana Branch Station

DURATION: Indefinate

OBJECTIVES: To evaluate commercial corn and sorghum varieties which have shown to be superior at the Eastern Montana Branch Station, Sidney, for silage production in Northwestern Montana.

PROCEDURES: A RCB design was used with four replications. Corn was planted in two row plots with rows 24 inches apart and the sorghum was planted in four row plots, 12 inch rows with all rows being 20 feet long. Both irrigated and dryland trials were planted in field Y-8 on May 20, 1970. The irrigated trial received 6 inches of additional water.

Corn was planted at the following plant populations:

Variety	Plants/Acre Dryland	Irrigated
KC-3, PX-20,3956,3872	15,000	30,000
G-5150	20,000	30,000
TX-68, PXE-1	30,000	40,000

Sorghum was planted at the following rates:

Variety	Pounds/Acre Dryland	Irrigated
931, Piper	12	12
894, MN54BR	8	8

consisted of

Harvest area 40 square feet from each plot. Plots were harvested September 16, 1970 after the killing frost of September 12.

RESULTS AND DISCUSSION:

Irrigated

The highest yielding variety under irrigation was the check variety, Northrup King KC-3 at 10.89 T/A D.M. (Table 1). The only other entry which yield was not significantly less than KC-3 was Pioneer 931, a forage sorghum, which produced 9.95 T/A D.M. (Table 1). Grain maturity of the corn range from milk stage early dent for PXE-1.

Dryland

The Pioneer 931 forage sorghum with a yield of 12.67 T/A of D.M. was the highest yielding entry and was significantly higher than the check, KC-3 (Table 2). Also PXE-1 and G-5150 yields were not significantly different from the check.

It is interesting to note that 6 in. of irrigation increased the yield of the corn entries on an average of 0.94 T/A D.M. (Table 2). The sorghums responded quite differently with the 6 in. of irrigation which decreased the average yield by 1.08 T/A D.M. (Table 3).

Table 2. Alfalfa nutrient preservation trial, chemical composition expressed as a percent of dry matter. Northwestern Montana Branch Station in 1970.

Harvest			Composite of Three Replications					
			Chemical analysis on dry matter basis					
Method	Cutting	Date	Protein	Fat	Ash	Crude Fiber	NFE	TDN
Hay	1st	6-22	17.3	1.3	7.8	30.7	42.9	63.1
Hay	1st	6-29	14.8	0.8	7.2	39.6	37.6	54.3
Hay	1st	7- 6	13.5	1.1	7.0	36.3	42.1	58.1
Hay	1st	7-13	14.5	1.5	6.6	37.5	39.9	56.8
Hay	1st	7-20	11.8	1.2	6.4	45.9	34.7	49.2
	$\bar{x}$		14.4	1.2	7.0	38.0	39.4	56.3
Silage	1st	6-22	16.6	1.7	8.0	34.5	39.2	59.6
Silage	1st	6-29	18.0	1.7	7.7	25.5	47.1	68.9
Silage	1st	7- 6	15.2	1.3	6.7	39.6	37.2	55.3
Silage	1st	7-13	16.3	1.9	7.4	38.2	36.2	56.8
Silage	1st	7-20	14.7	1.4	6.4	37.1	40.4	58.3
	$\bar{x}$		16.2	1.6	7.2	35.0	40.0	59.8
Hay	2nd	8- 3	19.5	0.9	9.2	26.1	44.3	65.9
Hay	2nd	8-10	17.9	1.3	9.1	29.2	42.5	63.3
Hay	2nd	8-17	17.1	1.4	8.1	28.5	44.9	65.1
Hay	2nd	8-24	18.3	1.1	9.0	28.3	43.3	64.1
Hay	2nd	8-30	18.2	0.9	9.9	29.0	42.0	62.2
	$\bar{x}$		18.2	1.1	9.1	28.2	43.4	64.1
Silage	2nd	8- 3	19.6	1.7	8.9	30.7	39.1	62.5
Silage	2nd	8-10	17.4	2.0	8.8	27.0	44.8	66.7
Silage	2nd	8-17	18.1	2.0	9.5	26.3	44.1	66.7
Silage	2nd	8-24	18.4	1.4	8.6	37.7	33.9	55.5
Silage	2nd	8-30	19.3	1.5	9.0	26.7	43.5	66.2
	$\bar{x}$		18.6	1.7	9.0	29.7	41.1	63.5
Seasons Means:	Hay	$\bar{x}$	16.3	1.1	8.0	33.1	41.4	60.2
	Silage	$\bar{x}$	17.4	1.7	8.1	32.3	40.6	61.7

TDN in silage vs TDN in hay -

1st cut	t= 0.972 with 4df non-significant at 5% level
2nd cut	t= 0.082 with 4df non-significant at 5% level
Season	t= 0.723 with 9df non-significant at 5% level

Protein in silage vs protein in hay -

1st cut	t= 2.595 with 4df non-significant at 5% level
2nd cut	t= 1.188 with 4df non-significant at 5% level
Season	t= 2.511 with 9df significant at the 5% level

Table 1. Alfalfa nutrient preservation trial, yield in TDM/A for five harvest dates and two storage methods, Northwestern Montana Branch Station, in 1970.

Harvest Date	Cutting	Hay TDM/A I	II	III	$\bar{x}$	Silage TDM/A I	II	III	$\bar{x}$	$\bar{x}$ for Date
6-22	1	2.45	2.21	2.40		2.57	2.84	2.47		
8- 3	2	1.17	1.22	1.36		1.27	1.48	1.87		
	Season				3.60				4.17	3.89*
6-29	1	3.21	2.62	2.58		2.69	2.92	3.21		
8-10	2	1.19	1.43	1.39		1.87	1.92	2.18		
	Season				4.14				4.93	4.56check
7- 6	1	3.16	3.09	3.16		3.49	3.14	3.14		
8-17	2	1.16	1.27	1.36		1.65	1.59	1.48		
	Season				4.40				4.83	4.62NS
7-13	1	2.57	2.98	3.03		3.75	3.81	3.96		
	2	1.24	1.41	1.17		2.03	1.98	1.50		
	Season				4.13				5.68	4.91NS
7-20	1	3.03	2.96	2.63		3.46	3.54	3.38		
	2	1.41	1.05	1.19		1.63	1.78	1.93		
	Season				4.09				5.24	4.67NS
	Method $\bar{x}$				4.07				4.98	

Dates LSD = 0.389 Tons; C.V. = 2.6%
Methods LSD = 0.657 Tons; C.V. = 2.4%
Interaction (dates x methods) LSD = 0.632NS; C.V. = 4.3%

ANOVA for Nutrient Preservation Yields

Source	D.F.	Mean Square
Replications	2	0.0050NS
Dates	4	0.8725**
Error(a)	8	0.0425
Methods	1	6.0200**
Error (b)	2	0.0350
Interaction (DxM)	4	0.3075NS
Error (c)	8	0.1125
Total	29	

TITLE: Alfalfa Nutrient Preservation

PROJECT: Forage Investigations MS755

PERSONNEL: A. J. Jarvi

LOCATION: Northwestern Montana Branch Station

DURATION: Terminated 1970

OBJECTIVES: To determine the extent of loss of nutrients and dry matter in alfalfa forage when harvested throughout the harvest period and preserved hay or silage.

PROCEDURE: A split-block design with three replications was used with cutting dates as whole units and preservation methods as sub-units. Whole units consisted of 12' x 120' plots which were split into sub-units 10' x 20' for silage and 10' x 100' for hay. Whole units were cut and conditioned with a swather at weekly intervals with silage sub-units allowed to wilt to about 65% moisture before chopping and hay sub-units baled at 25% moisture or less. Plots were located in a uniform irrigated alfalfa stand in field Y-6. For the first cutting harvest began June 22, at which time no bloom was apparent in the field and a week later, June 29, the 10% bloom stage was reached and used as the check. Six weeks were allowed between the first and second cuttings. The second cutting followed the same weekly schedule as the first cutting.

Silage was chopped at 65% moisture, stored in plastic bags which were placed inside plastic trash containers. Hay was allowed to cure in the field and baled when at 25% moisture or less. Hay was stored inside directly after baling. Chemical compositions were based on composite samples of three replications of each treatment.

RESULTS AND DISCUSSION:

Forage yields are presented in Table 1. Significant differences were observed between the cutting dates. The second date was used as the check, which was the 10% bloom stage. Harvesting the week before (0% bloom) resulted in a significantly lower season's yield. Delaying the first cutting beyond the 10% bloom did not significantly influence the season yields. Significantly higher yields were obtained from silage than hay. The difference of about 0.9 TDM/A indicates a considerable loss occurred in hay making operation. The interaction of dates x methods was not significant indicating the advantage of silage remained fairly consistent over various harvest dates.

Chemical compositions of the various dates and methods are presented in Table 2. No significant differences in TDN content of silage vs hay on a dry matter basis for the first cutting, second cutting or for the season as indicated by "t" test. Also no significant differences were observed in percent protein in silage vs hay on a dry matter basis for either the first or second cuttings, but for the season, silage had a significantly higher percent protein which was about 1.1% more than in the hay. In general, more nutrients were preserved in silage than hay.

Table 1. Intrastate cicer trial grown on the Northwestern Montana Branch Station in 1970. Yields in T/A at 12% moisture first cut.

Variety	Yield T/A				
	1	2	3	4	x
Bridger Cicer milkvetch	1.74	1.51	1.74	1.74	1.68
Ladak 65 alfalfa	2.40	2.25	2.23	1.85	2.18
Eski sainfoin	1.59	1.61	1.34	1.76	1.58
Sidney Cicer milkvetch	1.57	1.56	1.81	1.66	1.64
Bozeman Cicer milkvetch	1.38	1.61	1.46	1.90	1.59
Pengrift Crown vetch	2.96	1.59	1.37	2.27	2.05

L.S.D. .05 for varieties NS. C.V. = 9.5%

ANOVA for intrastate Cicer trial

Source of variation	D.F.	Mean Square
Varieties	5	0.2157 NS
Replications	3	0.0864 NS
Error	15	0.0916
Total	23	

TITLE: Intrastate Cicer Trial

PROJECT: Forage Investigations MS 755

PERSONNEL: A. J. Jarvi, A. E. Carleton, cooperator

LOCATION: Northwestern Montana Branch Station

DURATION: Through 1971

OBJECTIVES: Evaluation of Cicer milkvetch seed sources.

PROCEDURES: 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 and was completed on July 6, 1970. Yields are presented as T/A at 12% moisture. No irrigations were applied prior to first cutting.

RESULTS AND DISCUSSION:

No significant difference in the entries included in this nursery.For the first cutting Ladak 65 was the highest yielding entry. The second cutting was lost in field harvest operations but growth of vetches and sainfoin was considerably less than alfalfa.

TITLE: Small Grain Investigations

PROJECT: Spring Barley MS756

YEAR: 1970

PERSONNEL: Leader - Vern R. Stewart
Cooperators - R. F. Eslick and E. A. Hockett

LOCATION: Northwestern Montana Branch Station, Field A-2, Y-8, off station locations in Ravalli, Lake, Missoula, Flahead and Sanders Counties.

DURATION: Indefinite

OBJECTIVES:
1. To determine the adaptation of new and introduced barley varieties and selections.
2. To aid in overall experiment station breeding program.

SIGNIFICANT FINDINGS:

1. Centennial and Zepher are 9% and 4% higher in yield respectively than Ingrid under irrigation over a 3 year period. Ingrid and Unitan are equal over a 10 year period.

2. There are several lines superior in yield to Piroline. Those yielding 109% or better then Piroline for the same years are, CI 11868, Zepher and Centennial.

FUTURE PLANS: Continue to cooperate in the variety testing program. Work in hybrid barley program in cooperation with USDA and main station in Bozeman.

MATERIALS AND METHODS:

Standard nursery procedures were used in barley experiments. A randomized block design was used with four to five replications. The genetic studies were grown in latin square experiments.

Hybrid and male sterile material was grown which consisted of the world collection crossed on to male sterile lines. Four hundred plants were taged during the growing season. Plants were pulled and bulked for threshing.

Eighteen individual tests were conducted in 1970 under dryland and irrigated conditions. The irrigated intrastate nursery contained 30 entries, dryland 29 entries. The four off station nurseries consisted of 10 entries and were grown in Missoula, Ravalli, Lake and Sanders Counties.

Eight genetic studies were grown in 1970 in cooperation with Eslick and Hockett. These data will not appear in this report, but will be found in the feed grain research report.

Two nurseries were grown for Graduate students. The students were Wayne Mc Proud and Richard Ostrum. These nurseries were harvested and material taken to Bozeman for evaluation by the students.

Materials and Methods (con't)

The irrigated nurseries were not irrigated because of the high rainfall in June (4.37 inches) that occurred at heading time. Additional water at that period would have resulted in severe lodging of all entries. The field in which the irrigated studies were grown is generally high in moisture availability.

Weeds were controlled with 3/8 lbs/a of bromoxynil very early in the growing season while the weeds were quite small.

RESULTS AND DISCUSSION:

Intra-state yield nurseries - The irrigated yields are fair compared to other seasons, a little below average. Only one variety was found to be significantly lower in yield than Ingrid the check variety. Lodging was severe throughout the nursery. No attempt was made to estimate any differences in varieties. The early lodging could account for the low percent plump kernels in all varieties. The 1969 mean for percent plump was 89.3 compared to 61.1 for 1970. Table 1.

The average yield of the dryland nursery was 9.6 bushels/acre above the irrigated. This was due to the severe lodging which occurred in the irrigated nursery. Considerable loss occurred at harvest time in the irrigated nursery which may account for part of the yield difference. Centennial was the highest yielding variety in the nursery and significantly higher than Piroline which was used as a check. Centennial was also significantly higher in percent of plump kernels than Piroline. Table 2.

Off Station:

Missoula County - This nursery was abandoned because of a perennial weed, Canada thistle. The nursery was so located that it was completely engulfed by the thistle.

Ravalli County - These data are quite reliable as seen by the low C.V. Ingrid was the leading variety for yield, test weight and percent of plump kernels. The mean for the nursery was 77.5 bushels/acre. Table 3.

Lake County - It is difficult to account for the high C.V. in this nursery. Stands were uniform and fair moisture, however, there is a question on whether or not it was irrigated. Ingrid is the high yielding entry. Table 4.

Sanders County - Uneven soil conditions and lack of moisture when needed resulted in a poor test in this location. No real evaluation can be made from this study. Table 5.

The summary of irrigated barley varieties is given in Table 6. For the ten year period Unitan and Ingrid are about equal in yield. For the last three years Centennial is 109 percent of Ingrid and Zepher 104%. MT 4669 is equal to Ingrid for two years and for one year Primus II exceeds Ingrid in yield.

Results and Discussion (con't)

Piroline is used for comparison in the summary of dryland varieties found in Table 7. Unitan is just one percent better than Piroline over a ten year period. There are promising new lines and varieties that are superior to Piroline based on 3 and 4 years data. A four year comparison shows CI 13334, 110% of Piroline and Zepher 109%. Three years show Centennial 116%, MT 207111, 103%, MT 72654,103%. The author does not feel two years data is enough to make a comparison, however there are some promising lines.

A summary of the 10 varieties grown in Western Montana are found in Table 8. Ingrid is number one in yield in 1970. CI 11868 is number one in test weight followed by Ingrid. Centennial is number one in % plump. followed by Ingrid. It should be noted that kernel size was considerably below that of past seasons. Hembar, an Arizona hybrid, is low in yield and test weight, but did do fairly well in kernel size.

The male sterile material that was taged was pulled and harvested. There was up to 50% ergot in the material. It was floated off and the barley dried. Further separation will be made before planting the hybrid seed harvested.

Table 1. Agronomic data from the irrigated intrastate barley yield nursery grown at the Northwestern Montana Branch Station, Route 4, Kalispell Montana in 1970. Field No. Y-8. Experimental design - random block five replications.

Planting date: May 5, 1970 Harvest date: August 24, 1970
Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A.	Test Weight Lbs/Bu	Days Jan1 to Heading	Plant Height	% Plump
MT 46669	Semi Smooth Awn Titan	92.11	42.1	180	41.2	66.0
CI 13109	Primus	89.48	46.0	176b	41.4	76.4
CI 13796	Primus II	87.80	46.7	176b	43.2a	77.6
CI 7324	Vantage	87.35	46.8	182b	42.8a	78.2
CI 10421	Unitan	79.95	45.7	180b	41.4a	67.6
CD 5914	Centennial	75.95	48.5	184	36.4	83.4
MT 204723	Ingrid x Betzes	75.17	49.6	186	39.4	65.6
CI 10083	Ingrid 1/	75.05	46.0	187	38.4	69.8
CI 11868	BetxHaisaII2xPir 7155-60	74.65	45.2	184b	38.6	54.4b
UT 174216	Bonn/Nepal//Bonn Dwarf	73.27	43.4	180b	32.4b	69.4
CI 13826	Erbet	71.12	48.2	175b	36.0	61.8
CI 13334	Bet x HH 2x Pir 7698-62	70.12	43.2	182b	38.0	49.4b
MT 285086	Delta	69.60	46.1	184b	36.8	67.4
CI 13667	Zephyr	~~68.67~~	~~44.6~~	186	37.6	~~44.4b~~
AZ 31817	Hembar	67.82	41.6	174b	36.4	74.0
CI 13827	Shabet	67.75	45.6	185	38.6	54.2b
RB 21086	Belle	67.57	41.6	178b	39.0	59.6
CI 10968	Dickson	66.70	46.3	183b	43.0a	59.2
CI 6398	Betzes	66.12	45.3	183b	40.6	49.8b
MT 204738	Ingrid x Betzes	66.07	46.0	186	41.0	59.2
CI 9558	Piroline	64.82	44.8	181b	39.8	59.8
CI 7130	Freja	63.00	44.5	183b	34.4b	41.8b
MT 72132	Bet x Pall DB 5-120	62.40	48.0	180b	40.4	51.8b
MT 207111	Freja x Betzes	62.10	44.4	186	39.6	54.2b
MT 699422	Pale Green Betzes	61.97	43.2	186	38.8	35.8b
MT 8553	Stiff Freja	61.20	42.2	183b	35.4b	46.4b
CI 5438	Compana	59.87	44.1	179b	34.4b	74.8
MT 72654	Erectoides Betzes II	58.19	43.0	181b	34.8b	39.6b
MT 695801	Erectoides Compana	55.37	42.5	185	28.0	84.2
MT 207772	Betzes x Compana	51.14*	42.7	185	39.4	57.4
$\bar{x}$		69.7	44.9	182.0	38.2	61.1
F - value for variety comparison		1.66*	0.0	34.82**	11.70**	6.37**
S.E.$\bar{x}$		7.79	0.0	.61	.98	5.17
L.S.D.		21.81	0.0	1.70	2.74	14.48
C.V. %		11.17	0.0	.33	2.56	8.46

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

Table 2. Agronomic data from dryland intrastate barley yield nursery grown on the Northwestern Montana Branch Station, Route 4, Kalispell in 1970. Field No. A-2 Experimental design - random block, four reps.

Planting date: May 1, 1970 Harvest date: August 19, 1970 Size of Plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A.	Test Wt Lbs/Bu.	Days Jan 1 to Heading	Plant Height	Lodging % Prev.	Lodging Sev (0-9)	% Plump
CD 5914	Centennial	94.87*	50.4	183a	29.8b	74.3	2.8b	94.3a
CI 13667	Zephyr	93.75*	50.9	181a	28.8b	0.0	.0	86.8a
CI 13334	Bet x HH 2x Pir 7698-62	92.69*	50.5	179	29.8b	66.0b	5.8	81.5
MT 204733	Ingrid x Betzes	90.00*	52.4	183a	31.8	99.0	6.3	85.5
MT 8553	Stiff Freja	89.62*	48.5	179	29.5b	86.8	8.5	74.3
MT 204723	Ingrid x Betzes	87.53*	51.5	182a	29.3b	58.5b	5.5	75.8
CI 10421	Unitan	86.22	46.4	176b	33.5	99.0	9.0	78.5
CI 13796	Primus II	84.68	50.5	174b	33.8	95.5	2.8b	90.5a
CI 7130	Freja	83.72	46.5	179	29.3b	99.0	9.0	66.3
KK 1	Yukon	83.47	47.0	179	39.3a	99.0	8.8	76.5
CI 11868	BetxHaisaII2xPir 7155-60	83.00	50.2	181a	31.8	89.5	5.8	84.0
MT 46669	Semi Smooth Awn Titan	82.62	46.4	178	33.5	88.3	8.0	83.3
MT 207111	Freja x Betzes	80.62	47.6	182a	33.3	94.3	8.5	73.8
MT 72654	Erectoides Betzes II	80.18	49.4	180a	28.5	95.5	7.0	68.0
CI 13109	Primus	79.09	49.5	174b	34.8	99.0	1.5b	88.8a
CI 9558	Piroline 1/	78.71	48.5	178	32.8	99.0	6.5	75.5
AZ 31817	Hembar	75.56	46.8	171b	27.3b	83.3	8.8	69.3
MT 73481	Early Carlsberg II	74.99	47.5	175b	27.3b	99.0	9.0	80.0
CI 3351	Dekap	74.81	45.8	177b	29.3b	99.0	9.0	52.8b
MT 72132	Bet x Pall DB 5-120	74.02	47.5	179	31.5	99.0	9.0	72.3
CI 13827	Shabet	73.37	45.5	181a	34.8	99.0	9.0	61.5b
MT 699422	Pale Green Betzes	73.34	48.9	183a	32.3	86.8	9.0	61.3b
RB 21086	Belle	72.93	42.4	175b	35.0	99.0	8.8	58.0
CI 11772	Hypana	72.84	48.0	177b	32.0	74.3	4.3b	93.8a
CI 6398	Betzes	71.96	46.4	180a	34.5	99.0	9.0	56.0
MT 695801	Erectoides Compana	69.65	47.6	180 a	23.0b	74.3	1.3b	92.8a
CI 13826	Erbet	66.87	49.3	172b	27.0b	99.0	9.0	75.3
CI 5438	Compana	66.18	45.8	177	28.8b	99.0	9.0	85.5
MT 207772	Betzes x Compana	62.58	43.8	181a	33.8	99.0	9.0	46.8b

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

Table 2 (con't)

CI or State No.	Variety	Yield Bu/A.	Test Wt Lbs/Bu.	Days Jan 1 to Heading	Plant Height	Lodging % Prev.	Lodging Sev (0-9)	% Plump
	$\bar{x}$	79.3	48.0	178.4	31.2	88.00	6.9	75.4
	F - value for variety comparison	5.90**	0.0	77.28**	14.99**	3.79**	9.86**	11.88**
	S.E.$\bar{x}$	3.52	0.0	.36	.85	10.48	.89	3.69
	L.S.D.	9.90	0.0	1.02	2.38	29.46	2.51	10.38
	C. V. %	8.29	0.0	.86	2.00	24.66	2.10	8.69

Table 3. Agronomic data from western Montana off station irrigated barley nursery grown in Ravalli County on the Robert Symth farm, Corvallis, Montana in 1970. Experimental design - random block, four reps.

Planting date: April 28, 1970 Harvest date: August 27, 1970
Size of plot: 16 sq. ft.

CI or State #	Variety	Yield Bu/A.	Test Wt. Lbs/Bu.	Plant Height	Lodging % Prev.	Lodging Sev (0-9)	% Plump
CI 10083	Ingrid 1/	88.87	52.3	31.5	32.3	2.0	95.5
CI 10421	Unitan	87.34	46.9	33.3	99.0a	4.3	89.3b
CI 13667	Zephyr	83.34	51.0	28.3	2.5	.5	91.0b
AZ 31817	Hembar	80.40	47.6	31.8	99.0a	6.0a	81.8b
CI 13827	Shabet	77.43	50.5	33.0	99.0a	7.0a	90.8b
CD 5914	Centennial	76.74	51.0	27.0b	0.0	0.0	96.5
CI 6398	Betzes	75.56*	49.8	33.5	99.0a	8.0a	84.3b
CI 11868	BetxHaisaII2xPir 7155-60	73.71*	52.0	31.0	48.5	1.5	92.8
CI 9558	Piroline	67.05*	52.0	32.0	99.0a	4.0	93.8
MT 72654	Erectoides Betzes II	64.58*	50.7	27.3b	73.5	4.8a	84.0b
$\bar{x}$		77.5	50.4	30.8	65.2	3.8	89.9
F - values for variety comparison		3.30**	0.0	6.21**	11.22**	10.41**	10.85**
S.E.$\bar{x}$		4.35	0.0	.99	12.32	.85	1.55
L.S.D. (.05)		12.64	0.0	2.87	35.76	2.47	4.49
C.V.%		5.62	0.0	3.20	18.91	22.38	1.72

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

Table 4. Agronomic data from the western Montana off station irrigated barley nursery grown in Lake County on the James Fleming farm, Pablo, Mont. in 1970. Experimental design - random block, four replications.

Planting date: April 28, 1970 Harvest date: August 31, 1970
Size of plot: 16 sq. ft.

CI or State #	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Lodging % Prev	Lodging Sev (0-9)	% Plump
CI 10083	Ingrid[1/]	55.17	51.2	23.5	27.3	1.3	93.0
CI 13667	Zephyr	52.08	50.1	22.0	10.0	2.0	92.0
CI 6398	Betzes	50.80	50.0	24.8	99.0a	5.0a	83.3b
CI 13827	Shabet	47.92	49.8	25.5	59.8	4.3a	89.0
CI 9558	Piroline	47.30	51.6	24.0	37.3	2.0	93.8
MT 72654	Erectoides Betzes II	43.20	49.8	22.3	44.8	2.8	77.5b
CI 11868	BetxHaisaII2xPir 7155-60	42.80	51.6	23.3	47.5	1.5	91.5
CI 10421	Unitan	39.17	45.6	22.5	43.5	2.8	91.5
CD 5914	Centennial	32.70	48.6	19.0b	2.5	..8	96.5
AZ 31817	Hembar	29.07	43.8	21.0	.0	.0	81.8b
	$\bar{x}$	44.0	49.2	22.8	37.1	2.2	89.0
	F-value for variety comparison	1.84	0.0	3.86**	5.96**	4.82**	11.15**
	S.E.$\bar{x}$	6.22	0.0	.96	12.18	.70	1.83
	L.S.D. (.05)	N.S.	0.0	2.89	36.70	2.10	5.50
	C.V.%	15.41	0.0	2.38	30.19	1.73	4.52

1/ Check variety
a Values significantly higher than the check (.05)
b Values significantly lower than the check (.05)

Table 5. Agronomic data from the western Montana off station irrigated barley nursery grown in Sanders County on the Deihl Ranch, Plains, Montana in 1970. Experimental design - random block, four reps.

Planting date: April 29, 1970 Harvest date: August 25, 1970
Size of Plot: 16 sq. ft.

CI or State #	Variety	Yield Bu/A.	Test Wt. Lbs/Bu.	Plant Height	% Plump
CI 11868	BetxHaisaII2xPir 7155-60	47.39	47.5	27.5	43.0
MT 72654	Erectoides Betzes II	44.05	46.7	27.0	26.8a
CI 13667	Zephyr	38.33	44.1	25.0	50.3
CI 13827	Shabet	35.04	43.2	30.5	34.8
CD 5914	Centennial	33.54	44.0	24.0	71.0
CI 10083	Ingrid 1/	32.98	46.3	26.8	49.3
CI 6398	Betzes	31.42	43.5	30.3	18.5
CI 9558	Piroline	31.10	45.4	27.3	37.5
AZ 31817	Hembar	25.57	43.0	22.0	61.5
CI 10421	Unitan	16.04*	43.0	26.0	48.0

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

Precipitation: April 29 thru August 25 = 5.93 inches

$\bar{x}$	33.5	44.7	26.6	44.0
F - value for variety comparison	2.95*	0.0	2.14	8.76**
S.E.$\bar{x}$	5.16	0.0	1.77	5.28
L.S.D. (.05)	16.27	0.0	N.S.	16.23
C.V.%	15.39	0.0	6.67	11.98

Table 6. Summary yields for irrigated intrastate and station yield nursery grown on the Northwestern Montana Branch Station, Kalispell, Montana from 1958-1970.

Variety	CI or State No.	1958	1959	1960	1961	1965	1966	1967	1968	1969	1970	Station Years	% of Ingrid
Betzes	6398	71.9	93.0	65.0	66.9	88.5	67.6	104.7	63.2	82.7	66.1	10	84
Vantage	7324	81.9	90.4	55.8	71.5	101.6	67.8	119.2	90.3	96.0	87.4	10	94
Compana	5438	60.1	88.7	65.4	46.0	70.7	60.0	85.5	63.4	72.3	59.9	10	74
Piroline	9558	80.4	94.2	72.4	78.7	95.9	87.3	108.8	93.3	85.3	64.8	10	94
Unitan	10421	78.9	102.7	73.0	80.4	84.4	90.8	128.4	98.4	92.1	80.0	10	100
Ingrid	10083	94.4	101.7	68.8	90.8	92.0	88.9	111.7	80.6	109.3	75.1	10	100
BetxHaisaII2xPir 7155-60	11868					84.9	68.8	110.0	79.4	103.0	74.7	6	93
BetxHH2xPir 7698-62	13334							109.2	74.5	103.8	70.1	4	95
Delta	MT 285086							105.3	86.3	100.7	69.6	4	96
Erbet	13826							91.4	73.3	76.4	71.1	4	83
Centennial	5914								106.5	106.9	76.0	3	109
Ingrid x Betzes	204738								95.5	80.8	66.1	3	92
Zephyr	510669								95.0	110.8	68.7	3	104
Primus	13109								76.3	93.3	89.5	3	98
Erectoides Betzes II	MT 72654								74.9	79.9	58.2	3	83
Paragon	744011								63.4	82.4	67.8	3	55
Hembar	31817									102.2	73.3	2	95
Semi Smooth Awn Titan	MT 46669									91.4	92.1	2	100
Freja x Betzes	207111									89.8	62.1	2	82
Bet x Pall DB 5-120	72132									82.1	62.4	2	78
Dickson	10968									81.1	66.7	2	80
Shabet	13827									80.4	67.8	2	80
Betzes x Compana	207772									71.4	51.1	2	66
Primus II	13796										87.8	1	117
Ingrid x Betzes	MT 204723										75.2	1	100
Belle	RB 21086										67.6	1	90
Freja	7130										63.0	1	84
Pale Green Betzes	MT 699422										62.0	1	83
Stiff Freja	MT 8553										61.2	1	82
Erectoides Compana	MT 695801										55.4	1	74

Table 7. Summary of yields for dryland intrastate and station yield nurseries grown on the Northwestern Montana Branch Station, Kalispell, Montana from 1959 - 1970.

Variety	CI or State No.	1959	1960	1961	1964	1965	1966	1967	1968	1969	1970	Sta. Yrs.	% or Piroline
Compana	5438	43.3	45.5	34.9	57.1	79.8	62.9	58.2	89.1	44.9	66.2	10	89
Unitan	10421	51.9	50.0	37.9	65.5	80.4	72.6	60.7	90.1	64.5	86.2	10	101
DeKap	3351	38.6	52.8	45.7	56.8	72.5	56.5	52.4	86.7	53.8	74.8	10	90
Betzes	6398	43.9	46.1	31.6	61.7	73.9	69.9	56.5	90.4	76.4	72.0	10	95
Piroline	9553	43.0	46.9	54.1	75.3	80.8	69.1	58.3	96.5	50.4	78.7	10	100
Hypana	11772			50.2	69.2	75.8	66.2	55.3	85.3	61.0	72.8	8	95
BetxHaisaII 2xPir 7155-60	11868					68.0	71.9	49.4	93.3	58.4	83.0	6	97
BetxHH2xPir 7698-62	13334							60.8	101.6	56.6	92.7	4	110
Zepher	13667							60.9	94.8	60.5	93.8	4	109
Centennial	5914								101.4	64.5	94.9	3	116
Freja x Betzes	MT 207111								96.8	53.8	80.6	3	103
Erectoides Betzes II	MT 72654								94.8	56.6	80.2	3	103
Primus	13109								90.7	44.6	79.1	3	95
Erbet	13826									67.2	66.9	2	104
Ingrid x Betzes	MT 204723									62.7	87.5	2	116
Ingrid x Betzes	MT 204738									58.2	90.0	2	115
Shabet	13827									57.8	73.4	2	102
Hembar	AZ 31817									57.5	75.6	2	103
Betzes x Compana	MT 207772									55.6	62.6	2	92
Semi Smooth Awn Titan	MT 46669									43.9	82.6	2	97
Bet x Pall DB 5-120	MT 72132									43.1	74.0	2	91
Stiff Freja	MT 8553										89.6	1	114
Primus II	13796										84.7	1	108
Freja	7130										83.7	1	106
Yucon	KK 1										83.5	1	106
Early Carlsberg II	MT 73481										75.0	1	95
Pale Green Betzes	MT 699422										73.3	1	93
Belle	RB 21086										72.9	1	93
Erectoides Compana	MT 695801										69.7	1	89

Table 8. Summary of agronomic data from nurseries grown in Western Montana in 1970.

Variety	C.I. or State No.	Station	Location 1/ Ravalli	Lake	Sanders	$\bar{x}$	Rank
		YIELD BU/A					
Hembar	AZ 31817	67.8	80.4	29.1	25.6	50.7	10
Centennial	CD 5914	76.0	76.7	32.7	33.5	54.7	7
Zepher	13667	68.7	83.3	52.1	38.3	60.6	2
Ingrid	10083	75.1	88.9	55.2	33.0	63.1	1
Unitan	10421	80.0	87.3	39.2	16.0	55.6	6
Piroline	9558	64.8	67.1	47.3	31.1	52.6	8
Betzes	6398	66.1	75.6	50.8	31.4	55.9	5
Shabet	13827	67.8	77.4	47.9	35.0	57.0	4
Erectoides Betzes II	MT 72654	58.2	64.6	43.2	44.1	52.5	9
BetxHaisaII 2xPiroline	11868	74.7	73.7	42.8	47.4	59.7	3
L.S.D. Bu/acre		21.8	12.6	N.S.	16.3		
C.V. %		11.17	5.62	15.41	15.4		
		TEST WT. LBS/BU.					
Hembar	AZ 31817	41.6	47.6	43.8	43.0	44.0	10
Centennial	CD 5914	48.5	51.0	48.6	44.0	48.0	4
Zepher	13667	44.6	51.0	50.1	44.1	47.5	6
Ingrid	10083	46.0	52.3	51.2	46.3	48.9	2
Unitan	10421	45.7	46.9	45.6	43.0	45.3	9
Piroline	9558	44.8	52.0	51.6	45.4	48.5	3
Betzes	6398	45.3	49.8	50.0	43.5	47.2	8
Shabet	13827	45.6	50.5	49.8	43.2	47.3	7
Erectoides Betzes II	MT 72654	43.0	50.7	49.8	46.7	47.6	5
BetxHaisa II 2xPiroline	11868	45.2	52.0	51.6	47.5	49.1	1
		SIEVE SIZE 6/64					
Hembar	AZ 31817	74	82	82	62	75.0	3
Centennial	CD 5914	83	97	97	71	87.0	1
Zepher	13667	44	91	92	50	69.3	7
Ingrid	10083	70	96	93	49	77.0	2
Unitan	10421	68	89	92	48	74.3	4
Piroline	9558	60	94	94	38	71.5	5
Betzes	6398	50	84	83	18	58.8	9
Shabet	13827	54	91	89	35	67.2	8
Erectoides Betzes II	MT 72654	40	84	78	27	57.3	10
BetxHaisaII 2xPiroline	11868	54	93	92	43	70.5	6

1/ location by county

TITLE: Winter barley trials

PROJECT Small Grains Investigations MS756

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

LOCATION: Northwestern Montana Branch Station, Uniform Winter Barley Nursery in Field No. E-2, Uniform Winter Hardiness Nursery and Composite Cross material in Field No. R-6b.

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 desireable types for possibly 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 4 row plots in a RCB design with 4 replications. This nursery was seeded in Field E-2 on September 29, 1969. Yield was taken from 16 sq. ft. from the center rows.

The Uniform Winter Hardiness Nursery consisted of single row plots 12 ft. long in a RCB design with two replications. This was planted on September 26, 1969 in Field R-6.

Composite cross material was drilled with a conventional grain drill with a 6" spacing between rows on September 25, 1969 in Field R-6.

RESULTS AND DISCUSSION:

Uniform Winter Barley Yield Trial. 'Alpine' the check variety was the highest yielding entry at 91.1 B/A (Table 1). Winter survival in this nursery was fairly good. Test weights were about normal. In general it appears that the winter types are more resistant to lodging than spring barley. The variety 'Luther' which was derived from Alpine by means of a chemical mutagen is shorter and has increased lodging resistance.

Winter survival data of winter hardiness nursery are presented in Table 2. Very little winter killing was present in the nursery with 80% of the spring variety 'Trebi' surviving. This nursery was not harvested for yield.

Results and Discussion (con't):

Five pound lots of seed from male sterile plants were collected from three generations of the World Collection X ms, composite cross. Two pounds of seed from the most advanced generation (F_5) was exposed to 800 rad fission neutrons in order to induce translocations. About one-fourth of this seed was planted here in October 1970 and the other three-fourths was to be planted at Tuscon, Arizona. This seed was harvested from male sterile plants so the seed will be either heterozygous or homozygous for the male sterility and with an appropriate translocation, the desired balanced tertiary trisomics could be developed. Bulk samples were also harvested from all three generations discribed above. Five pounds of the F_5 generation was sent to the Moccasin station for additional winter hardiness screening. Also seed from both the male sterile and the bulk of the most advanced generation (F_5) were planted for another cycle of natural selection and recombination.

Table 1. Agronomic data from uniform winter barley nursery grown in Field E-2 on the Northwestern Montana Branch Station in 1970. Experimental design - RCB with four replications.

Variety	CI No.	Means of four replications: Yield B/A	Test Weight	Winter Sur. %	Height Inches	Lodging %	Date Headed
Alpine[1]	9578	91.1	48.5	98	39	44	160[2]
Luther	13340	89.2	48.0	95	31	0	170
Olympia	6107	85.2	49.0	98	37	3	170
Schulyer	11887	82.8	48.0	93	28	0	164
Mich. 62-434-3		82.1	49.0	98	35	18	162
N.Y. 6005-18		81.7	49.5	95	32	11	155
N.Y. 6005-19		81.0	49.5	98	22	0	154
Mich. 62-434-22		79.5	50.0	100	30	0	160
Ky. 66-7-73-1294	13876	78.5*	49.5	98	34	0	152
Kentucky 1	6050	78.0*	49.0	100	39	75	160
N.Y. 6005-15		75.9*	51.0	100	32	0	160
Hudson	8067	74.2*	50.0	93	36	6	159
Lakeland	13734	73.2*	49.5	93	24	0	164
Reno	6561	72.7*	48.0	100	35	63	155
Mo. B-475	9168	70.8*	46.0	98	35	50	157
Mo. B-1773		70.8*	49.5	55	37	63	158
Mo. B-1590		69.6*	49.0	90	37	69	156
Mich. 62-448-24		68.6*	49.5	100	30	0	157
OAC WB36-18	13872	67.9*	47.0	78	31	25	162
Harrison	10667	67.5*	49.0	88	30	0	160
Okla. S633806	13853	67.0*	47.5	98	34	0	160
OAC WB42-7-1	13873	65.9*	47.0	90	31	0	164
N.J. 5B02-6-2		62.7*	49.5	85	35	31	156
Purd. 5724A7-14-4		62.2*	46.5	93	21	25	155
Kans. 66217		61.6*	49.0	85	32	21	158
Jefferson	11902	57.9*	47.5	88	33	0	158
Kearny	7580	57.2*	46.5	95	35	75	159
Barsoy	11904	55.7*	50.0	80	24	25	146
Mo. B1899		54.5*	48.5	100	35	44	152
Purd. 5924A7-14-1		54.5*	47.0	88	22	3	158
Okla. S-633815	13854	54.2*	44.5	98	36	6	156
Knob	11910	50.0*	48.5	78	28	3	152
$\bar{x}$		70.1	48.5	92.1	31.9	20.6	158.4

1/ Check Variety
2/ Days from January 1
* Significantly less than check variety at the 5% level for yield.
C.V. = 6.3%, L.S.D. @ 5% = 12.31 B/A

ANOVA for Yield

Source	D.F.	M.S.
Replications	3	133.30 N.S.
Varieties	31	487.30**
Error	93	76.55
Total	127	

N.S. Non-significant at .05 level of probability
** Significant at .01 level of probability

Table 2. 1969-70 Barley Winterhardiness nursery grown in Field No. R-6b on the Northwestern Montana Branch Station.

Entry No.	CI No.	Variety	Survival (pct.) Rep. 1	Rep. 2	Ave.
1	6034	Tenn. Winter (check)	60	100	80
2*	6561	Reno	m	90	90 1/
3		Ks. 66217	90	m	90 1/
4		Ks. 65111	100	90	95
5		Ks. 66160	100	80	90
6*		Ks. 66200 (a)	90	60	75
7*		Ks. 66201 (a)	90	100	95
8	13855	Okla. S-633717	80	80	80
9		Okla. S-653524	50	50	50
10		Okla. S-653537	m	40	40 1/
11	6034	Tenn. Winter (check)	90	80	85
12	6051	Mo. Ey. Bdls.	100	100	100
13	9168	Mo. B-475	100	100	100
14		Mo. B1590	100	90	95
15*		Mo. B1891 (b)	100	90	95
16*		Mo. B1790 (c)	90	90	90
17*		Mo. B1807 (d)	90	100	95
18	10667	Harrison	90	20	55
19	11902	Jefferson	90	100	95
20		Purd. 5924A7-14-1	90	100	95
21	6034	Tenn. Winter (check)	80	90	85
22*		Purd. 5924A7-14-4 (e)	100	100	100
23		Va. 65042-33	100	80	90
24		Or. 6818	100	80	90
25*		Or. 6832 (f)	100	80	90
26	936	Trebi	80	80	80
27*		Isogenic) VV (g)	100	80	90
28*		pair) vv (g)	100	70	85
29*		Isogenic) VV (h)	100	80	90
30*		pair) vv (h)	90	100	95
31	6034	Tenn. Winter (check)	90	m	90 1/
32*		Isogenic) VV (i)	90	100	95
33*		pair) vv (i)	100	90	95
34*		Isogenic) 00 (j)	m	100	100 1/
35*		pair) oo (j)	90	90	90
36*		Isogenic) 00 (k)	90	90	90
37*		pair) oo (k)	90	100	95
38*		Isogenic) 00 (l)	100	100	100
39*		pair) oo (l)	100	100	100
40*		Belts. 68-1447 (m)	80	60	70
41	6034	Tenn. Winter (check)	90	80	85
42		Belts. 68-1448 (m)	100	80	90
43*		Isogenic) 00 (n)	80	80	80
44*		pair) oo (n)	70	70	70

* New entry this year

1/ One plot missing. Average figure is survival of a single plot

Table 2. (con't)

Entry No.	CI No.	Variety	Survival (pct.) Rep. 1	Rep. 2	Ave.
45*	13874	OAC WB55-7 (o)	100	90	95
46*	13875	OAC WB60-14 (p)	90	90	90
47	1442	Kharkof (wheat)	100	100	100
48	7580	Kearney	80	90	85
49		Nebr. 62204	100	100	100
50	6050	Kentucky 1	m	90	90 1/
51	6034	Tenn. Winter (check)	90	80	85
52	5529	Dicktoo	100	80	90
53	12218	Blackhawk (wheat)	100	m	100 1/
54		Harrow 9	100	90	95
55		Harrow 12	80	90	85
56	11171	Harrow 14	90	80	85
57		N.Y. 6005-15	100	70	85
58*		N.Y. 6005-17 (q)	90	100	95
59		N.Y. 6005-18	100	100	100
60		N.Y. 6005-19	100	100	100
61	6034	Tenn. Winter (check)	80	80	80
62	6728	Wong	100	100	100
63	11887	Schuyler	90	100	95
64		Mo. B1766	100	100	100

1969-70 Barley Winterhardiness Nursery
Parentage or origin of new entries

(a) Rogers x Kearney (E6,7)
(b) CI 9243 x Ludwig (E15)
(c) Franger x Ludwig (E16)
(d) CI 9224 x Ludwig (E17)
(e) Kearney 6 x Kenbar 5 x Ky. 1 4x Comfort x Purd. 1101 3x Ped. 38 x Chevron 2x Bolivia 7x Harrison (E22)
(f) Olympia x Dicktoo (E25)
(g) Isogenic pair for 2-row (E27) vs. 6-row (E28) Khayyam x$_{12}$ Reno
(h) Isogenic pair for 2-row (E29) vs. 6-row (E30) Khayyam x$_{12}$ Randolph
(i) Isogenic pair for 2-row (E32) vs. 6-row (E33) Khayyam x$_{12}$ Randolph
(j) Isogenic pair for normal (E34) vs. orange lemma (E35) or. lem. x $\frac{4}{8}$ Khayyam
(k) Isogenic pair for normal (E36) vs. orange lemma (E37) or. lem. x $\frac{4}{8}$ " "
(l) Isogenic pair for normal (E38) vs. orange lemma (E39) or. lem. x $\frac{4}{8}$ Mo. B-475
(m) Everson 1 x^{4} Mo. B-475 (E40,42)
(n) Isogenic pair for normal (E43) vs. Orange Lemma (E44) or. lem. x $\frac{4}{8}$ Mo. B-475
(o) Purd. B466A1-17-15-15-4 x Dover (E45)
(p) Purd. B466A1-17-15-10-17 x Dover (E46)
(q) Traill x Hudson

TITLE: Small Grains Investigations

PROJECT: Spring Oats MS 756

YEAR: 1970

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

LOCATION: Northwestern Montana Branch Station, Field No. Y-8

DURATION: Indefinite

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

SIGNIFICANT FINDINGS:

Cayuse and OT 714 were high yielding entries with yields over 150 bushels per acre.

Basin over an eight year period is a higher yielding variety than Park, Rodney and Garry.

FUTURE PLANS: Continue small scale variatal testing in cooperation with several Pacific Northwest states.

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 1970. The Uniform nursery which is grown throughout the Pacific Northwest, consisted of 25 entries. In the small Montana nursery there were 10 entries.

RESULTS AND DISCUSSION:

Mean yield of the Uniform Northwestern States Nursery was 133.6 bushels/acre which is about 10 bushels below 1969 yields. Yield range was 102.22 to 167.74 bushels/acre. Lodging throughout the nursery was severe and no attempt was made to get this information for individual varieties. This lodging in part is caused by a root rot organism.

Using Cayuse as a check, twelve entries were significantly lower in yield including the variety Park. Table 1.

Yield data from the Intrastate Nursery was found to be non-significant for yield. Yields ranged from 112.85 bushels/acre to 147.17 bushels/acre. Basin and Cayuse were the two leading varieties. Lodging was severe in this nursery also. Table 2.

Using Park as a long term check and comparing those varieties grown three or more years, Basin, Glen, Orbit, Cayuse, Sierra, ID 654547 and Fraser are higher in yield. Table 3.

Table 1. Agronomic data from the dryland Uniform Northwestern States oat nursery grown on the Northwestern Montana Branch Station, Route 4, Kalispell, Montana in 1970. Field No. Y-8. Experimental design - random block, three replications.

Planting date: May 6, 1970 Harvest date: September 11, 1970
Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu./A.	Test Wt. Lbs./Bu.	Days Jan.1 to Heading	Plant Height
OT 714	Pendek x Glen	167.74	33.83	185a	44.0
CI 008263	Cayuse 1/	158.68	31.97	188	42.7
ID 352807	CI 5345 x 2 Anster (63)	155.43	30.80	186	43.3
ID 635100	63AB5100-1 Cx20 2x Saxsi	150.80	29.40	189	43.3
CI 005346	Basin	148.74	32.80	189	45.3
CI 007652	Glen	147.99	30.23	183a	48.0a
CI 007706	Sierra	142.80	29.37	184a	43.7
CI 7989	Harmon	142.30	36.13	188	52.7a
ID 654547	65AB4547 Park x Russell	138.42	35.37	191	51.3a
ID 637868	63AB7868 Rodney x Shelby	136.04	30.97	186a	42.3
OT 717	Pendek x Glen	134.98	30.43	184a	42.7
CI 007811	Orbit	133.98	31.10	186	47.3
CI 006661	Rodney	132.17	30.87	188	50.3a
CI 001145	Victory	131.23	33.40	189	50.7a
IL 631668	Albion x Newton 2xVictory	131.17	33.13	187	45.3
ID 352801	CI 5345 x 2 Anster (63)	130.73	29.50	186a	46.7
CI 008318	Fraser	129.67*	30.93	189	47.0
OT 000611	Kelsey Manitoba	127.60*	29.83	186a	46.0
CI 002027	Gopher	127.42*	32.47	183	43.3
CI 006611	Park	127.10*	33.40	190a	45.3
CI 007561	Lodi	126.98*	33.87	188	50.0a
ID 654602	65AB4602 Park x Russell	122.60*	31.20	188	40.7
CI 002611	Bridger	121.42*	29.83	190a	50.0a
CI 002053	Markton	120.48*	31.03	186a	47.0
CI 002874	Minn. II-22-220	119.79*	30.47	188	41.0
WS 099541	Wisc. x 995-4-1 Wisc.	117.98*	30.63	189	46.7
CI 008304	Minn. II-54-109 Minn.	114.41*	31.03	180a	41.7
OA 12333	Cal23-33xCD38202xVictory	102.22*	31.00	181a	39.7

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

$\bar{x}$	133.6	31.6	186.6	45.6
F-value for variety comparison	2.11**	2.06**	27.65**	5.33**
S.E.$\bar{x}$	9.94	1.24	.52	1.52
L.S.D. (.05)	28.18	3.51	1.48	4.30
C.V.%	7.44	3.92	.28	3.32

Table 2. Agronomic data from the dryland Intrastate Oat Nursery grown on the Northwestern Montana Branch Station, Route 4, Kalispell in 1970. Field No. Y-8. Experimental design-random block, three replications.

Planting date: May 6, 1970 Harvest date: September 11, 1970
Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A.	Test Wt. Lbs./Bu.	Days Jan.1 to Heading	Plant Height
CI 005346	Basin	147.17	33.60	190a	44.3a
CI 008263	Cayuse 1/	143.55	30.90	188	40.3
CI 002027	Gopher	141.73	32.37	191a	50.0a
CI 002611	Bridger	136.86	33.17	186a	44.7a
CI 007706	Sierra	136.61	28.03a	186a	45.0a
CI 008318	Fraser	131.42	30.07	185a	47.0a
CI 006611	Park	125.04	34.50	188	46.0a
CI 006662	Garry	123.79	33.63	183.a	43.0
ID 004547	Park x Russell 65AB4547	116.29	30.70	189	46.7a
CI 006661	Rodney	112.85	31.40	191a	49.7a

1/ Check variety
a Values significantly different from the check

$\bar{x}$	131.5	31.8	187.7	45.7
F-value for variety comparison	.95	4.72**	54.75**	4.96**
S.E.$\bar{x}$	11.99	.91	.34	1.31
L.S.D. (.05)	N.S.	2.71	1.02	3.89
C.V.%	9.12	2.87	.18	2.87

Table 3. Summary of oat yield data from uniform oat nursery, Northwestern Montana Branch Station, 1957-70.

Variety	C.I. or State No.	1957	1958	1959	1960	1962	1964	1967	1968	1969	1970	Sta. Yrs.	% Park
Rodney	6661	30.8	141.1	51.6	15.9	84.8	73.0	126.2	121.4	126.2	132.2	10	98
Park	6611	46.3	63.5	99.4	17.5	89.5	80.5	108.3	120.3	171.4	127.1	10	100
Victory	1145	64.8	49.4	92.5	18.1	78.8	62.8	81.2	114.2	122.2	131.2	10	88
Garry	6662	46.6	54.0	112.2	11.6	87.8	100.3	112.2	112.8	121.5	123.8	10	96
Markton	2053	47.2	52.5	89.7	16.9	74.7	89.1	89.9	101.7	120.2	120.5	10	87
Gopher	2027	30.1		49.7	10.6	61.6	46.2	116.8	101.0	134.9	127.4	9	79
Basin	5346	51.1			15.0	89.5	120.7	120.2	149.1	151.5	148.7	8	111
Bridger	2611	49.7				91.8	87.1	95.7	104.5	147.9	121.4	7	94
Lodi	7561							105.8	144.3	128.8	127.0	4	96
Glen	7652							118.9	134.9	146.7	148.0	4	104
Orbit	7811							116.3	133.4	147.4	134.0	4	101
Cayuse	8263							142.6	130.0	138.1	158.7	4	108
Sierra	7706							115.4	118.1	163.1	142.8	4	102
Minn. II-22-220	2874							122.9	96.1	145.8	119.8	4	92
65AB4547 Park x Russell	654547								153.8	190.7	138.4	3	115
Fraser	8318								136.2	161.1	129.7	3	102
63AB5100-1Cx20 2xSax SI	635100								123.9	133.7	150.8	3	97
Wisc. x 995-4-1 Wisc.	99541									158.5	118.0	2	94
Minn. II-54-109 Minn.	8304									150.6	114.4	2	89
63AB7868 Rodney x Shelby	637868									143.6	136.0	2	94
Kelsey - Manitoba	0611									142.5	127.6	2	91
65AB4602 Park x Russell	654602									135.0	122.6	2	86
Pendek x Glen	OT 714										167.7	1	131
CI 5345 x 2 Anster (63)	ID 352807										155.3	1	122
Harmon	7989										142.3	1	112
Pendek x Glen	OT 717										135.0	1	106
Albion x Newton x Victory	IL 631668										131.2	1	103
CI 5345 x 2 Anster (63)	ID 352801										130.7	1	103
OA123-33xCD38202 x Victory	OA 12333										102.2	1	80

TITLE: Winter Wheat

PROJECT: Small Grains Investigations MS 756

YEAR: 1970

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

LOCATION: Northwestern Montana Branch Station 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 conduct 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. Crest was the leading hard red entry in yields.
2. Most lines with 35 or more inches of straw are too weak for effective production and harvest in this area.
3. The Burt x PI 178383 line continues to provide good resistance to dwarf smut and stripe rust.

FUTURE PLANS: Plans for 1969-70 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 Montana Branch Station in Field E-2; 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 Montana Branch Station in Field E-2. The off station nurseries were located in Ravalli, Missoula, Lake, Sanders and Mineral Counties.

Precipitation rates were recorded beginning April 17, until harvest. Small rain gauges were set up in locations adjacent or near the research plot. These were read by the farmer cooperator during the growing season. Gauges were located in Ravalli, Sanders, Lake and Mineral counties. There was not one set up in Missoula County because the plot was located in the vicinity of the airport.

Plots were harvested with a power harvester.

RESULTS AND DISCUSSIONS:

Intrastate Hard Red Winter Wheat Nursery

ID 5006 was the highest yielding entry in this nursery, being significantly higher in yield than Crest which is used as a check. ID 5006 is quite susceptible to dwarf smut in another location. No smut readings were made in this nursery because of severe lodging throughout the study. ID 5006, WA 4836, Wanser and McCall displayed the most straw strength of the entries in the study. Table 1.

Table 2 is a ten year table of varieties grown in the above named nursery. Two long term checks have been left out for the past two years. Thus there is only Cheyenne left. McCall, Wanser and Crest are equal or better in yield than Cheyenne. However, McCall and Wanser are highly susceptible to dwarf smut. Crest is highly resistant to both dwarf smut and stripe rust.

Western Regional Hard Red Winter Nursery

Stands were fair in this nursery in spite of the late date of seeding (September 30). Only Delmar was found to be significantly less in stand than Cheyenne which is used as a standard.

Dwarf smut was found in all entries except the Burt x PI 178383 lines and ID 0027. A very light rate, .5% was found in Crest.

Yields were not significantly different in this study, however MT 6827 was the highest yielding entry. This line is somewhat late in maturity and could account for the lower test weight. See Table 3 for completed tabulation of data.

Uniform White Wheat Nursery

Yields in this nursery were about average. Luke was the highest yielding entry. Only a light rate of dwarf smut was noted. Paha (CI 14485) and Yamhill, new releases along with Luke, were quite high in dwarf smut. Nugaines and Paha were about equal in smut percentage.

Luke was significantly higher in yield than Nugaines as were OR 631305. Complete agronomic data are found in Table 4.

A summary of eight years yield data from this nursery is given in Table 6. Omar is used as the long term check. Based on six years data Moro is 110% of Omar at this location. Several of the newer entries are somewhat superior to Omar.

Missoula County

Yields were about average for this location, with a yield range of 36.8 bushels/acre down to 17.8 bushels/acre. Very dry conditions exsisted at seeding time and emergence was slow but uniform. Generally, the white wheat out yielded the hard red entries with Omar being the highest yielding entry. This yield was significantly higher than Crest, the check variety. Stands were low in the hard red entries which no doubt accounts for the yield reduction in this group. Moro and Omar were highest in stand percentage. Table 7.

RESULTS AND DISCUSSION (con')

Ravalli County

Yield data from this study were not statistically significant. Dry conditions throughout the growing season plus low fall moisture no doubt accounts for these type result. Some uneveness in soils and stands contribute to the high C.V. Table 8.

Lake County

Moro and Crest were the leading varieties in yield at the Lake County location. The mean yield for the nursery was 41.6 bushels per acre. The Burt x PI 178383 lines lodged quite severely, as did most of the lines with PI 178383 as one of the parents. Test weights were light by 2 pounds on the lines with PI 178383 as one of the parents. See table 9 for complete details.

Sanders County

Yields in this nursery were about or above average for this location. Stands were generally very good. Weeds (species unknown at this writing) were very heavy in the nursery, but didn't seem to affect production. Wanser is the highest yielding entry, but is not significantly higher than Crest, the check variety. Test weights are very low in this nursery. For this the author could see no apparent reason. Table 10.

Mineral County

An unsatisfactory seed bed at seeding time plus a severe infestation of cheatgrass resulted in this nursery being abandoned.

In Table 11 are the yield data in summary form from the four off station locations harvested. Crest is the leading hard red entry this season, compared with 4th in 1969. Moro is the leading white entry as it was in 1969.

Table 1. Agronomic data from the intrastate hard red winter wheat nursery grown at the Northwestern Montana Branch Station, Route 4, Kalispell in 1970. Field No. E-2 Experimental design - random block, six replications.

Planting date: September 29, 1969 Harvest date: August 11, 1970 Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Days Jan.1 to Heading	Plant Height	Lodging % Prev.	Lodging Sev. (0-9)
ID 5006	Nrnl0/Staring//2*cnn	76.34[2]	60.0	166	32.0	0.0	.0
WA 4836	Bezostaja 3/Sel B	74.27	61.6	162	38.1	0.0	.0
CI 13880	Crest[1]	69.02	59.0	159	38.7	99.0	8.0
CI 13844	Wanser	65.52	58.6	161	42.8	82.5	1.7
CI 8885	Cheyenne	63.74	60.0	164	48.2	99.0	7.7
CI 13544	Sawmont	63.32	60.6	165	51.5	99.0	5.0
CI 13842	McCall	63.30	58.7	164	43.5	49.5	.7
MT 669	Rego x Cnn 39-10-10	62.49	59.5	164	52.2	99.0	6.8
MT 6611	Rego x Cnn 39-18-7	62.35	59.7	164	49.8	99.0	7.2
MT 668	Rego x Cnn 39-4-7	61.79*	59.8	163	48.3	99.0	7.0
CI 12933	Itana	61.10*	59.9	164	46.8	82.5	5.8
CI 13190	Warrior	60.79*	59.5	161	47.2	99.0	7.0
MT 6535	Rego/Cnn 39-7-4	59.02*	59.4	165	49.7	99.0	6.5
MT 692	MM/Yogo//Rsc/3/Td 123	58.79*	59.5	163	46.8	99.0	6.2
MT 6532	Rego x Cnn 37-12-4	58.74*	58.1	163	48.3	99.0	7.0
CI 13181	Rego	58.69*	58.0	164	49.8	93.5	7.3
MT 691	Yogo/Rsc//Marmin/3/Td	58.42*	57.1	179	48.0	99.0	7.5
CI 13547	Lancer	58.37*	60.4	159	44.5	99.0	5.3
MT 6616	Sel Bulk 6-142-6	58.30*	60.6	166	48.5	99.0	7.7
MT 6910	Wsc/Yogo//Rsc/3/Td 231	58.22*	59.7	163	47.8	99.0	4.0
MT 6531	Rego x Cnn 37-3-6	58.20*	58.6	163	49.2	99.0	7.0
MT 698	Wsc/Yogo//Rsc/3/Wrr 189	57.87*	59.4	162	46.5	93.5	6.2
CI 13670	Winalta	57.85*	61.0	163	46.7	99.0	5.8
CI 13526	Hume	57.52*	60.0	160	46.2	99.0	5.3
CI 14000	Winoka	57.15*	60.9	164	47.7	99.0	7.0
MT 693	Winalta 41	56.72*	61.1	163	46.5	99.0	7.3
MT 672	Sawmont - Lax	56.59*	60.8	165	49.0	99.0	6.7
CI 13999	Trapper	56.55*	59.6	162	46.5	99.0	7.5
MT 654	Sel Bulk 7-58	55.69*	60.0	164	48.7	99.0	7.2
CI 13872	Froid	55.53*	59.3	166	50.5	99.0	7.3

Table 1 . (Con't)

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Days Jan.1 to Heading	Plant Height	Lodging % Prev.	Lodging Sev. (0-9)
CI 8033	Yogo	55.53*	59.6	166	50.2	99.0	7.2
MT 6615	Rego x Yto 457	55.38*	58.5	165	48.2	99.0	7.0
MT 671	Sawmont - Erect	55.18*	59.6	164	48.8	99.0	4.8
CI 13998	Trader	54.73*	59.0	162	46.2	99.0	6.3
MT 6610	Rego x Cnn 39-16-3	54.33*	59.5	165	52.3	99.0	7.0
CI 6938	Kharkof MC 22	53.25*	58.7	169	50.8	99.0	6.2
MT 694	Mm/Yogo//Rsc/3/Yogo/Tk/0	52.32*	60.0	163	49.8	99.0	7.2
CI 6700	Karmont	50.30*	59.5	167	49.0	99.0	7.7

1/ Check variety
* Varieties yielding significantly less than the check (.05)
2/ Variety yielding significantly more than the check

$\bar{x}$	59.3	59.6	164	47.2	91.3	6.0
F - value for variety comparison	5.67*	0.0	1.44	21.43**	19.27**	13.80**
S.E.$\bar{x}$	2.24	0.0	2.73	.86	5.35	.56
L.S.D.	6.22	0.0	7.56	2.37	14.84	1.56
C.V. %	3.78	0.0	1.66	1.81	5.86	9.37

Table 2. Summary of selected winter wheat data from the intrastate yield nurseries grown at the Northwestern Montana Branch Station, Kalispell, Montana from 1961-1970.

Variety	Number	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	Sta. Yrs.	% of Cheyenne	$\bar{x}$	2 Yrs. Average bu/acre	3 Yrs. Average bu/acre	4 Yrs. Average bu/acre	10 Yrs. Average bu/acre
Cheyenne	8885	49.5	55.5	61.9	57.5	48.7	59.3	46.4	57.2	57.0	63.7	10	100	55.7	60.4	59.3	56.1	55.7
Rego	13181	46.7	60.6	60.2	49.9	42.5	62.4	43.6		51.3	58.7	9	95	52.7	55.0			
Winalta	13670				54.4	31.4	67.4	44.9	55.8	45.7	57.9	7	92	51.1	51.8	53.1	51.0	
Crest	13880					40.8	73.4	53.5	51.5	43.8	69.0	6	100	55.3	56.4	54.7	54.5	
McCall	13842						56.4	51.9	76.8	40.5	63.3	5	102	57.8	51.9	60.2	58.1	
Lancer	13547						57.0	41.7	44.0	38.3	58.7	5	84	47.9	48.5	47.0	45.7	
Wanser	13844						73.9	51.7	76.5	56.0	65.5	5	114	64.7	60.8	66.0	62.4	
Itana	12933	48.0	50.3	54.5	46.8	38.3	58.2				61.1	7	90	51.0				
Warrior	13190				45.8	37.1	59.5	43.5			60.8	5	90	49.3				
Karmont	6700	44.4	50.4								50.3	3	86	48.3				

Table 3. Agronomic data from the western regional hard red winter wheat nursery grown on the Lance Claridge farm, Kalispell, Montana in 1970. Experimental design - ramdom block, four replications.

Planting date: September 30, 1969 Harvest date: August 17, 1970 Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu.	Days Jan.1 to Heading	Plant Height	% Dwarf Smut	Lodging % Prev.	Lodging Sev. 0-9	% Stand
MT 6827	Burt/PI 178383 14-1202	46.92	58.7	174	31.3	.0	0.0	.0	80.0
MT 6829	Burt/PI 178383 101-1200	41.41	59.3	173	30.3	.0	0.0	.0	80.0
MT 6826	Burt/PI 178383 4-1192	40.69	59.5	172	28.5	.0	0.0	.0	77.5
CI 1442	Kharkof	38.71	61.7	174	37.5	10.0	27.3	1.5	91.3
ID 0030	It*2/Ut*2//ID/B/3/13438	38.61	63.0	172	33.3	10.3	0.0	.0	86.3
UT 697010	It/Dm//Td/Ut 225-15-6	37.71	60.5	175	36.0	5.0	0.0	.0	93.8
CI 14580	Bridger	37.24	63.1	173	33.3	5.0	0.0	.0	91.3
ID 0007	Cheyenne/Utah 175A-53	37.04	62.5	175	33.5	11.5	0.0	.0	91.3
CI 10061	Rio	36.71	62.3	174	33.5	8.8	46.3	4.5	90.0
MT 6535	Rego/Cnn 39-7-4	36.51	60.4	173	34.8	6.5	0.0	.0	87.5
CI 13426	Tendoy	36.09	61.2	174	33.0	5.3	0.0	.0	90.0
CI 13842	McCall	35.99	61.0	174	30.5	16.8	0.0	.0	82.5
ID 0031	It*2/Ut*2//Id/B/3/13438	35.84	61.8	173	33.0	6.3	0.0	.0	85.0
MT 6641	Wmt*2/PI 178383	35.79	61.2	174	32.8	4.8	0.0	.0	87.5
MT 6828	Burt/PI 178383 13-1201	35.61	59.0	172	31.3	.3	0.0	.0	76.3
CI 8885	Cheyenne	35.59	61.5	173	32.0	8.8	0.0	.0	87.5
CI 13880	Crest	35.56	61.9	170	26.5	.5	27.5	2.5	80.0
CI 13846	Itana 65	35.21	61.5	173	32.3	20.0	0.0	.0	80.0
ID 0009	Cheyenne/Utah 175A-53	34.94	60.9	174	31.5	7.8	0.0	.0	83.8
CI 12933	Itana	34.86	61.7	174	33.5	13.8	0.0	.0	92.5
MT 691	Yogo/Rsc//Marmin/3/Td	34.46	61.0	174	33.5	.0	5.0	2.3	85.0
ID 0008	Cheyenne/Utah 175A-53	34.36	61.0	175	33.0	7.5	0.0	.0	83.8
ID 0010	Cnn/Utah 175A-53	34.06	62.4	173	32.0	6.5	0.0	.0	86.3
CI 13442	Delmar	34.04	61.6	175	35.3	4.0	0.0	.0	75.0
ID 0027	Wrr//Ka/PI 178383	32.74	62.3	172	30.5	.0	0.0	.0	77.5
CI 13844	Wanser	32.71	61.0	173	29.8	10.0	0.0	.0	76.3
ID 5006	Nrnl0/Staring//2*Cnn	31.91	60.0	175	23.0	13.8	0.0	.0	82.5
$\bar{x}$		36.3	61.2	173.4	32.0	6.3	3.9	.4	84.4
F - value for variety comparison		1.58 NS	0.0	13.21**	12.55**	3.23**	3.0**	4.57**	1.86**
S.E.$\bar{x}$		2.43	0.0	.31	.82	3.02	6.45	.50	4.05
L.S.D. .05		6.85	0.0	.87	2.30	8.53	18.21	1.41	11.44
C. V. %		6.68	0.0	.18	2.55	44.66	164.4	125.18	4.80

Table 4. Agronomic data from the western regional white winter wheat nursery, grown at the Northwestern Montana Branch Station, Route 4, Kalispell in 1970. Field No. E-2 Experimental design - random block, four replications.

Planting date: September 29, 1969 Harvest date: August 11, 1970 Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Days Jan. 1 to Heading	Plant Height	% Dwarf Smut	Lodging % Prev.	Lodging (0-9) Sev.
WA 5573	Luke	93.08*	60.4	169	35.5	1.3	24.8	2.3
OR 631305	Nord Desprez/2*Sel. 101	88.78*	58.8	163	33.0	1.3	49.5	.8
OR 63112	Nord Desprez/2*Sel. 101	87.33	58.7	165	31.8	3.0	0.0	.0
CI 14485	Suwon 92/4*Omar	87.00	58.2	167	35.0	6.3	0.0	.0
CI 14482	N10/B11//P14/3/14/53 101	81.98	60.5	164	33.3	7.8	0.0	.0
OR 6739	178383/2*Omar//13438	80.65	57.8	162	33.8	.3	0.0	.0
OR 611227	Yamhill	78.35	55.7	169	37.0	11.3	0.0	.0
CI 13968	Nugaines 1/	77.58	61.5	165	31.5	6.3	0.0	.0
CI 12385	Brevor	75.83	59.9	167	40.5	6.3	52.0	2.8
CI 13740	Moro	75.37	56.4	167	43.0	.0	93.3	5.8
CI 13072	Omar	74.95	58.8	169	44.3	11.3	27.3	2.5
OR 6857	27-15//Rio/Rex/3/EG/4/M0	74.72	59.0	166	37.5	.0	2.5	.5
CI 11755	Elgin	74.12	58.1	169	42.8	23.8	24.8	2.0
CI 14483	Suwon 92/4*Burt	73.07	58.7	163	31.3	17.5	0.0	.0
CI 12696	Burt	71.60	58.0	163	41.8	6.5	12.5	2.0
CI 14484	14//53/Odin/3/CI 13431	71.30	60.2	168	31.3	12.5	0.0	.0
WA 5379	Omar Mutant 642084-808	68.62	58.3	169	32.0	1.5	0.0	.0
OR 6882	Oam/3/178383/2*Omar//101	67.35	59.4	169	45.5	.0	24.8	.5
WA 5572	Omar Mutant 642026-197	64.92 2/	59.6	167	40.3	5.0	74.3	2.5
CI 10063	Golden	64.17 2/	58.9	168	46.8	7.5	74.3	4.3
CI 5408	Triplet	63.57 2/	61.2	164	47.3	15.0	99.0	6.8
CI 1442	Kharkof	56.39 2/	59.7	165	50.0	11.3	74.3	6.3

* Varieties yielding significantly more than the check .05

1/Check variety 2/ Varieties yielding significantly less than the check

$\bar{x}$	75.0	59.0	166	38.4	7.1	28.8	1.8
F - Value for variety comparison	5.14*	0.0	20.00**	85.15**	6.2**	5.38**	4.29*
SE$\bar{x}$	4.01	0.0	.53	.65	2.56	14.79	1.06
L.S.D. .05	11.34	0.0	1.51	1.85	7.23	41.84	3.0
C.V.%	5.34	0.0	.32	1.70	36.23	51.41	60.31

Table 6. Summary of uniform white winter wheat nursery grown at the Northwestern Montana Branch Station, Kalispell Montana, 1962-1970

Variety	Number	1962	1963	1964	1966	1967	1968	1969	1970	Total	Sta. Yrs.	$\bar{x}$	% Omar
Omar	13072	60.2	36.0	51.2	58.7	51.4	73.9	71.0	75.0	477.4	8	59.7	100
Brevor	12385	68.5	61.7	67.7	71.0	60.0	87.9	68.4	75.8	561.0	8	70.1	118
Golden	10063	50.6	43.5	42.3	55.0	46.3	70.4	67.2	64.2	439.5	8	54.9	92
Burt	12696	60.0	58.7	54.6	62.2	46.0	86.5	66.0	71.6	505.6	8	63.2	106
Kharkof	1442	48.8	50.1	49.2	52.1	47.4	58.5	58.9	56.4	421.4	8	52.7	88
Triplet	5408	50.2	49.8	51.1	59.5	47.4	71.3	57.2	63.6	450.1	8	56.3	94
Elgin	11755	59.3	41.6	57.3	52.3	49.6	80.5	51.2	74.1	465.9	8	58.2	98
Moro	13740			50.1	85.9	57.2	86.3	65.7	75.4	420.6	6	70.1	110
Nugaines	13968				79.7	58.7	85.8	63.2	77.6	365.0	5	73.0	111
N10/B11/P14//14/53-101(WA4995)	14482						98.8	70.7	82.0	251.5	3	83.8	114
Paha (WA 4966)	14485						98.1	65.4	87.0	250.5	3	83.5	114
N and Desprey/2 Sel. 101	OR63112						90.1	62.7	87.3	240.1	3	80.0	109
Suwon 92/4 Burt (WA 4984)	14483						84.5	55.4	73.1	213.0	3	71.0	97
(14/53/Odin)/CI 13431 (WA4877)	14484						86.7	53.3	71.3	211.3	3	70.4	96
Yamhill	OR611227							69.6	78.4	148.0	2	74.0	101
178383/2 Omar 2/13438	OR 6739							63.3	80.7	144.0	2	72.0	99
Omar Mutant 642084-808	WA 5379							50.7	68.2	118.9	2	59.5	81
Luke	WA 5573								93.1	93.1	1	93.1	124
Nord Desprez/2 x Sel. 101	OR631305								88.8	88.8	1	88.8	117
15//Rio/Rex/3/EG/4/MO	OR685727								74.7	74.7	1	74.7	100
AM/3/178383/2 x Omar//101	OR 6882								67.4	67.4	1	67.4	90
Omar Mutant 642026-197	WA 5572								64.9	64.9	1	64.9	87

Table 7. Agronomic data from off station winter wheat nursery grown in Missoula County on the Alvin Goodan farm, Missoula, Montana in 1970. Experimental design - random block, four replications.

Planting date: September 22, 1969 Harvest date: Aug. 6,1970
Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A.	Test Wt Lbs/Bu.	Plant Height	Lodging % Prev	Lodging Sev. 0-9	% Stand
CI 13072	Omar	36.79	59.4	26.3	0.0	.0	73.8
CI 13842	McCall	35.86	59.0	24.8	57.5	2.8	58.8
CI 13968	Nugaines	33.94	60.6	24.0	0.0	.0	73.8
CI 13740	Moro	33.21	56.6	24.5	0.0	.0	83.8
MT 6829	Burt/PI 178383 101-1200	30.41	58.8	24.0	56.0	5.5	61.3
CI 13880	Crest 1/	29.93	59.1	20.8	67.3	4.3	58.8
CI 8885	Cheyenne	29.88	59.4	29.0	92.3	4.3	55.0
MT 6826	Burt/PI 1783 4-1192	29.38	57.5	24.8	37.5	3.8	55.0
CI 13442	Delmar	28.63	59.3	30.3	59.8	4.5	58.8
MT 6827	Burt/PI 178383 14-1202	28.16	58.0	25.3	18.8	3.8	63.8
CI 13844	Wanser	28.06	59.1	27.0	26.3	1.3	68.8
CI 14484	14//53/Odin/3/CI 13431	24.33	58.4	23.3	0.0	.0	58.8
MT 6828	Burt/PI 178383 13-1201	24.11	57.0	23.3	2.5	.8	57.5
CI 12930	Westmont	22.93*	60.2	24.3	26.3	3.3	48.8
CI 14580	Bridger	19.78*	0.0	25.5	63.3	4.5	48.8
CI 13670	Winalta	17.76*	0.0	24.5	26.3	3.3	60.0
	$\bar{x}$	28.3	58.7	25.1	33.3	2.6	61.6
	F - value for variety comparison	4.96**	0.0	11.25**	4.36**	5.70**	1.90
	S.E.$\bar{x}$	2.44	0.0	.67	14.15	.82	6.79
	L.S.D.	6.94	0.0	1.92	40.30	2.32	19.33
	C.V. %	8.60	0.0	2.69	42.44	31.27	11.02

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

Table 8. Agronomic data from the off station winter wheat nursery grown on the L. B. McFadgen farm in Ravalli County at Stevensville, Montana in 1970. Experimental design - random block, four replications.

Planting date: September 22, 1969 Harvest date: August 5, 1970
Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Days Jan.1 to Heading	Plant Height
CI 13670	Winalta	27.18	59.2	161	26.8
CI 13880	Crest	26.11	57.1	157	22.3
CI 13968	Nugaines	25.73	58.0	169	21.3
CI 13740	Moro	24.41	54.2	167	21.8
CI 13442	Delmar	24.11	58.0	162	25.8
CI 13844	Wanser	23.98	56.5	161	24.3
CI 12930	Westmont	23.21	58.2	159	20.8
CI 8885	Cheyenne	22.21	58.4	163	24.8
MT 6829	Burt/PI 178383 101-1200	21.48	54.8	161	22.0
MT 6828	Burt/PI 178383 13-1201	21.11	54.7	159	24.3
CI 13842	McCall	20.86	57.3	161	21.0
CI 13072	Omar	18.51	0.0	168	20.5
MT 6826	Burt/PI 1783 4-1192	17.53	0.0	161	21.5
CI 14580	Bridger	16.61	0.0	163	21.0
MT 6827	Burt/PI 178383 14-1202	16.03	0.0	160	20.5
CI 14484	14//53/Odin/3/CI 13431	14.98	0.0	168	18.3
$\bar{x}$		21.5	56.9	162.5	22.3
F - value for variety comparison		2.07	0.0	0.0	3.55
S.E.x		2.65	0.0	0.0	1.20
L.S.D. (.05)		N.S.	0.0	0.0	3.55
C.V.%		12.32	0.0	0.0	5.36

Table 9. Agronomic data from off station winter wheat nursery grown in Lake County on the Walter Mangles farm, Polson, Montana in 1970. Experimental design - random block, four replications.

Planting date: September 23, 196[illegible]
Harvest date: August 13, 1970
Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A.	Test Wt Lbs/Bu.	Plant Height	Lodging % Prev.	Lodging Sev. 0-9
CI 13740	Moro	54.69	56.2	30.3	28.8	1.8
CI 13880	Crest 1/	49.72	58.3	28.8	84.8	6.5
CI 13072	Omar	47.29	58.4	31.8	27.3	1.5
CI 13968	Nugaines	45.99	60.0	27.0	0.0	.0
MT 6826	Burt/PI 1783 4-1192	44.84	56.3	31.5	72.0	4.5
CI 8885	Cheyenne	43.81	60.6	33.5	74.5	3.8
MT 6828	Burt/PI 178383 13-1201	43.26	58.4	33.0	74.0	4.0
CI 14484	14//53/Odin/3/CI 13431	42.56	59.0	28.3	0.0	.0
CI 13842	McCall	41.54	59.3	31.3	29.8	1.8
CI 14580	Bridger	41.46	61.8	34.0	56.0	3.8
MT 6827	Burt/PI 178383 14-1202	40.34	56.8	33.0	88.5	5.3
CI 13670	Winalta	38.09	60.8	33.5	99.0	1.8
MT 6829	Burt/PI 178383 101-1200	37.99	58.3	29.8	89.8	5.0
CI 13844	Wanser	33.31*	59.4	31.5	21.3	1.0
CI 13442	Delmar	33.16*	60.6	32.3	18.8	2.0
CI 12930	Westmont	27.91*	60.5	28.8	21.3	3.3

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

$\bar{x}$	41.6	59.0	31.1	49.1	2.9
F - value for variety comparison	2.67**	0.0	3.23**	5.31**	5.91**
S.E.$\bar{x}$	4.07	0.0	1.18	14.77	.79
L.S.D.	11.59	0.0	3.37	42.06	2.25
C.V.%	9.77	0.0	3.80	30.08	27.64

Table 10. Agronomic data from the off station winter wheat nursery grown in Sanders County on the Jack Marriman farm, Hot Springs, Montana in 1970. Experimental design - random block, four replications.

Planting date September 23, 1969 Harvest Date: August 6, 1970
Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Lodging % Prev	Lodging Sev. 0-9	% Stand
CI 13844	Wanser	29.33	56.2	29.5	80.8	2.5	95.8
CI 13670	Winalta	26.78	58.6	27.0	74.3	1.3	99.0
CI 13842	McCall	26.51	57.2	27.8	89.5	2.8	86.3
CI 13740	Moro	26.46	53.0	30.0	78.3	4.5	83.8
CI 13880	Crest 1/	26.43	56.0	28.0	94.5	3.5	96.0
MT 6829	Burt/PI 178383 101-1200	25.13	55.2	28.3	92.0	3.8	92.0
CI 13072	Omar	25.03	55.3	28.3	28.8	2.0	92.3
CI 8885	Cheyenne	24.48	57.8	29.0	91.8	2.8	95.8
CI 14580	Bridger	24.01	58.1	29.5	91.8	3.5	93.5
CI 13968	Nugaines	23.86	56.5	22.8	0.0	.0	95.8
MT 6826	Burt/PI 1783 4-1192	23.81	55.3	29.8	99.0	3.8	88.8
CI 14484	14//53/Odin/3/CI 13431	23.61	54.2	25.3	13.8	.8	86.3
MT 6827	Burt/PI 178383 14-1202	23.13	54.8	28.3	93.5	2.5	92.5
CI 12930	Westmont	22.83	59.8	27.8	64.5	3.0	81.3
CI 13442	Delmar	20.91*	56.5	30.5	51.0	3.3	83.8
MT 6828	Burt/PI 178383 13-1201	20.83*	54.7	27.8	92.0	3.3	92.3
	$\bar{x}$	24.6	56.2	28.1	71.0	2.7	90.9
	F - value for variety comparison	2.47*	0.0	4.26**	5.46**	3.56*	1.60
	S.E.$\bar{x}$	1.41	0.0	.93	13.36	.63	4.18
	L.S.D. (.05)	4.02	0.0	2.65	38.06	1.80	11.92
	C.V. %	5.74	0.0	3.31	10.04	23.45	4.60

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

Table 11. Yield summary of winter wheat varieties grown in western Montana, 1969-70.

CI or State #	Variety	Yield Bu/A Location by Counties				$\bar{x}$	Rank
		Missoula	Ravalli	Lake	Sanders		
13880	Crest	29.9	26.1	49.7	26.4	33.0	1
8885	Cheyenne	29.9	22.2	43.8	24.5	29.9	3
13442	Delmar	28.6	24.1	33.2	20.9	26.7	10
12930	Westmont	22.9	23.2	27.9	22.8	24.2	12
13844	Wanser	28.1	24.0	33.3	29.3	28.7	6
13670	Winalta	17.8	27.2	38.1	26.8	27.5	7
13842	McCall	35.9	20.9	41.5	26.5	31.2	2
14580	Bridger	19.8	16.6	41.5	24.1	25.5	11
MT 6826	Burt x PI 178383	29.4	17.5	44.8	23.8	28.9	4
MT 6827	Burt x PI 178383	28.2	16.0	40.3	23.1	26.9	9
MT 6828	Burt x PI 178383	24.1	21.1	43.3	20.8	27.3	8
MT 6829	Burt x PI 178383	30.4	21.5	38.0	25.1	28.8	5
13968	Nugaines	33.9	25.7	46.0	23.9	32.4	2w 1/
13740	Moro	33.2	24.4	54.7	26.5	34.7	1w
14484	14//53/Odin/3/CI 13431	24.3	15.0	42.6	23.6	26.4	4w
13072	Omar	36.8	13.5	47.3	25.0	31.9	3w
$\bar{x}$		28.3	21.5	41.6	24.6		
F - Value for variety comparison		4.96**	2.07	2.67*	2.47*		
S.E.$\bar{x}$		2.44	2.65	4.07	1.41		
L.S.D.(.05)		6.94	N.S.	11.59	4.02		
C.V.%		8.60	12.32	9.77	5.74		

1/ w= white wheat ranking

TITLE: Spring Wheat

PROJECT: Small Grains Investigations MS 756

YEAR: 1970

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

LOCATION: Northwestern Montana Branch Station - Field No. Y-8. 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 variety.
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. In general, semi-dwarf types were higher in yield than standard varieties.
2. CA 6903, a semi-dwarf, was outstanding in the Western Regional Nursery.
3. CI 13736 was the highest yielding variety grown in Western Montana in 1970, but is very late in maturity which is a definite draw back.

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 Y-8 at the Northwestern Montana Branch Station. The nurseries grown were: Advanced Yield Nursery, containing 30 entries; the Western Regional White Spring Wheat Nursery, containing 27 entries; the Isogenic Height Level Nursery, 5 entries (four located off station) the Yield Component Yield Nursery, 27 entries and the Protein Yield Nursery, 18 entries. Tiller counts, kernels/head, 500 kernel weights were secured on the protein yield nursery and the yield component study. Tillers were counted in 16 linear feet of row and 25 heads selected at random were used to determine seeds per head. Four off station nurseries consisting of 16 entries were seeded in Lake, Missoula, Sanders and Ravalli Counties.

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

RESULTS AND DISCUSSION:

Advance Yield Nursery

Twenty entries in this nursery were significantly higher in yield than Sheridan which was used as the check. The semi-dwarf types were for the most part the highest yielding lines and lodging resistance was excellent in most of the semi-dwarf lines except Pitic 62, MT 6539 and Bonanza. Nine entries all semi-dwarf exceeded 80 bushels per acre in this study. Severe early lodging in Fortuna and Sheridan no doubt accounts for the low yields in these two varieties. Based on agronomic data MT 6903, MT 6902, MT 6865, MT 6868 and MT 6723 are entries that should be given additional consideration. None of the commercial entries were outstanding in performance, however Bonanza a DeKalb entry was the highest yielding of this group. Table 1.

A summary of 10 years data of the Advance Yield nursery is given in Table 2. The semi-dwarf are far superior to Sheridan and Thatcher for the most part. Fortuna is 119 percent of Sheridan, 109 of Thatcher, based on 6 years data. For the three year period MT 6723 is 130 percent of Sheridan and 118% of Thatcher, Era for a 2 year period is 140% of Thatcher and 149% of Sheridan. These two varieties have real possibility for use in Western Montana.

Western Regional White Wheat Nursery

CA 6903 is the high yielding entry in this nursery and has a maturity date similar to Idaed 59, and is highly resistant to lodging. Springfield(ID 0019)and ID 0015 were lower in yield than last year. ID 0015 was very late and had a very low test weight. Springfield (ID 0019)has fair test weight, but did not out yield Idaed in this years nursery. Lodging and stripe rust were severe, however rust rates were not recorded. Table 3.

In Table 4 is found data for ten years on wheats grown in the Western Regional Nursery. Varieties are compared with Lemhi and also with Idaed 59. There are several entries that are far superior to the checks in yield. Maturity of varieties is a critical factor in many of the entries, however these data are not included in Table 4.

Off Station

Of the four nurseries planted only two were harvested. The nursery in Missoula County was dropped because of a high infestation of Canada thistle. The nursery in Sanders County was not harvested because of uneven stands and growth. This was due in part to a soil condition and inadequate irrigation.

Ravalli County

In this location ID 0015 was the leading entry for yield, but had a very low test weight due to the lateness in maturity. This nursery was harvested a little on the green side, however Sheridan had a good test weight. Table 5.

Results and Discussion (con't)

Lake County

ID 0015 was high in this location as it was in Ravalli County. Test weights were low in both ID 0015 and ID 0019, but ID 0019 is a slight bit higher. Five entries were significantly higher in yield than the variety Sheridan. Table 6.

In 1970 the top three yielding varieties were CI 14555, CI 13736 and Pitic 62. All three were low in test weight and quite late in maturity. CI 13736 was very late as was Pitic 62. Table 7.

Isogenic Height Nurseries

Significant results were obtained in two of the four nurseries. At the station the medium types were significantly higher in yield than Centana and in Ravalli County the medium types were highest in yield but only one bushel higher than Centana. The nurseries in Sanders and Lake Counties were not significantly different in yield.

Plant heights were all found to vary significantly at all locations as would be expected with this material.

Kernel weights were significantly different in all locations. Medium is the heaviest of the entries. Complete data for these studies are seen in Table 8 thru 11. Table 12 gives a summary of these data.

Table 1. Agronomic data from the advanced yield nursery grown at the Northwestern Montana Branch Station, Route 4, Kalispell, in 1970. Field No. Y-8. Experimental design - random block, four reps.

Planting Date: May 6, 1970
Harvest Date: September 10, 1970
Size of Plot: 16 sq. ft.

CI or State #	Variety	Yield Bu/A	Test Wt Lbs/Bu.	Days Jan 1 to Heading	Plant Height	Lodging % Prev.	Lodging Sev. 0-9
MT 6903	Si/3/Nrn10/Bvr14//5*Cnt	87.68*	58.1	185b	37.0b	0.0b	0.0b
ID 0018	Tzpp/Sonora 64	85.68*	56.6	185b	39.3b	27.5b	2.0b
MT 6902	7327/3/N10/Bvr14//5*Cnt	85.03*	57.2	187a	38.3b	0.0b	0.0b
MT 6865	B52-91/3/N10/B14//4*Cnt	84.65*	55.1	184b	38.0b	0.0b	0.0b
MT 6868	B52-91/3/N10/B14//4*Cnt	84.05*	57.2	185b	37.0b	0.0b	0.0b
CI 13927	Pitic 62	82.48*	54.3	189a	38.5b	78.8	6.3
CI 13986	Era	82.23*	58.8	187a	36.5b	10.0b	2.5b
MT 6839	Ftr/3/Nrn10/Bvr14//5*Cnt	80.25*	58.2	187a	39.5b	71.0	4.0b
MT 6723	Nrn10/Bvr14//6*Cnt	80.23*	58.2	186	35.8b	0.0b	0.0b
DK 1	Bonanza	79.70*	58.2	185b	33.8b	71.0	7.8
CI 13985	Fletcher	78.03*	57.7	188a	36.0b	10.0b	1.0b
SB 8	Dekalb SB8	77.23*	59.0	185b	35.8b	0.0b	0.0b
MT 6901	Ceres/3/N10/Bvr14//4*Cnt	75.47*	56.2	186	39.0b	20.0b	2.0b
MT 6830	Si/3/Nrn10/Bvr14//5*Cnt	74.05*	56.3	184b	37.0b	0.0b	0.0b
ND 6579	Fta/61-107,S6579	71.32	57.9	185b	42.8b	62.0b	4.0b
MT 6834	Si/3/Nrn10/Bvr14//5*Cnt	70.60*	56.4	185b	39.3b	42.3b	2.0b
RL 4200	Neepawa	70.40*	57.4	185b	43.5b	15.0b	2.0b
CI 13958	Waldron	67.10*	55.4	184b	44.0b	32.5b	2.8b
CI 13775	Manitou, R.L. 4159	66.92*	57.4	185b	44.3b	51.0b	5.3b
MT 6905	B59-3/Sheridan	66.22*	53.6	186	40.0b	85.8	8.3
WO 1812	World Seeds 1812	65.95*	56.9	184b	31.0b	46.0b	.5b
CI 13768	Leeds	64.00*	58.6	185b	48.0	69.5	6.8
WO 1809	World Seeds 1809	60.57*	54.2	180b	31.3b	84.5	7.5
SB 6	Dekalb SB6	57.74*	52.9	180b	31.5b	63.5b	6.3
MT 6851	B52-91/Ftr	55.89	55.7	186	47.0	80.8	5.5b
CI 10003	Thatcher	55.47	56.3	185b	42.8b	98.0	4.0b
CI 13333	Wells	53.67	54.6	186	48.8	99.0	8.5
CI 12974	Centana	52.77	57.1	187a	45.3b	94.3	7.5
CI 13773	Polk	50.22	57.5	186	46.5	82.3	6.3
CI 13586	Sheridan 1/	45.72	55.6	186	47.8	99.0	9.0
CI 13596	Fortuna	41.86	51.0	186	43.3b	99.0	8.8
MT 681	Nrn10/Bvr14//Cnt/3/4*RS	38.64	47.9	186	36.0b	99.0	8.0
MT 6812	Nrn10/Bvr14//Cnt/3/4*RS	35.66	47.9	186	41.0b	99.0	8.0
$\bar{x}$		67.5	55.9	185.2	39.8	51.2	4.1
F - Value for variety comparison		12.82**	0.0	24.14**	31.15**	10.75**	10.51**
S.E.$\bar{x}$		4.13	0.0	3.6	.88	11.66	1.0
L.S.D. (.05)		11.57	0.0	1.02	2.48	32.69	2.80
C.V.%		6.12	0.0	.20	2.22	22.76	24.19

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

Table 2. Summary of dryland hard red spring wheat yields for the advanced yield nursery grown at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana from 1961-1970.

CI or State No.	Variety	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	Sta. Yrs.	% Thatcher	% Sheridan
CI 10003	Thatcher	27.4	49.7	34.7	46.7	65.4	62.2	60.6	63.4	69.5	55.5	10	100.0	99.3
CI 13586	Sheridan	38.5	59.4	36.9	50.6	76.8	50.9	54.5	54.4	71.7	45.7	10	100.8	100.0
CI 12974	Centana	28.3	59.1	34.3	47.8	61.1	50.4	54.5	66.1	61.9	52.8	10	96.5	95.7
CI 13333	Wells		52.6	33.7	57.1	59.4	67.9	62.8	63.1	64.8	53.7	9	101.2	102.5
CI 13775	Manitou, R.				50.8	62.2	67.5	57.5	57.6	70.7	66.9	7	102.3	107.1
CI 13596	Fortuna				62.9		66.2	56.4	74.7	88.9	41.9	6	109.2	119.4
CI 13768	Leeds						55.8	58.1	58.2	49.4	64.0	5	91.8	103.1
CI 13773	Polk						51.4	52.3	57.2	64.3	50.2	5	88.5	99.5
MT 6723	Nrnl0/Bvrl4								71.8	71.9	80.2	3	118.8	130.2
CI 13986	Era									93.1	82.2	2	140.2	149.4
CI 13927	Pitic 62									101.1	82.5	2	146.9	156.4
ND 6579	Fta/61-107,									90.9	71.3	2	129.8	138.2
MT 6839	Ftr/3/Nrnl0									80.9	80.3	2	129.0	137.3
MT 6830	Si/3/Nrnl0/									87.0	74.0	2	128.8	137.1
MT 6834	Si/3/Nrnl0/									86.7	70.6	2	125.8	133.9
RL 4200	Neepawa									74.2	70.4	2	115.7	123.2
CI 13958	Waldron									62.0	67.1	2	103.3	110.1
MT 6903	Si/3/Nrnl0/										87.7	1	158.0	191.9
ID 18	Tzpp/Sonora										85.7	1	154.4	187.5
MT 6902	7327/3/Nl0/										85.0	1	153.2	186.0
MT 6865	B52-91/3/Nl										84.7	1	152.6	185.3
MT 6868	B52-91/3/Nl										84.1	1	151.5	184.0
DK 1	Bonanza										79.7	1	143.6	174.4
CI 13985	Fletcher										78.0	1	140.5	170.7
SB 8	Dekalb SB8										77.2	1	139.1	168.9
MT 6901	Ceres/3/Nl0										75.5	1	136.0	165.2
MT 6905	B59-3/Sheri										66.2	1	119.3	144.9
WO 1812	World Seeds										65.9	1	118.7	144.2
WO 1809	World Seeds										60.6	1	109.2	132.6
SB 6	Dekalb SB6										57.7	1	104.0	126.2
MT 6851	B52-91/Ftr										55.9	1	100.7	122.3
MT 681	Nrnl0/Bvrl4										38.6	1	69.5	84.5
MT 6812	Nrnl0/Bvrl4										35.7	1	64.3	78.1

Table 3. Agronomic data from the western regional spring wheat nursery grown at Northwestern Montana Branch Station, Route 4, Kalispell Montana in 1970. Field No. Y-8 Experimental design - random block, four replications.

Planting date: May 6, 1970
Harvest date: September 10, 1970
Size of plot: 16 sq. ft.

CI or State #	Variety	Yield Bu/A	Test Wt Lbs/Bu.	Days Jan 1 to Heading	Plant Height	Lodging % Prev.	Lodging Sev. 0-9
CA 6903	Azteca F67	87.95*	57.9	181b	34.3b	0.0b	0.0b
CA 6901	Inia 66	79.30*	58.3	181b	33.3b	0.0b	0.0b
CI 13736	Burt x Kf, 58-2025	77.13*	54.5	193a	42.3	41.3b	3.5b
MT 6723	Nrnl0/Bvrl4//6*Cnt	75.37	57.8	187a	37.5b	2.5b	.5b
CA 6902	Tobari 66	73.27	56.0	183a	34.8b	25.0b	2.0b
CI 14587	TZpp/Sonora 64	70.37	56.3	185a	38.0b	52.5b	4.5
ID 0035	Tzpp/Sonora 64	67.92	56.7	186a	38.5b	50.0b	5.3
UT256006	Svn/4/Lee/3/N10/Bvr//Ut	67.05	57.0	184a	35.8b	71.0	5.5
ID 0028	Nrnl0/Bvr//Tk/3/2*Cnt	66.60	57.4	183b	40.8	80.8	2.8b
OR 6713	Idaed/Burt//Idaed 59	64.90	57.0	185a	42.0	52.0b	1.3b
CI 14588	Aberdeen Selection	64.32	51.4	190a	37.5b	32.5b	4.0
CI 13631	Idaed 59 1/	59.82	55.5	182	42.0	99.0	6.8
CA 6907	Opal	59.42	52.3	191a	45.5	87.3	6.3
OR 672	Idaed x Burt, 19-1	57.09	54.6	185a	39.0b	85.8	3.8
WA 5652	Henry/Burt, Sel 65-2	56.69	56.5	189a	49.0	98.0	6.0
CI 10003	Thatcher	56.67	56.0	186a	44.3	99.0	4.3
CI 14589	Aberdeen Selection	54.32	59.3	187a	36.3b	51.0b	5.0
UT256002	Svn/4/Lee/3/N10/Bvr//Ut	53.09	50.7	193a	36.0b	78.3	8.0
ID 0020	Aberdeen Selection	48.94	59.7	187a	37.0b	77.5	8.0
CI 1697	Baart	40.31 2/	54.6	188a	45.3	99.0	9.0
WA 5651	Marfed Mutant 6278	38.19 2/	59.5	190a	42.8	99.0	9.0
ID 0036	Gaines/Lemhi 53	36.11 2/	43.5	187a	36.3b	73.3	6.0
WA 5658	Marfed Mutant x 6135-1	33.34 2/	51.4	190a	45.3	99.0	7.5
WA 5488	K337/Ao//Koelz7941S66-9	29.61 2/	47.1	188a	42.5	99.0	7.0
CI 11415	Lemhi	29.41 2/	48.5	189a	44.3	95.5	8.5
CI 11919	Marfed	26.46 2/	50.3	189a	43.8	99.0	8.5
CI 4734	Federation	18.43 2/	43.2	191a	44.8	96.8	7.8

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

$\bar{x}$	55.3	54.2	186.9	40.3	68.3	5.2
F-Value for variety comparison	10.26**	0.0	77.36**	20.98**	5.83**	5.88**
S.E.$\bar{x}$	5.69	0.0	.37	.92	13.78	1.15
L.S.D.(.05)	16.03	0.0	1.05	2.59	38.78	3.24
C.V.%	10.30	0.0	.20	2.28	20.18	22.10

Table 4. Summary of regional spring wheat variety yields grown at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana from 1960-69.

CI or State No.	Variety	1960	1961	1962	1963	1964	1966	1967	1968	1969	1970	Sta. Yrs.	% Lemhi	% Idaed 59
1697	Baart	29.1	25.5	41.8	21.8	35.0	32.4	60.9	52.5	62.1	40.3	10	126.1	77.1 1/
4734	Federation	30.6	24.9	44.1	21.2	29.5	36.6	43.7	54.1	55.2	18.4	10	112.6	68.3 1/
10003	Thatcher	25.5	30.0	50.3	35.2	50.1	72.6	57.4	54.7	70.5	56.7	10	158.2	97.0 1/
11415	Lemhi	17.8	18.3	52.4	6.2	14.7	15.7	37.2	69.7	57.0	29.4	10	100.0	61.4 1/
13631	Idaed 59	31.8		52.1	29.1	55.7	66.7	59.6	54.8	78.2	59.8	9	162.8	100.0
UT 256002	Svn/4/Lee/3/N10/Bvr//UT							63.3	61.6	113.0	53.1	4	150.7	115.3
13736	Burt x KF, 58-2025								70.2	103.0	77.1	3	160.4	129.9
11919	Marfed								53.0	67.3	26.5	3	94.0	76.1
14588	Aberdeen Selection 0015								71.9	95.5	64.3	3	148.4	123.0
ID 0020	Aberdeen Selection									93.2	48.9	2	162.7	102.9
UT 256006	Svn/4/Lee/3/N10/Bvr//Ut									85.1	67.1	2	151.2	110.3
CA 6902	Tobari 66									85.1	73.3	2	181.2	114.8
MT 6723	Nrn10/Bvr14//16*Cnt									85.1	75.4	2	183.5	116.0
OR 672	Idaed x Burt 19-1									82.0	57.1	2	159.3	100.1
CA 6903	Azteca F67									79.8	88.0	2	192.0	121.6
CA 6901	Inia 66									78.3	79.3	2	180.3	114.2
ID 0028	Nrn10/Bvr//Tk/3/2*Cnt									72.6	66.6	2	159.3	100.8
WA 5488	K337/AB//Koelz 7941S 66-9									69.0	29.6	2	112.8	71.4
14589	Aberdeen Selection 0019									90.0	54.3	2	167.0	104.6
14587	TZPP/Sonora 64										70.4	1	239.5	117.7
ID 0035	TZPP/Sonora 64										67.9	1	231.0	113.5
OR 6713	Idaed/Burt//Idaed 59										64.9	1	220.7	108.5
CA 6907	Opal										59.4	1	202.0	99.3
WA 5652	Henry/Burt, Sel 65-2										56.7	1	192.9	94.8
WA 5651	Marfed Mutant 6278										38.2	1	129.9	64.0
ID 0036	Gaines/Lemhi 53										36.1	1	122.8	60.5
WA 5658	Marfed Mutant x 6135-1										33.3	1	113.3	55.7

1/ 9 year average

Table 5. Agronomic data from off station spring wheat grown in Ravalli County on the Robert Symth farm, Corvallis, Montana in 1970.
Experimental design - random block, 4 replications.
Planting date: Apring 28, 1970
Harvest date: August 27, 1970
Size of Plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height
ID 0015	Aberdeen Selection	62.35*	50.80	27.75a
CI 13927	Pitic 62	62.25*	53.00	29.75a
CI 13736	Burt/Kf,58-2025	58.37	58.10	28.75a
ID 0019	Aberdeen Sel. Springfield	56.14	51.90	25.75a
MN 6261	Era	51.02	58.50	27.25a
UT 256002	Svn/4/Lee/3/Nrnl0/Bvr//Ut	50.62	53.30	24.25a
CI 14193	Red River 68	47.69	60.30	27.25a
MT 6834	Si/3/Nrnl0/Bvrl4//5*Cnt	47.57	59.20	34.50a
CI 13586	Sheridan 1/	46.74	61.00	42.25
DK 1	Bonanza	46.27	58.20	26.75a
MT 6723	Nrnl0/Bvrl4//6*Cnt	45.16	56.70	28.50a
MT 6830	Si/3/Nrnl0/Bvrl4//5*Cnt	44.09	57.50	28.75a
CI 13631	Idaed 59	42.04	59.20	33.25a
CI 10003	Thatcher	41.46	58.50	36.00a
WO 1812	World Seeds 1812	37.74	59.20	24.25a
CI 13596	Fortuna	33.91	58.90	34.00a

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

$\bar{x}$	48.3	57.1	29.2
F - value for variety comparison	3.83**	0.0	14.56**
S.E.$\bar{x}$	4.19	0.0	1.27
L.S.D. (.05)	11.92	0.0	3.62
C.V.%	8.66	0.0	4.25

Table 6. Agronomic data from off station spring wheat nursery grown in Lake County on the James Flemming farm, Pablo, Montana in 1970. Experimental Design - Random Block, 4 replications.

Planting date: Apring 28, 1970
Harvest date: September 17, 1970
Size of plot: 16 sq. ft.

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs./Bu.	Plant Height
ID 0015	Aberdeen Selection	47.25*	56.90	25.50a
ID 0019	Aberdeen Sel. Springfield	47.22*	58.50	24.50a
CI 13736	Burt/Kf, 58-2025	41.11*	59.40	30.50
UT 256002	Svn/4/Lee/3/Nrnl0/Bvr//U	40.05*	55.60	26.00a
MN 6261	Era	38.55*	60.50	25.00a
MT 6830	Si/3/Nrnl0/Bvrl4//5*Cnt	32.38	59.80	25.50a
DK 1	Bonanza	32.14	57.80	22.25a
CI 13927	Pitic 62	32.11	55.00	25.25a
MT 6834	Si/3/Nrnl0/Bvrl4//5*Cnt	31.58	60.60	30.25
CI 13631	Idaed 59	31.41	58.50	25.50a
CI 14193	Red River 68	30.71	60.00	26.50a
CI 13586	Sheridan 1/	28.88	60.00	32.00
CI 13596	Fortuna	28.61	58.50	33.25
MT 6723	Nrnl0/Bvrl4//6*Cnt	27.74	59.50	26.00a
CI 10003	Thatcher	26.23	.00	30.50
WO 1812	World Seeds 1812	25.21	.00	22.75a

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

$\bar{x}$	33.8	58.7	27.0
F - value for variety comparison	4.10**	0.0	16.77**
S.E.$\bar{x}$	3.43	0.0	.80
L.S.D. (.05)	9.76	0.0	2.29
C.V.5	10.13	0.0	2.98

Table 7. Summary of spring varieties grown in Western Montana in 1970.

CI or State No.	Variety	N.W. Mont. Br. Sta.	Ravalli County	Lake County	$\bar{x}$	Rank	N.W. Mont. Br. Sta.	Ravalli County	Lake County	$\bar{x}$
		Yield Bu/A					Test Wt. Lbs/Bu.			
14588	Aberdeen Selection	64.32	62.35	47.25	57.97	3	51.4	50.8	56.9	53.0
13927	Pitic 62	82.48	62.25	32.11	58.95	1	54.3	53.0	55.0	54.1
13736	Burt/KF 58-2025	77.13	58.37	41.11	58.87	2	54.5	58.1	59.4	57.3
14589	Springfield	54.32	56.14	47.22	52.56	6	59.3	51.9	58.5	56.6
MN 6261	Era	82.23	51.02	38.55	56.93	4	58.8	58.5	60.5	59.3
UT 256002	SVN/4/Lee/3/NRN10/BVR//U	53.09	50.62	40.05	47.92	10	50.7	53.3	55.6	53.2
14193	Red River 68		47.69	30.71	39.20*			60.3	60.0	60.2*
MT 6834	SI/3/NRN/10/BVR14//5*Cnt	70.60	47.57	31.58	49.92	9	56.4	59.2	60.6	58.7
13586	Sheridan	45.72	46.74	28.88	40.45	15	55.6	61.0	60.0	58.9
DK 1	Bonanza	79.70	46.27	32.14	52.70	5	58.2	58.2	57.8	58.1
MT 6723	NRN/10/BVR14//6*Cnt	80.23	45.16	27.74	51.04	8	58.2	56.7	59.5	58.1
MT 6830	SI/3/NRN10/BVR14//5*Cnt	74.05	44.09	32.38	50.17	7	56.3	57.5	59.8	57.9
13631	Idaed 59	59.82	42.04	31.41	44.42	11	55.5	59.2	58.5	57.7
10003	Thatcher	55.47	41.46	26.28	41.07	13	56.3	58.5		57.4*
WO 1812	World Seeds 1812	65.95	37.74	25.21	42.97	12	56.9	59.2		58.1
13596	Fortuna	41.86	33.91	28.61	34.79	15	51.0	58.9	58.5	56.1

* Two locations

Table 8. Agronomic data from dryland isogenic height level nursery grown on the Northwestern Montana Branch Station, Route 4, Kalispell in 1970. Field No. Y-8. Experimental design - random block, four replications

Planting date: May 6, 1970 Harvest date: September 10, 1970
Size of plot: 16 sq. ft.

Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Jan. 1 to Heading	Plant Height	Kernel Weight	Heads/16'
Medium	70.50*	58.20	186	36.5 b/	16.80 b/	704.25
Short	48.82	51.60	187 a/	25.0 b/	15.27 b/	709.25
Centana - Check 1/	46.22	58.00	186	43.0	16.77	554.25
Tall	42.74	58.40	185 b/	41.8	17.00	607.25
Fortuna - Check	34.61	58.40	184 b/	43.0	20.92 a/	583.00
$\bar{x}$	48.6	56.9	185.6	37.8	17.4	631.6
F value for variety comparison	5.99**	0.0	47.18**	10.56**	47.48**	3.06
S.E.$\bar{x}$	5.46	0.0	.15	.36	.31	40.65
L.S.D.	16.48	0.0	.47	7.27	.94	N.S.
C.V.%	11.25	0.0	.08	6.23	1.77	6.44

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

Table 9. Agronomic data from irrigated isogenic height level nursery grown in Ravalli County on the Robert Symth farm, Corvallis, Mont. in 1970. Experimental design - random block, four replications.

Planting date: April 28, 1970 Harvest date: August 27, 1970
Size of plot: 16 sq. ft.

Variety	Yield Bu/A.	Test Wt. Lbs/Bu.	Plant Height	Kernel Weight
Medium	62.97	60.0	30.25	17.02 b/
Centana - Check 1/	61.62	62.0	39.25	18.25
Tall	57.19	62.0	37.75	17.87
Short	48.94 a/	58.4	22.50 b/	15.47 b/
Fortuna - check	44.24 b/	60.8	35.75 b/	20.82 a/
$\bar{x}$	55.0	60.6	33.1	17.9
F value for variety comparison	8.06**	0.0	60.63**	85.52**
S.E.$\bar{x}$	2.87	0.0	.88	.21
L.S.D.	8.83	0.0	2.71	.65
C.V.%	5.21	0.0	2.65	1.18

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

Table 10. Agronomic data from isogenic height level nursery located in Lake County on the James Flemming farm, Pablo, Mont. in 1970. Experimental design - random block, four replications.

Planting date: May 15, 1970 Harvest date: September 17, 1970
Size of plot: 16 sq. ft.

Variety	Yield Bu/A	Test Wt. Lbs/Bu	Plant Height	Lodging Prev. %	Lodging Sev.(0-9)	Kernel Weight
Centana - Check[1/]	28.53	62.80	29.50	48.75	5.25	16.07
Tall	27.63	62.40	30.75	74.50[b/]	6.50	15.47
Medium	27.31	61.20	24.25[b/]	0.00[b/]	.00[b/]	15.60
Short	26.06	59.20	17.75[b/]	7.50[b/]	1.00[b/]	12.77
Fortuna - Check	25.66	62.00	31.75	99.00[a/]	8.00	13.82
$\bar{x}$	27.00	61.5	26.8	45.9	4.1	14.8
F value for variety comparison	.61	0.0	39.55**	10.50**	10.15*	8.06**
S.E.$\bar{x}$	1.51	0.0	.93	13.12	1.10	.49
L.S.D.	N.S.	0.0	2.85	40.43	3.38	1.51
C.V.%	5.57	0.0	3.46	28.55	26.40	3.33

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

Table 11. Agronomic data from isogenic height level nursery grown in Sanders County on the Diehl Ranch, Plains, Mont. in 1970. Experimental design - random block, four replications.

Planting date: April 29, 1970 Harvest date: August 25, 1970
Size of plot: 16 sq. ft.

Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height	Kernel Weight
Centana - Check[1/]	30.89	59.60	39.25	13.70
Medium	30.36	59.20	28.00[b/]	14.07
Tall	28.41	59.20	34.50[b/]	13.47
Fortuna - Check	24.66	59.60	36.25	18.52[a/]
Short	20.71	58.80	21.00[b/]	12.57
$\bar{x}$	27.0	59.3	31.8	14.5
F value for variety comparison	1.71	0.0	23.46**	38.44**
S.E.$\bar{x}$	3.28	0.0	1.51	.38
L.S.D.	N.S.	0.0	4.65	1.16
C.V.%	8.26	0.0	3.80	.95

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

Table 12. Summary of the isogenic height nurseries grown in Western Montana in 1970.

Variety	Location: N.W. Br. Station	Ravalli County	Lake County	Sanders County	x
		YIELD BU/ACRE			
Medium	70.50	62.97	27.31	30.36	47.79
Centana - Check	46.22	61.62	28.53	30.89	41.76
Tall	42.74	57.19	27.63	28.41	38.99
Short	48.82	48.94	26.06	20.71	36.13
Fortuna	34.61	44.24	25.66	24.66	32.29
		TEST WT. LBS/BU.			
Medium	58.2	60.0	61.2	59.2	59.7
Centana - Check	58.0	62.0	62.8	59.6	60.6
Tall	58.4	62.0	62.4	59.2	60.5
Short	51.6	58.4	59.2	58.8	57.0
Fortuna	58.4	60.8	62.0	59.6	60.2
		PLANT HEIGHT/INCHES			
Medium	36.50	30.25	24.25	28.00	29.75
Centana - Check	43.00	39.25	29.50	39.25	37.75
Tall	41.75	37.75	20.75	34.50	36.19
Short	25.00	22.50	17.75	21.00	21.60
Fortuna	43.00	35.75	31.75	36.25	36.69
		KERNEL WEIGHT/GRAMS			
Medium	16.80	17.20	15.60	14.07	15.66
Centana - Check	16.77	18.25	16.07	13.70	16.18
Tall	17.00	17.87	15.47	13.47	15.95
Short	15.27	15.47	12.77	12.57	14.02
Fortuna	20.92	20.82	13.82	18.52	18.52

TITLE: Small Grains Investigations

PROJECT: Triticale - Rye MS 756

YEAR: 1970

PERSONNEL: Leader - Vern R. Stewart
Cooperator - Feed Grain Research Committee

LOCATION: Northwestern Montana Branch Station, Fields A-2, E-2

DURATION: Unknown

OBJECTIVES:
1. To compare wheat, oats and barley with triticale
2. Evaluate winter rye varieties

SIGNIFICANT FINDINGS:

1. Cougar - high yielding rye, more pounds per acre than wheat this year.

2. Wheat, oats and barley are superior to triticale in production of feed grains.

FUTURE PLANS: Unknown at this writing.

MATERIALS AND METHODS:

Standard nursery methods were used in this testing program.

The rye was grown as part of the winter wheat nursery, being placed at the end of each replication. It was replicated six times. It is reported here rather than in the wheat section of the annual report. It contained five entries.

The triticale study contained five entries, oats, barley, wheat and two triticale varieties. These were grown under dryland conditions in a randomized block design. Each species was harvested when it was ripe.

RESULTS AND DISCUSSION:

Rye - Cougar was the highest yielding entry and was higher in yield than the highest yielding wheat. Wheat yield was 4580 lbs/acre and Cougar 4802 lbs/acre. There was a high rate of ergot in all entries. Stands were poor in Antelope and Pearl, which was caused from low germination. Table 1.

Triticale - Oats yielded the most grain per acre (4477#) of the five entries in the study. Both triticale entries were lowest in yield of all entries. Table 2. Armadillo 50 had a high level of ergot and Batger 73 a light level. These data indicate that present triticale varieties are not equal to wheat, oats or barley for production of feed grains.

Table 1. Agronomic data from five rye varieties grown at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana. 1969-70 Field No. E-2

State #	Variety	Heading Date	Yield Grams/Plot 1	2	3	4	5	6	$\bar{x}$	Yield Lbs/A	Yield Bu/A	Test Weight	Plant Height	Lodging % Prev	Lodging Sev.
MT 7022	Cougar	149	857	902	764	851	662	762	800	4802	85.7	54.9	56.2	66	.5
MT 7023	Pearl	152	642	532	537	555	572	601	573	3439	61.4	54.7	60.6	88	1.0
MT 7024	Frontier	152	363	467	634	456	485	459	477	2863	51.1	55.7	60.7	99	2.8
MT 7025	Antelope	149	580	642	557	566	509	599	577	3463	61.8	56.0	58.7	99	2.8
MT 7026	VonLochow	149	700	847	800	873	786	714	787	4724	84.3	55.8	57.8	99	1.8
									$\bar{x}$	3858	68.9				
									S.E.$\bar{x}$	173.996	3.107				
									L.S.D. (.05)	516	9.2				
									C.V.%	4.50	4.50				

Table 2. Agronomic data from triticale study grown at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana in 1970. Field No. A-2. Experimental design - random block, four replications.

Planting date: May 1, 1970 Size of plot: 16 sq. ft.

Crop	Variety	Days Jan 1 to Heading	Plant Height	Yield Lbs/A	Test Wt Lbs/Bu.	Days Jan 1 to Harvest	Remarks
Oats	Cayuse	180.0	32.8	4477	36.7	231 2/	
Wheat	Era	179.0	32.0	4725	62.0	231 2/	
Barley	Unitan	175.8	34.5	3835	46.0	231 1/	Lodging 97 Prev.-7 Sev.
Triticale	Batger 73	173.5	37.5	3596	50.6	231 2/	Light ergot
Triticale	Armadillo 50	172.0	36.0	2984	47.8	231 2/	Heavy ergot
	$\bar{x}$	176.1	34.6	3923			
	F - value for comparison	88.68**	31.61**	66.41**			
	S.E.$\bar{x}$	.36514	.40311	98.80			
	L.S.D. (.05)	1.12	1.24	30.5			
	C.V. %	.2	1.17	2.52			

1/ Cut and threshed.
2/ Cut 231 and bundles threshed 236.

TITLE: Fertilizers on Winter Annuals

PROJECT: Small Grains Investigations (756)

YEAR: 1970

PERSONNEL: Vern R. Stewart

LOCATION: Rotation R-1-8, Northwestern Montana Branch Station

DURATION: Indefinite

OBJECTIVES: To measure the long term effect of fertilizers in a field rotation with winter cereal crops.

MATERIALS AND METHODS:

All applications of fertilizers were made with field equipment as in seeding and harvesting.

Rates used are found in table I.

RESULTS AND DISCUSSION:

Rainfall for the growing season was 20.99 inches, the annual average is 19.36. Harvest weather was excellent which resulted in a high quality crop.

Yield in R-1b is somewhat less than the untreated area, but perhaps is not significant. Weed control was not complete in either R-1b or R-2b.

Protein levels were higher in all fertilized plots, except R-7b, which will have to go unexplained.

Table 1. Yield of winter annuals grown in rotation R, Northwestern Montana Branch Station, Kalispell, Montana in 1970.

Field No.	Acres	Fertilizer Type	Lbs/A	Rate Lbs/A N	P	K	Crop Variety	Yield	Test Wt Lbs/Bu	Protein %
R-1b	2.65	16-30- 0	200	32	40	0	Crest[2]	36.1	60	12.7
R-2b	2.95	0- 0- 0	0	0	0	0	Crest	39.4	60	11.5
R-3c	3.3	16-20- 0	200	32	40	0	Nugaines[3]	45.5	60	--
R-4b	3.1	16-20- 0	200	32	40	0	Crest	60.7	60	12.3
R-5b	3.3	16-20- 0	200	32	40	0	Crest	62.3	60	12.0
R-6b[1]	½	16-16-16	200	32	32	32	Alpine[4]	50.0	--	--
R-7b	3.3	16-20- 0	200	32	40	0	Crest	56.3	60	11.2
R-8c	3.1	16-20- 0	200	32	40	0	Crest	54.2	60	13.5

1/ Only about ½ acre of field cut for yield.
2/ Crest: a hard red winter wheat
3/ Nugaines: a soft white winter wheat
4/ Alpine: Winter barley

TITLE: Potato yield trials and seedling evaluations

PROJECT: Potato Investigations MS 757

PERSONNEL: A. J. Jarvi, Cooperators: J. W. Dunse, H. N. Metcalf, O. W. McCarver

LOCATION: Northwestern Montana Branch Station

DURATION: Undetermined

OBJECTIVES: Evaluation of virus-free Gem with other grower stocks. Evaluation of some commercial varieties, screen seedlings and select desirable types derived from the Montana potato breeding program.

PROCEDURES: All trials were planted in field X-3 with 300# of 16-20-0 applied per acre. Di-Syston was applied with the fertilizer. Yield trials were planted in RCB with replications with plots consisting of 3 rows, 30 feet long, 42 inches between rows and 9 inches between drops. Seedlings were planted in 42 inch rows as units (units = tubers derived from one seed) with 9 inch spacing within units, 3½ feet between units and 9 feet between materials from different crosses.

RESULTS AND DISCUSSION

The data from the yield trial comparing virus-free Gems with five grower sources of Gems are presented in Table 1. No significant differences were found in stand counts, yield of No.1's or yield of No.1's adjusted for stand counts. The mean in yield of No.1's was 335.1 cwt/A and a range of 23 cwt. The virus-free Gem ranked 4th in yield of No.1's. The distribution of tuber types from the various seed sources is presented in Table 2. The non-significant heterogeneity Chi-square indicated the distribution of various tuber types is not different from the various sources of Gems. In fact, the high probability of .90-.95 for the heterogeniety Chi-square indicates that the distributions are very similar.

Data from the potato yield trial involving four varieties are presented in Table 3. No significant differences in stand counts were observed with relatively poor stands in all cases due to deteriated seed pieces used for planting. Norchip yielded significantly less No.1's than the other three varieties. Analysis revealed that the regression yield on stand was not significant so no adjustment of No. 1 yields for stand counts were made. Distribution of various tuber types is presented in Table 4. The heterogeneity Chi-square with a probability .005 indicates considerable deviations in the distribution.

Progeny from 15 crosses from the Bozeman breeding program were grown for the first time under field conditions. About 30 selections were saved from this seedling material for further evaluation. These materials had been selected for high specific gravity prior to planting.

Table 1. Potato yield trial comparing various sources of Gem's, Northwestern Montana Branch Station, 1970.

	Mean of Four Replications						
Seed Source	Stand Counts Plants/105 sq.ft. Number	U.S. #1 1½-16 oz. Cwt/A	Total Yield Cwt/A	Tubers 16 oz.+ Cwt/A	U.S. #2 Cwt/A	Culls Cwt/A	Specific Gravity
Skone & Conner	36.50	345.9	366.7	5.2	3.6	11.9	1.0915
Mangels	37.00	341.0	369.7	13.5	1.0	14.5	1.0893
Jacobson	38.25	340.7	372.9	10.3	2.6	26.4	1.0900
Virus-free	34.75	332.4	346.4	2.1	0.0	11.9	1.0888
Small	34.25	327.2	351.1	4.1	1.6	20.2	1.0908
Schutter	35.50	323.1	344.3	8.8	3.6	14.0	1.0895
$\bar{x}$	36.04	335.1	358.5	7.3	2.1	16.5	1.090
L.S.D.	N.S.	N.S.					
C.V.	3.7%	5.1%					

ANOVA for stand counts, yield of No.1's and adjusted yield of No.1's.

		Mean Square			
Source	D.F.	Stand	Yield No.1	D.F.	Adjusted
Replications	3	7.930 N.S.	2104.773 N.S.		
Varieties	5	8.942 N.S.	316.644 N.S.		
Error	15	5.497	1149.945	14	1113.79
Total	23				
Varieties (adjusted)				5	158.87 N.S.

Table 2. Distribution of tuber types from various Gem seed sources

	Distribution of Tuber Types				
Seed Source	1½-4oz. %	4-16oz. %	16oz.+ %	U.S. #2 %	Culls %
Skone & Conner	14.7	80.9	0.1	1.0	3.3
Mangles	15.8	76.5	3.6	0.2	3.9
Jacobson	21.1	68.3	2.8	0.7	7.1
Virus-free	18.0	78.0	0.6	0.0	3.4
Small	16.7	75.9	1.2	0.4	5.8
Schutter	19.6	72.6	2.6	1.1	4.1
$\bar{x}$	17.6	75.4	1.8	0.6	4.6

Heterogenity Chi-square = 11.460 with 20df. Probability = .90-.95

Table 3. Potato variety trial, Northwestern Montana Branch Station, 1970.

Variety	Stand Count Plants/105 sq.ft. Number	U.S. No.1 1½-16oz. Cwt/A	Total Yield Cwt/A	Tubers 16oz.+ Cwt/A	U.S. #2 Cwt/A	Culls Cwt/A	Specific Gravity
Norgold	26.75	307.0a[1/]	354.9	43.6	1.2	7.3	1.0883
Norland	23.50	281.3a	316.8	17.6	13.0	7.3	1.0793
Gems	30.75	274.2a	344.5	18.1	16.3	39.9	1.0915
Norchip	25.50	195.4b	362.7	0.0	59.3	107.9	1.0945
$\bar{x}$	26.63	264.5	344.7	19.8	22.5	40.6	1.0884
C.V. $s_{\bar{y}}$	5.9%	1.6%					
	$\bar{y}$						

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

ANOVA for stand counts and yield of No.1's

Source	D.F.	Mean Square Stand	Yield No.1
Replications	3	24.083 N.S.	21.460 N.S.
Varieties	3	37.417 N.S.	537.460**
Gem	9	9.917	68.416
Total	15		

ANOVA for regression of yield on stand

Source	D.F.	Mean Square
Regression	1	186.57 N.S.
Deviation from regression	8	53.65
Total	9	

Table 4. Distribution of tuber types of four varieties.

Variety	Distribution of tuber types 1½-4oz. %	4-16oz. %	16oz.+ %	U.S. #2 %	Culls %
Norgold	8.3	77.0	12.3	0.4	2.0
Norland	3.4	86.4	5.6	4.1	2.3
Gems	18.1	60.3	5.3	4.7	11.6
Norchip	4.9	53.9	0.0	16.4	29.7
$\bar{x}$	8.7	69.4	5.8	6.4	11.4

Heterogeneity Chi-square = 104.474 with 12df probability $<.005$

TITLE: Miscellaneous Crops

PERSONNEL: A. J. Jarvi, H. N. Metcalf, Cooperator

LOCATION: Northwestern Montana Branch Station

DURATION: Undetermined

OBJECTIVES: Evaluate given species for seed production.

PROCEDURES: All entries were planted in a single 4 row plot with rows 20" long and 12" apart in an observation nursery. The nursery was planted on a non-irrigated site in Field R-9 on June 2, 1970.

RESULTS AND DISCUSSION:

None of the plantings of Thalictrum olasycarpum emerged even though seed bed was excellent. Also the planting of Silene conoidea failed to emerge. The species Daucus aurea produced an excellent stand but was late with plants just passed the flowering stage at the first killing frost on September 11, 1970. Seed yields are listed for the entries in Table 1. Camelina sativa and Crambe hispanica 'Indy' were mature prior to September 11, 1970. Seed was not fully matured in the crambe 'Prophet', late cow cockle or the forage radish on September 11, 1970. None of the cow cockle seed was black in color which is an indication of mature seed.

Table 1. Observation nursery of miscellaneous crops planted at the Northwestern Montana Branch Station in 1970.

Entry	Strain	Pounds per Acre	
		Seeding Rate	Seed Yield
Thalictrum dasycarpum	PI 349316	12	/1
Thalictrum dasycarpum	PI 349317	12	/1
Thalictrum dasycarpum	PI 349319	12	/1
Thalictrum dasycarpum	PI 349321	12	/1
Thalictrum dasycarpum	PI 349322	12	/1
Thalictrum dasycarpum	PI 349323	12	/1
Daucus aurea	PI 319403	18	0 /2
Crambe hispanica	'Indy'	15	480
Crambe abyssinica	'Prophet'	15	540
Cow cockle	Late strain B67	10	660
Forage radish		20	510
Silene conoidea		4	/1
Camelina sativa		4	600

1/ No plants emerged
2/ No seed set at first frost

FARM FLOCK REPORT FOR 1970

The sheep inventory for January 1, 1970 was made up of 47 Registered Columbia ewes, 12 ewe lambs, 2 rams and 81 whiteface ewe lambs for resale as yearlings.

The farm flock was closed out during the 1970 calendar year. Mr. C. W. Roath had selected the top of the line based on multiple birth records and production to be transfered to the station at Red Bluff. This breeding line is to be incorporated into the program conducted by Mr. Van Horn. The other half of the flock of breeding ewes were sold to Mr. Gene Dose of Whitefish, Montana. The white faced yearlings were sold to Mr. Allen Sheldon of Kalispell. Mr. Sheldon is building a grade flock of Columbia ewes. Lambs were sold thru the lamb pool in September.

A complete history of the farm flock has been carefully filed, so that any family can be traced as to heritage if this becomes necessary or desireable.

Total income from farm flock in 1970 was $4863.42.