TWENTY-FIRST ANNUAL REPORT

1969

Northwestern Montana Branch
of the
Montana Agricultural Experiment Station

Route 4
Kalispell, Montana

TABLE OF CONTENTS

PUBLICATIONS

1. Roath, C. W. 1968 Sainfoin for dryland hay in Western Montana. Sainfoin Symposium at Montana State University. Bulletin 627. pp. 26-28.

2. Carleton, A. E., C. S. Cooper, C. W. Roath, and J. L. Krall. 1968 Evaluation of sainfoin for irrigated hay in Montana. Sainfoin Symposium at Montana State University. Bulletin 627. pp. 44-48.

3. Cooper, C. S., C. W. Roath, J. L. Krall, and C. W. Crowell. 1968 Preliminary evaluation of sainfoin (Onobrychis viciaefolia Scop.) for irrigated pasture. Sainfoin Symposium at Montana State University. Bulletin 627. pp. 49-52.

4. Roath, C. W., and Don R. Graham. 1968 Response of sainfoin to phosphorus. Sainfoin Symposium at Montana State University. Bulletin 627. pp. 63-64.

5. Stewart, V. R. 1968 Chemical weed control in sainfoin. Sainfoin Symposium at Montana State University. Bulletin 627. pp. 55-62.

6. C. S. Cooper, D. E. Baldridge, and C. W. Roath. 1969 Selection and management of irrigated pasture mixtures. Bulletin 622.

7. Carleton, A. E., and C. W. Roath. 1969 From the University. The Montana Stockgrower.

8. Roath, C. W. 1969 Forages for livestock. (talk given for the Western District Agents, Missoula, February 20).

9. Roath, C. W. 1969 Research in progress. (report given to Northwestern and Western Advisory Council meeting. Polson, January 28)

10. Roath, C. W. 1969 Chemicals a modern day necessity. (panel at Ag. Council meeting, Kalispell, March 11).

11. Roath, C. W. 1969 Grass is for cows. (talk given at Conservation Day program, Polson, March 18).

12. Roath, C. W. 1969 Need for agricultural research in western Montana. (KGVO-TV in Missoula, March 25).

13. Roath, C. W. 1969 Irrigation as a conservation measure. (lecture to 935 8th grade students on Conservation tour, Kalispell, May 12 - 14).

14. Shaw, F. A., V. R. Stewart, and Charles Crowell. 1969 Cayuse Oats. Extension Bulletin.

15. Stewart, V. R. 1969 Chemical weed control in sainfoin. Western Society of Weed Science Research Progress Report. pp. 88-89.

16. Stewart, V. R. 1969 Fall applications of herbicides to sainfoin. Western Society of Weed Science Research Progress Report. pp. 89-90.

Publications (con't)

17. Stewart, V. R. 1969 Barley varieties. The Missoulian. April.

18. Stewart, V. R. 1969 Recommended varieties of spring wheat. The Missoulian. April.

19. Stewart, V. R. 1969 Recommended varieties of spring oats. The Missoulian. April.

20. Stewart, V. R. 1969 Weed control in legumes. Montana Farmer Stockman. March 6.

21. Stewart, V. R. 1969 Cost of winter annuals. (talk given to Farm Forum, Stanford, Montana. January 18).

22. Stewart, V. R. 1969 Highlight of research projects. (talk given to the Northwestern and Western Branch Advisory Council meeting, January 28).

23. Stewart, V. R. 1969 Weed free feed for livestock. (talk given to the Western District Agents, Missoula, February 20).

24. Stewart, V. R. 1969 Herbicide toxicity. (talk given to Ag Council meeting, Kalispell, March 1).

25. Stewart, V. R. 1969 Research a tool. (KGVO - TV in Missoula, April 1).

26. Suneson, C. A., E. A. Hockett, R. F. Eslick, V. R. Stewart, and G. A. Wiebe. 1969 A gene pool of naked seeded barleys (ccXXVII) for use in food and hybrid breeding programs. (Proceeding, Barley Symposium, Pullman, Wn. July 8).

27. Stewart, V. R., and G. P. Hartman. 1969 Effects of ethrel chemical growth regulator on the agronomic characteristics of spring wheat and barley. (paper presented before Western Crop Science Society meeting, Reno, Nevada, July 22).

ACTIVITIES

Activities reported include learning experiences participated in as well as an opportunity to share research information or farm experience with others.

DATE	ACTIVITY	STAFF	LOCATION
Jan. 7	TAP Meeting	Stewart	Kalispell
14	Ag Council	Stewart	Kalispell
18	1969 Farm Forum	Stewart	Stanford, Mont.
22	Sugar Beet Research Conf.	Stewart	Billings, Mont.
28	Advisory Committee Meeting	Roath Stewart	Polson, Mont.
Feb.9-12	Western Weed Science Socity Meeting	Stewart	Las Vegas, Nev.
20	County Agents Up-Dating Meeting	Roath Stewart	Missoula, Mont.
Mar. 4-7	Annual Planning Conference	Roath Stewart	Bozeman, Mont.
11	Ag Council	Roath Stewart	Kalispell
13	Pasture School	Roath	Kalispell
18	Conservation Day	Roath	Polson, Mont.
	Chemical Meeting (Chipman Company)	Stewart	Kalispell
20	Pasture School	Roath	Kalispell
24	Mrs. Frach's Kindergarten (22 students)	Roath	Station
26	Mrs. Cumming's Kindergarten (20 students)	Roath	Station
27	Meeting at Extension Office	Roath Stewart	Kalispell
Apr. 1	TV Program	Stewart	Missoula, Mont.
8	Ag Council	Roath Stewart	Kalispell
18	Tour Lethbridge Canada Experiment Station	Roath Stewart	Lethbridge
23	Primary children to see lambs	Roath	Station
May12-14	Conservation Tour (all county 8th graders)	Roath	Flathead County
12	Columbia Falls Biology Class Tour (47 students)	Stewart	Station
13	Columbia Falls Biology Class Tour (50 students)	Stewart	Station
14	Columbia Falls Biology Class Tour (60 students)	Stewart	Station
15	Columbia Falls Biology Class Tour (48 students)	Stewart	Station
16	Flathead FFA Tour (35 students)	Roath Stewart	Station
June 19	Flathead High School Biology Tour (20 students)	Roath Stewart	Station
July 2	Summer Staff Conference	Roath Stewart	Station
7	UM Botany Class Tour-Directed by Dr. Thomas	Roath Stewart	Station
22-24	Western Section Crop Science Meeting	Stewart	Reno, Nevada

Activities (con't)

DATE	ACTIVITY	STAFF	LOCATION
Aug. 8	Meeting on Crest Wheat	Stewart	Bozeman, Mont.
20	Judge Missoula County Fair	Roath	Missoula, Mont.
30	Judge Sanders County Fair	Roath	Thompson Falls
Sept.10-12	Review of Research Projects by USDA	Roath Stewart	Bozeman, Mont.
Oct. 14-14	Annual Conference	Roath Stewart	Bozeman, Mont.
29-30	Montana Weed Control Conference	Stewart	Malta, Mont.
Nov. 4	TV Program	Roath	Missoula, Mont.
18	Ag Council	Roath Stewart	Kalispell
Dec. 12	TAP Meeting	Stewart	Kalispell

VISITORS

The following individuals visited the station in 1969:

DATE		NAME	REPRESENTING	ADDRESS
Feb.	12	John Latta	Gulf Oil	Billings
	13	Mr. Boyanousky	International Harvester	California
		Mr. Parker	International Harvester	Missoula
	24	Darrell Peterson	County Extension Office	Kalispell
	25	Darrell Peterson	County Extension Office	Kalispell
	27	Roger Scott	Geigy Chemicals	Missoula
	28	Larry Slater	Monsonto Chemicals	Spokane, Wn.
Mar.	5	Leland P. Cade	Montana Farmer Stockman	Great Falls
	24	Jake Hoffer	Farmer	Chester
		Dan Brenneman	Farmer	Rt. 4, Kalispell
April	5	Julieta Caicedo Zuoyaziul	Student	Ecuador
		Lorretta Buchanan	Student	Columbia Falls
		Mrs. R. D. Buchanan	Housewife	Columbia Falls
	9	Mr. McKinnley	Farmer	Rt. 4, Kalispell
	14	Jake Hoffer	Farmer	Chester
	15	Jay Person	Farmer	McCooke, Nebr.
		Bruce Person	Architect	Kalispell
	30	J. A. Hoffman	USDA - ARS - CRS	Pullman, Wn.
		Bob Allen	USDA - ARS - CRS	Pullman, Wn.
May	13	Andrew Schmidt	Pacific Power & Light Co.	
		Everett Burns	Pacific Power & Light Co.	Kalispell
	23	Bill Ambrose	Farmer	Rt. 4, Kalispell
	28	Martin Burris	Montana State University	Bozeman
		Allen Taylor	Montana State University	Bozeman
		Jim Shepherd	Montana State University	Bozeman
		Gene Sharp	Montana State University	Bozeman
June	10	Don Mathers	Montana State University	Bozeman
		Bob Johnston	Montana State University	Bozeman
	18	Bill Anliker	CIBA Chemicals	
July	1	Dean Finnerty	DuPont Chemicals	Hopkins, Minn.
	3	Bill Miller	Montana State University	Bozeman
		Bob Eslick	Montana State University	Bozeman
		Al Carleton	Montana State University	Bozeman
		Roy Eslick	Farmer	Washington
		Jim Eslick	Farmer	Washington
	11	J. W. Yocum	Lt. Col. U.S.A.F.	Colorado Springs Colo.
		Roger Scott	Geigy Chemicals	Missoula
	17	Larry Baker	Montana State University	Bozeman
	18	Robert Wolf	Barley Breeder	Brandon,Manitoba
		Karl Schrade	Farmer	Kalispell
	19	F. H. McNeal	Montana State University	Bozeman
	25	Allen Taylor	Montana State University	Bozeman
	29	Art Rivers	BSAF Chemicals	California
		Robin Johnston	BSAF Chemicals	Colorado
		Coil Suneson	Retired agronomist	Bigfork
	30	Everett P. Smyth	Chipman Chemicals	College Place, Wn.

Visitors (con't)

DATE	NAME	REPRESENTING	ADDRESS
Aug. 11	Gene Hockett	Montana State University	Bozeman
18	Roger Scott	Geigy Chemical	Missoula
19	Allen Taylor	Montana State University	Bozeman
	Bill Ambrose	Farmer	Rt. 4, Kalispell
	Burton Isch	Farmer	Rt. 4, Kalispell
20	Dr. Barna Geiorffy	Institute of Genetics	Budapest,Hungry
	Donald Bolog & son	Pharmacist	Kalispell
21	Roger Scott	Geigy Chemicals	Missoula
26	Dan Brenneman	Farmer	Rt. 4, Kalispell
	Orville McCarver	Montana State University	Bozeman
Sept. 17	Roger Scott	Geigy Chemicals	Missoula
	John Dunse	Montana State University	Bozeman
	Homer Metcalf	Montana State University	Bozeman
	Russell Silves	Montana State University	Bozeman
Oct. 1	Don Graham	Western Montana Branch Station	Corvallis
Nov. 5	Mike Jackson	Montana State University	Bozeman
	Ned Jefferies	Montana State University	Bozeman
19	Darrell Peterson	County Extension Office	Kalispell
Dec. 3	Sig Jonnass	Motel Operator	Kalispell
15	Don Graham	Western Montana Branch Station	Corvallis

FISCAL PROJECT REPORT FOR 1969

ADMINISTRATION - 750

Included in the administration budget is one months salary for the superintendent, the station travel budget, a portion of the clerical budget and a budget for office supplies and operation. Activities of such nature as not to be chargeable to a research project, or other fiscal projects find a home here; more specifically those dealing with general education, information or public relations.

Summer Conference for the Experiment Station Staff was held at the Northwestern Montana Branch Station July 2. A tour occupied the morning and included research projects and the Robert's land for which a purchase agreement was authorized. Lunch was at Hennessy Chicken and Steak House in Kalispell. An afternoon program presided over by Director Asleson, Associate Director Burris and Ass't. Director Carter was followed by a supper served by the ladies of the Creston Community Club. A slide program followed at 8:30 P.M.

The activities section of this report could properly be made a part of this administration report. Attention is called to this section, particularly to those education and conservation events participated in by members of the staff.

Travel, budgeted for in this project, was largely within the area, and when out-of-state was charged to grant funds deposited with the Endowment and Research Foundation. Annual Conference, Planning Conference and a Research Project Review, all held at Montana State University at Bozeman were attended by both members of the N. W. Branch staff. Both also attended the meeting of the Advisory Committee held in Polson, an Up-dating meeting for Western District Agents held in Missoula, and on occasion presented fifteen minute talks over KGVO-TV in Missoula. Local travel was largely for the purpose of doing off station research in crop production, soil management, or weed control.

PHYSICAL PLANT - 751

Chargeable to this project is the cost of land and buildings and an operations and maintenance budget. The big news is of course, the purchase of the Robert's land authorized by the 1969 Legislative session. Following that session an agreement to purchase the land that had been held under lease plus an additional 70 acres were negotiated and the first payment made. The purchase price for 150 acres was $68,000 which was to be paid, plus agreed interest, in ten equal annual payments. No money was appropriated by the Legislature for this, however the Experiment Station was authorized to make payment out of income. Lease fees will no longer be required and long term improvement and use can be planned.

Residence buildings on the station were re-roofed with steel with a baked on enamel color finish. Snow, once a problem on these roofs, now slides off doing no damage.

GENERAL FARM - 752

Having 70 acres more land and permanent use of the former lease will increase the cost of gas and oil for farm tractors and machines and of farm labor, but probably not so much as general farm income is increased. Greater flexability is provided for operations, and additional research possibilities are provided.

Considerably more hay and feed grain was produced on the station in 1969 than was needed for the livestock program. Pasture however, was utilized completely, including field residue in all fenced portions of the station.

Farming for products is not the purpose of having a station however. Stations are maintained and farmed so as to provide suitable controlled conditions for research. With sufficient acreage and a choice as to whether to irrigate or not to irrigate this becomes not only possible but easier to accomplish.

With intelligent planning and effective management the research needed for crop and livestock production, control of pests, conservation of resources, and in the field of outdoor living can proceed side by side in a controlled environment without undue interference.

CLIMATOLOGY

With only 85 frost free days in 1969 the season was by this measurement twenty-three days shorter than average. Partially compensating for this was 5.4 inches greater than normal precipitation for the twelve month period.

Extremely cold temperatures during the winter of 1968-69 reached a climax on December 30, 1968 with a minus of 41 degrees. During December and January, 6.17 inches of moisture fell in snow, which at a normal moisture content of 8% would have produced a snowfall of 77 inches. No one spending the winter at Kalispell would have questioned receiving a most unusual snow fall.

Harvest in June was more than customarily difficult, however second cutting in August was favored by dry warm weather. Cereal grain harvest also went smoothly and well.

Yields were not all bad. Crops not badly hurt by the hard June 13 frost (28 degrees) came through well. This depended largely on state of growth or maturity.

Table _____. Summary of climatic data by months for the 1968-69 crop year (September to August) and averages for the period 1949-1969 at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana.

	Month and Year												Total or Average Growing Season
	Sept. 1968	Oct. 1968	Nov. 1968	Dec. 1968	Jan. 1969	Feb. 1969	Mar. 1969	Apr. 1969	May 1969	June 1969	July 1969	Aug. 1969	
Precipitation (inches)													
Current Year	4.51	2.39	1.59	3.12	3.05	.75	.69	1.39	1.19	5.21	.70	.09	24.68
Ave. 1949 to 1968-69	1.54	1.53	1.56	1.68	1.63	1.12	.99	1.27	2.06	3.01	1.25	1.62	19.26
Mean Temperature (°F)													
Current Year	53.8	42.9	33.4	20.1	13.1	24.0	29.6	47.1	53.9	58.8	62.3	63.3	41.9
Ave. 1949 to 1968-69	54.3	44.2	32.7	26.5	22.1	28.0	32.4	43.2	51.9	58.4	64.3	64.3	43.5

Last killing frost in spring*
1969 - June 13 (28°)
Ave. 1949-69 - May 28

First killing frost in fall*
1969 - Sept. 6 (32°)
Ave. 1949-69 - Sept. 13

Frost-free period
1969 - 85 days
Ave. 1949-69 - 108 days

Maximum summer temperature - 97° on August 24,1969

Minimum winter temperature - 41° below zero on December 30, 1968

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

Comparison of monthly averages for 1968-1969 and 1950-1969 for Northwestern Montana Branch Station, Route 4, Kalispell, Montana (Creston)

	Air Temperature (Fehrenheit)									Precipitation		
	Average 1968			Average 1969			Average 1950-69					Average
Month	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	1968	1969	1950-69
January	23.3	31.5	15.0	13.1	20.8	5.4	22.1	29.3	14.8	.79	3.05	1.63
February	32.8	40.8	24.8	24.0	32.5	15.4	27.9	36.2	19.5	1.15	.75	1.12
March	41.2	52.6	29.7	29.6	40.9	18.2	32.4	42.4	22.4	.68	.69	.99
April	42.0	54.2	29.8	47.1	59.5	34.6	43.2	55.2	31.2	.57	1.39	1.27
May	49.8	63.4	36.1	53.9	68.7	39.0	51.8	65.6	38.0	3.92	1.19	2.06
June	59.0	72.2	45.7	58.8	72.0	45.5	58.5	72.2	44.7	2.22	5.21	3.01
July	64.6	82.7	46.4	62.3	78.9	45.7	64.3	81.3	47.3	1.00	.70	1.25
August	61.3	75.7	46.8	63.3	83.0	43.5	62.8	79.3	46.2	3.42	.09	1.63
September	53.8	65.9	41.7	56.0	70.4	41.6	54.3	69.3	39.4	4.51	1.54	1.56
October	42.9	53.1	32.6	40.0	49.7	30.3	44.3	55.7	32.9	2.39	1.90	1.57
November	33.4	40.6	26.1	35.4	43.0	27.8	32.7	40.1	25.3	1.59	.31	1.49
December	20.1	27.1	12.4	27.7	32.8	22.6	26.5	32.7	20.3	3.12	1.14	1.70
Total	524.2	659.8	387.1	511.0	652.2	369.6	520.8	659.3	382.0	25.36	17.96	19.28
Average	43.7	55.0	32.3	42.6	54.4	30.8	43.4	54.9	31.8			

FROST FREE PERIOD

	1968	1969	1950-69
Last Freeze Date:	May 20	June 13	May 28
First Freeze Date:	Sept. 21	Sept. 6	Sept. 13
Frost Free Season:	124 days	85 days	108 days

PART I

1969

Annual Research Report

Northwestern Montana Branch

of the

Montana Agricultural Experiment Station

Kalispell, Montana

by

C. W. Roath

Superintendent

TITLE: Sainfoin Evaluation

PROJECT: Forage Investigations MS 755

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Undetermined

OBJECTIVES:

A. To determine characteristics and relative merit of selections.
B. To estimate the value of Eski sainfoin as a pasture legume both alone and in mixtures.
C. Determine most practical harvest frequency for simulated pasture.
D. Compare regrowth selections with other varieties in dryland and irrigated nurseries.
E. Determine the response of sainfoin to fertilizers in comparison to alfalfa.
F. Determine the most effective seeding rate and method for sainfoin forage production.

PROCEDURE: Employ approved field plot methods to insure reliable data.

SIGNIFICANT FINDINGS:

Eski with ladino is equal to orchard with ladino in irrigated pastures in 1969 also regrowth with ladino about equals Eski and ladino in yield. Seeding orchard grass or intermediate wheatgrass with Eski sainfoin in six inch rows did not reduce total hay yields in 1969.

FUTURE PLANS: Harvest study A, B, D and F in 1970.

INTRODUCTION: Replicated studies have been harvested in 1969 that contribute data relative to the stated objectives of this project phase.

RESULTS AND DISCUSSION:

A. Three selections from Eski were compared to Eski in a small replicated study. Plots are single row, 2 ft. wide and 10 ft. long, separated by rows of grass. Harvest was in two cuttings on June 13, 1969 and August 4, 1969. While four plot totals seem to indicate a superiority for Selection B-1 over Eski for yield the interplot variation renders the difference non-significant at the 5% level. See data for 1969 in Table 1-A.

B. Two nurseries were harvested at four week intervals to determine the value of sainfoin as a pasture legume. One compares Eski to regrowth types selected by Carleton.

One with fifteen entries and four replications had a mean yield of 3.06 T/A from four cuttings. Eski sainfoin, orchard grass and a mixture of these all produced similarly from 2.6 to 2.8 T/A. High yields in the study came from use of Brome with Ladino but were not greatly different when Brome, sainfoin and ladino were used. Pro-

RESULTS AND DISCUSSION: (con't)

ducing comparable yields were sainfoin and ladino, orchard and ladino, brome and trefoil and sainfoin and trefoil. See Table 1 Ba.

A second nursery having twelve entries compares regrowth selection to Eski as a pasture legume. The mean yield was 2.98 T/A at 12% moisture. In this study regrowth produced significantly above Eski in pure stands and when seeded with ladino. Regrowth with ladino and ladino with orchard were similar in yield.

C. A harvest frequency study designed to determine what growth period between harvest was best for sainfoin and trefoil produced non-significant data in 1969. The yield per cutting tended to increase with longer growth periods but not sufficiently to produce more total forage for the season. Sainfoin yields averaged slightly better than trefoil yields in this test. See Table 1C.

D. Regrowth sainfoin was compared to Eski and other varieties in dryland and irrigated trails which were harvested in two cuttings June 11, 1969 and August 8, 1969. Mean yields were 1.59 T/A greater in the irrigated site. Using Eski as the check variety Agusta produced less under irrigation. White, Persian and Agusta all produced less on dryland. A Canadian strain was high in both nurseries, however this difference did not reach significance at the 5% level. See Tables 1 Da and 1 Db.

E. Response of sainfoin and alfalfa to fertilizers in 1969 was below the 5% level of significance. While this has been the case for sainfoin each year, alfalfa has here-to-fore given real responses. One might suspect that phosphorous which was applied in one treatment at seeding time in 1965 might have been depleted except that the twenty-five pound P annual treatment was no better. Mean yields were 1.19 T/A greater for alfalfa than for sainfoin. This is the first time in this study that alfalfa has produced equal to sainfoin in a two cutting harvest in the unfertilized check plots. See Tables 1 Ea and 1 Eb.

F. Sainfoin Seeding Rate, Spacing and Competition Study. Ten rate, spacing and competition variables were imposed on plots seeded with Eski sainfoin in 1968. Harvest in 1969 was in two cuttings made June 10, 1969 and August 8, 1969. Yields calculated at 12% moisture varied from a low of 2.01 to 4.18 tons per acre.

Uniformly high in yield were plots seeded in six inch and one foot rows with thirty pounds of seed and those seeded in six inch rows with fifteen pounds of sainfoin and three pounds of orchard or six pounds of intermediate wheatgrass. Next and very close were plots seeded in six inch or one foot rows with fifteen pounds of sainfoin. Twelve inch alternate row seedings, twelve inch row seedlings under barley and twenty-four inch row seedings were low in yield. Table 1F.

Table 1A. Sainfoin selections in 1969. Seasons yields in tons per acre from two cutting harvest.

Selection	Cutting	Replications I	II	III	IV	Total	Average
A-4	1	2.64	3.23	2.74	2.74		
	2	.88	1.03	.97	.72		
	Season	3.52	4.26	3.71	3.46	14.95	3.74
A-6	1	2.20	1.78	3.44	3.79		
	2	.97	.98	1.48	1.13		
	Season	3.17	2.76	4.92	4.92	15.77	3.94
B-1	1	3.71	4.31	4.53	3.28		
	2	1.59	1.36	1.57	.80		
	Season	5.30	5.67	6.10	4.08	21.15	5.29
Eski	1	2.93	1.85	3.81	2.41		
	2	1.31	1.25	1.64	.83		
	Season	4.24	3.10	5.45	3.24	16.03	4.01

$\bar{x}$	4.2439
F. - Value	N.S.
S.E.x	4.2986
C.V.%	10.13

Table 1Ba. Cooper Pastures - seasons yields in tons per acre of sainfoin and mixtures when irrigated and harvested at four week intervals in 1969.

Species	Cutting	I	II	III	IV	Total	Average
Sainfoin	1	.36	.57	.73	.75		
	2	.76	.75	.84	.87		
	3	.40	.39	.34	.32		
	4	.88	.92	.81	.90		
	Season	2.40	2.63	2.72	2.84	10.59	2.65c[1/]
Orchard	1	.94	1.21	1.07	.96		
	2	.51	.51	.48	.66		
	3	.46	.38	.47	.69		
	4	.80	.60	.58	.71		
	Season	2.71	2.70	2.60	3.02	11.03	2.76c
Orchard-ladino	1	.87	.83	.96	.83		
	2	.79	.82	.74	.78		
	3	.76	.58	.62	.56		
	4	1.19	1.16	1.05	.53		
	Season	3.61	3.39	3.37	2.70	13.07	3.27abc
Brome-sainfoin	1	.61	.84	.85	.95		
	2	.48	.59	.67	.74		
	3	.35	.40	.39	.48		
	4	.80	.65	.63	.87		
	Season	2.24	2.48	2.54	3.04	10.30	2.58c
Sainfoin-trefoil	1	.73	.75	.81	.74		
	2	.76	.89	.92	.89		
	3	.40	.44	.54	.46		
	4	.99	1.07	.96	.92		
	Season	2.88	3.15	3.23	3.01	12.27	3.07abc
Orchard-sainfoin	1	1.32	1.07	.96	.81		
	2	.64	.60	.57	.48		
	3	.52	.46	.43	.33		
	4	1.02	.77	.67	.52		
	Season	3.50	2.90	2.63	2.14	11.17	2.79c
Brome-ladino	1	1.00	.92	.53	1.01		
	2	.76	.77	.86	.77		
	3	.66	.68	.71	.71		
	4	1.04	1.22	1.44	1.09		
	Season	3.46	3.59	3.54	3.58	14.17	3.54a
Brome-sainfoin-ladino	1	.82	.93	.91	.96		
	2	.73	.73	.81	.76		
	3	.67	.76	.65	.74		
	4	1.05	1.18	.84	1.22		
	Season	3.27	3.60	3.21	3.68	13.76	3.44ab

Table 1Ba . (con't)

Species	Cutting	I	II	III	IV	Total	Average
Brome-sainfoin-trefoil	1	1.10	.97	1.06	1.19		
	2	.57	.68	.68	.65		
	3	.38	.82	.36	.60		
	4	.87	1.18	.92	.80		
	Season	2.92	3.65	3.02	3.24	12.83	3.21abc
Brome	1	.79	1.39	1.43	1.04		
	2	.47	.51	.51	.42		
	3	.32	.52	.57	.43		
	4	.53	1.24	.76	.39		
	Season	2.11	3.66	3.27	2.28	11.32	2.83bc
Brome-trefoil	1	.93	.96	1.10	.97		
	2	.54	.55	.86	.58		
	3	.37	.50	.73	.46		
	4	.77	.71	1.04	.70		
	Season	2.61	2.72	3.73	2.71	11.77	2.94bc
Orchard-sainfoin-trefoil	1	1.28	1.21	1.22	1.25		
	2	.58	.58	.66	.57		
	3	.43	.52	.53	.53		
	4	.89	.70	.76	.98		
	Season	3.18	3.01	3.17	3.33	12.69	3.17abc
Orchard-trefoil	1	1.59	1.43	1.06	1.25		
	2	.58	.58	.73	.60		
	3	.47	.51	.46	.46		
	4	.66	.80	.75	.76		
	Season	3.30	3.32	3.00	3.07	12.69	3.17abc
Orchard-sainfoin-ladino	1	.80	1.20	.88	.77		
	2	.63	.71	.81	.71		
	3	.46	.79	.82	.54		
	4	.88	1.32	.98	.97		
	Season	2.77	4.02	3.49	2.99	13.27	3.32abc
Sainfoin-ladino	1	.94	.78	.67	.94		
	2	.61	.69	.98	.78		
	3	.55	.58	.61	.62		
	4	.95	.99	.98	1.04		
	Season	3.05	3.04	3.24	3.38	12.71	3.18abc

1/ Values followed by the same letter are not significantly different at the 5% level. Duncans Multiple Range Test.

$\bar{x}$	3.0607	F. - Value	2.80**
S.E.$\bar{x}$	.17853	L.S.D. (P. = .05)	.51
C.V. %	5.83	L.S.D. (P. = .01)	.68

Table 1Bb. Rapid regrowth sainfion. Seasons yields in tons per acre of regrowth type sainfoin compared to Eski in irrigated pasture mixtures, 1969.

Species	Cutting	Replications I	II	III	IV	Total	Average
Eski sainfoin	1	.64	.59	1.06	.98		
	2	1.03	.99	.90	1.00		
	3	.33	.21	.25	.28		
	4	.47	.33	.36	.41		
	Season	2.47	2.12	2.57	2.67	9.83	2.46
Eski - orchardgrass	1	.75	.80	.70	1.38		
	2	.89	.79	.80	.77		
	3	.48	.55	.56	.42		
	4	.39	.37	.45	.32		
	Season	2.51	2.51	2.51	2.89	10.42	2.60
Eski - Ladino clover	1	.73	.91	.79	1.25		
	2	.89	.94	.95	1.02		
	3	.73	.78	.83	.28		
	4	.43	.48	.41	.36		
	Season	2.78	3.11	2.98	2.91	11.78	2.94
Eski-Birdsfoot trefoil	1	.83	.94	1.16	1.06		
	2	1.44	1.04	.99	1.10		
	3	.47	.32	.45	.41		
	4	.53	.37	.37	.36		
	Season	3.27	2.67	2.97	2.93	11.84	2.96
Ladino clover-orchardgrass	1	1.03	1.22	.94	1.21		
	2	1.12	.89	1.08	.96		
	3	.95	1.19	.91	.91		
	4	.43	.46	.40	.56		
	Season	3.53	3.76	3.33	3.64	14.26	3.56
Trefoil - orchardgrass	1	.81	1.23	.77	.78		
	2	.83	.82	.88	.79		
	3	.79	.58	.53	.60		
	4	.38	.35	.39	.39		
	Season	2.81	2.98	2.57	2.56	10.92	2.73
Rapid regrowth sainfoin	1	1.63	1.25	1.26	1.47		
	2	.83	.69	.96	.87		
	3	.48	.37	.32	.40		
	4	.43	.33	.32	.41		
	Season	3.37	2.64	2.86	3.15	12.02	3.00

Table 1Bb . (con't)

Species	Cutting	Replications I	II	III	IV	Total	Average
X - orchardgrass	1	1.23	1.15	.68	1.23		
	2	.73	.72	.50	.64		
	3	.50	.58	.27	.48		
	4	.40	.35	.34	.31		
	Season	2.86	2.80	1.79	2.66	10.11	2.53
X - Ladino clover	1	1.19	1.16	1.16	1.25		
	2	.98	1.16	.79	1.07		
	3	.79	1.00	.67	.92		
	4	.40	.51	.66	.39		
	Season	3.36	3.83	3.28	3.63	14.10	3.52
X - Birdsfoot trefoil	1	1.23	.94	1.14	1.02		
	2	.89	1.01	.94	.96		
	3	.38	.59	.37	.40		
	4	.43	.39	.37	.39		
	Season	2.93	2.93	2.82	2.77	11.45	2.86
X - alfalfa	1	1.57	1.62	1.39	1.64		
	2	.98	.90	.91	1.11		
	3	.40	.51	.44	.40		
	4	.38	.56	.40	.34		
	Season	3.33	3.59	3.14	3.49	13.55	3.39
Eski - alfalfa	1	1.29	1.62	1.50	1.34		
	2	.87	1.00	.98	.95		
	3	.37	.42	.42	.49		
	4	.35	.35	.60	.35		
	Season	2.88	3.39	3.50	3.13	12.90	3.22

$\bar{x}$	2.9829
F. - Value	8.88*
S.E.$\bar{x}$	.12639
L.S.D. (P. = .05)	.37
L.S.D. (P. = .01)	.48
C. V. %	4.24

Table 1C. Frequency of legume harvest. Seasons yield of two legumes when irrigated and harvested at varied frequencies in 1969.

Frequency	Legume	Cutting	Replications I	II	III	IV	Total	Average	Average per cut
4 weeks	Trefoil	1	.58	.73	.99	.64	2.94	.74	
		2	.58	.85	1.13	.73	3.29	.82	
		3	.53	.44	.64	.43	2.04	.51	
		4	.40	.35	.35	.40	1.50	.38	
		5	.20	.12	.15	.09	.56	.14	
		Total	2.29	2.49	3.26	2.29	10.33	2.59	.52
4 weeks	Sainfoin	1	1.16	.81	1.05	1.00	4.02	1.01	
		2	.67	.77	.82	.79	3.05	.76	
		3	.53	.52	.44	.38	1.87	.47	
		4	.42	.39	.32	.34	1.47	.37	
		5	.21	.15	.17	.10	.63	.16	
		Total	2.99	2.64	2.80	2.61	11.04	2.77	.55
5 weeks	Trefoil	1	.87	.96	1.43	.67	3.93	.98	
		2	.91	.95	1.24	.83	3.93	.98	
		3	.53	.39	.44	.57	1.93	.48	
		4	.41	.47	.51	.21	1.60	.40	
		Total	2.72	2.77	3.62	2.28	11.39	2.84	.71
5 weeks	Sainfoin	1	.75	1.04	1.30	1.12	4.21	1.05	
		2	1.02	.81	.98	.86	3.67	.92	
		3	.46	.37	.51	.46	1.80	.45	
		4	.38	.42	.39	.20	1.39	.35	
		Total	2.61	2.64	3.18	2.64	11.07	2.77	.69
6 weeks	Trefoil	1	1.26	.72	.90	.43	3.31	.83	
		2	.83	1.10	1.17	.96	4.06	1.01	
		3	.83	.50	.77	.70	2.80	.70	
		4	.11	.15	.09	.10	.45	.11	
		Total	3.03	2.47	2.93	2.19	10.62	2.65	.66
6 weeks	Sainfoin	1	1.25	1.32	1.14	.89	4.60	1.15	
		2	.85	.99	1.09	.96	3.89	.97	
		3	.61	.73	.48	.40	2.22	.55	
		4	.21	.29	.15	.05	.70	.18	
		Total	2.92	3.33	2.86	2.30	11.41	2.85	.71
3 weeks	Trefoil	1	.68	.80	.72	.83	3.03	.76	
		2	1.00	1.38	.59	1.60	4.57	1.14	
		3	.07	.20	.21	.15	.63	.16	
		4	.61	.67	.50	.50	2.28	.57	
		5	.33	.32	.37	.40	1.42	.37	
		6	.13	.21	.08	.13	.55	.14	
		Total	2.82	3.58	2.47	3.61	12.48	3.14	.52

Table 1C . (con't)

Frequency	Legume	Cutting	Replications I	II	III	IV	Total	Average	Average per cut
3 weeks	Sainfoin	1	.78	1.07	1.07	.84	3.76	.94	
		2	1.07	1.55	.80	1.10	4.52	1.13	
		3	.06	.25	.12	.20	.63	.16	
		4	.55	.48	.53	.62	2.18	.54	
		5	.34	.32	.49	.37	1.52	.38	
		6	.14	.21	.12	.13	.60	.15	
		Total	2.94	3.88	3.13	3.26	13.21	3.30	.55

$\bar{x}$	2.8609
F. - Value	1.32
S.E.$\bar{x}$	.20768
L.S.D. (P. = .05)	N.S.
C. V. %	7.26

Table 1Da . Irrigated regrowth sainfoin variety test in 1969. Seasons yields in two cuttings of regrowth sainfoin and named varieties.

Variety	Cutting	Replications I	II	III	IV	Total	Average
Eski	1	3.06	3.04	3.20	2.83		
	2	1.43	1.33	1.69	1.72		
	Season	4.49	4.37	4.89	4.55	18.30	4.57
Regrowth	1	2.96	2.90	3.05	2.72		
	2	1.98	1.88	1.56	1.85		
	Season	4.94	4.78	4.61	4.57	18.90	4.72
White	1	2.82	3.25	2.67	2.94		
	2	1.26	1.49	1.20	1.15		
	Season	4.08	4.74	3.87	4.09	16.78	4.19
Agusta	1	2.51	2.42	2.73	2.32		
	2	1.25	.74	1.33	1.07		
	Season	3.76	3.16	4.06	3.39	14.37	3.59
Ladak	1	2.49	2.56	2.49	2.59		
	2	2.19	2.59	2.27	2.42		
	Season	4.68	5.15	4.76	5.01	19.60	4.90
Canadian	1	3.79	3.38	3.06	3.02		
	2	1.58	1.48	2.03	1.66		
	Season	5.37	4.86	5.09	4.68	20.00	5.00
Persian	1	2.25	2.59	3.00	2.64		
	2	1.77	1.89	1.95	1.77		
	Season	4.02	4.48	4.95	4.35	17.80	4.45

$\bar{x}$	4.491
F. - Value	9.19**
S.E.$\bar{x}$	.15851
L.S.D. (P. = .05)	.47
L.S.D. (P. = .01)	.65
C.V.%	3.53

Table 1Db. Dryland regrowth sainfoin variety test in 1969. Seasons yields in two cuttings of regrowth and named varieties.

Variety	Cutting	Replications I	II	III	IV	Total	Average
Eski	1	1.98	2.08	1.94	1.98		
	2	1.24	1.44	1.34	1.05		
	Season	3.22	3.52	3.28	3.03	13.05	3.26
Regrowth	1	1.75	1.56	1.63	1.87		
	2	1.47	1.43	1.50	1.23		
	Season	3.22	2.99	3.13	3.10	12.44	3.11
White	1	2.09	1.21	1.60	1.57		
	2	1.19	.88	.89	.97		
	Season	3.28	2.09	2.49	2.54	10.40	2.60
Agusta	1	1.43	1.06	1.37	1.53		
	2	.77	.57	.78	.86		
	Season	2.20	1.63	2.15	2.39	8.37	2.09
Ladak	1	1.78	1.46	1.27	1.27		
	2	1.45	1.60	1.36	1.68		
	Season	3.23	3.06	2.63	2.95	11.87	2.97
Canadian	1	2.22	1.95	2.15	2.09		
	2	1.65	1.81	1.49	1.22		
	Season	3.87	3.76	3.64	3.31	14.58	3.64
Persian	1	1.57	1.65	1.54	1.52		
	2	1.37	1.50	1.13	1.00		
	Season	2.94	3.15	2.67	2.52	11.28	2.82

$\bar{x}$	2.928
F - Value	12.74
S.E.$\bar{x}$	.13903
L.S.D. (P. = .05)	.41
L.S.D. (P. = .05)	.57
C.V.%	4.75

Table 1Ea. Fertilizer on sainfoin and alfalfa in 1969. Seasons yield in two cuttings when given varied rates of commercial fertilizer.

Treatment	Crop	Cutting	Replications I	II	III	IV	Total	Average
90# Potash + 100# P_2O_5	Sainfoin	1	2.27	1.70	2.74	2.55		
		2	.76	.48	.62	.73		
		Season	3.03	2.18	3.36	3.28	11.85	2.96
	Alfalfa	1	2.24	2.83	2.02	2.93		
		2	1.45	1.39	1.45	1.83		
		Season	3.69	4.22	3.47	4.76	16.14	4.03
60# Sulfur + 100# P_2O_5	Sainfoin	1	1.94	2.45	1.69	2.34		
		2	.43	.51	.53	.59		
		Season	2.37	2.96	2.22	2.93	10.48	2.62
	Alfalfa	1	2.78	3.12	2.70	2.19		
		2	1.63	1.61	1.79	1.17		
		Season	4.41	4.73	4.49	3.36	16.99	4.25
Check	Sainfoin	1	2.52	2.20	1.83	2.07		
		2	.62	.80	.50	.80		
		Season	3.14	3.00	2.33	2.87	11.34	2.84
	Alfalfa	1	2.89	2.68	2.42	1.92		
		2	1.29	1.56	1.54	1.22		
		Season	4.18	4.24	3.96	3.14	15.52	3.88
P_2O_5 25# each year	Sainfoin	1	2.03	1.99	2.36	2.17		
		2	.62	.65	.89	.76		
		Season	2.65	2.64	3.25	2.93	11.47	2.87
	Alfalfa	1	2.68	2.28	2.85	2.21		
		2	1.77	1.50	1.70	1.61		
		Season	4.45	3.78	4.55	3.82	16.60	4.15
P_2O_5 50#	Sainfoin	1	2.25	2.57	1.70	1.83		
		2	.66	.87	.46	.53		
		Season	2.91	3.44	2.16	2.36	10.87	2.72
	Alfalfa	1	2.57	3.02	2.45	2.42		
		2	1.49	1.57	1.64	1.30		
		Season	4.06	4.59	4.09	3.72	16.46	4.11

Table 1Ea . (con't)

Treatment		Crop	Cutting	Replications I	II	III	IV	Total	Average
P_2O_5	100#	Sainfoin	1	2.39	1.70	1.79	2.12		
			2	.64	.88	.46	.79		
			Season	3.03	2.58	2.25	2.91	10.77	2.69
		Alfalfa	1	2.17	2.22	2.19	2.42		
			2	1.35	1.39	1.48	1.30		
			Season	3.52	3.61	3.67	3.72	14.52	3.63
P_2O_5	150#	Sainfoin	1	2.05	2.40	1.88	2.00		
			2	.74	.37	.74	.76		
			Season	2.79	2.77	2.62	2.76	10.94	2.73
		Alfalfa	1	2.36	2.18	2.35	2.51		
			2	1.48	1.07	1.45	1.48		
			Season	3.84	3.25	3.80	3.99	14.88	3.72

SAINFOIN		ALFALFA	
$\bar{x}$	2.776	$\bar{x}$	3.968
F - Value	N.S.	F - Value	1.04
S.E.$\bar{x}$	.2045	S.E.$\bar{x}$	.2269
L.S.D. (P = .05)	N.S.	L.S.D. (P = .05)	N.S.
C.V. %	7.37	C.V. %	5.72

Table 1Eb. Five year summary table. Fertilizer on sainfoin at the Northwestern Montana Branch Station. Tons per acre at 12% moisture. Non-irrigated, two cuttings.

Treatment	1965 1/	1966	1967	1968	1969	Total	Average
			Fertilizer on sainfoin				
Potash + P_2O_5	1.33	5.26	3.80	4.35	2.96	17.70	3.54
Sulfur + P_2O_5	1.25	5.90	3.05	3.58	2.62	16.41	3.28
Check	1.36	5.53	3.81	4.88	2.84	18.42	3.68
25 P_2O_5 Annual	1.13	5.78	3.71	4.73	2.87	18.22	3.64
50# P_2O_5	1.45	5.36	3.33	4.39	2.72	17.25	3.45
100 # P_2O_5	1.41	5.69	4.01	4.67	2.69	18.47	3.69
150 # P_2O_5	1.29	5.44	3.39	4.72	2.73	17.57	3.51
			Fertilizer on alfalfa				
Potash + P_2O_5	1.39	5.69	5.67	4.48	4.03	21.26	4.25
Sulfur + P_2O_5	1.66	5.19	5.38	4.88	4.25	21.36	4.27
Check	1.35	4.21	4.10	4.08	3.88	17.62	3.52
25 P_2O_5 Annual	1.47	4.74	5.25	4.33	4.15	19.94	3.99
50# P_2O_5	1.55	4.97	5.66	3.64	4.11	19.93	3.99
100 # P_2O_5	1.61	4.78	5.53	4.79	3.63	20.34	4.07
150 # P_2O_5	1.43	4.67	6.21	4.75	3.72	20.78	4.18

1/ One cut only the seeding year.

Table 1F. Sainfoin seeding rate and spacing competition study in 1969. Seasons yields in tons per acre from two cuttings in response to varied seeding rates, spacings and competing crop.

Spacing	Rates	Rows	Cutting	Replications I	II	III	IV	Total	Average
1' rows	15#	4	1	2.44	3.03	2.44	2.70		
			2	1.14	1.26	1.21	1.24		
			Total	3.58	4.29	3.65	3.94	15.46	3.86ab 1/
1' rows	30#	4	1	2.48	3.38	2.81	2.47		
			2	1.54	1.20	1.25	1.35		
			Total	4.02	4.58	4.06	3.82	16.48	4.12a
6" rows	30#	7	1	2.57	3.12	3.07	2.58		
			2	1.15	1.42	1.50	1.31		
			Total	3.72	4.54	4.57	3.89	16.72	4.18a
6" w/grass (Latar)	15# + 3#	7	1	2.61	3.17	2.86	2.87		
			2	1.05	1.41	1.34	1.21		
			Total	3.66	4.58	4.20	4.08	16.52	4.13a
6" w/grass (Oahe)	15# + 6#	7	1	2.66	3.01	2.64	3.06		
			2	.93	1.21	1.33	1.34		
			Total	3.59	4.22	3.97	4.40	16.18	4.04a
6" rows	15#	4	1	2.23	2.53	2.39	2.51		
			2	1.12	1.21	1.42	1.41		
			Total	3.35	3.74	3.81	3.92	14.82	3.71bc
12" rows w/barley	15# + 30#	4 3	1	.63	1.07	1.00	.95		
			2	1.22	1.26	1.25	1.26		
			Total	1.85	2.33	2.25	2.21	8.64	2.16d
12" alternate row w/Later	15# + 3#	4 3	1	.95	1.12	.99	.96		
			2	1.43	1.38	1.30	1.50		
			Total	2.38	2.50	2.29	2.46	9.63	2.41cd
12" alternate rows w/Oahe	15# + 6#	4 3	1	1.13	1.29	1.03	.96		
			2	1.41	1.18	1.39	1.44		
			Total	2.54	2.47	2.42	2.40	9.83	2.46cd
2' rows	15#	3	1	.86	.89	.86	.88		
			2	1.08	1.19	1.21	1.06		
			Total	1.94	2.08	2.07	1.94	8.03	2.01e

1/ Values having a common number are not significantly different one from another. Duncan's Multiple Range Test.

$\bar{x}$	3.3	F - Value	72.22**
S.E.$\bar{x}$	.10848	L.S.D. (P. = .05)	.31
C. V. %	3.28	L.S.D. (P. = .01)	.42

TITLE Species-Care-Harvest Nurseries

PROJECT: Forage Investigations MS 755

PERSONNEL C. W. Roath and Don R. Graham

LOCATION: Selected farms in northwestern counties

DURATION: Through 1969 or 1970

OBJECTIVES: To determine the most effective combinations of species, fertilizers and harvest schedules for high perennial forage production in Western Montana.

PROCEDURES: One replication of each species and treatment in each location.

SIGNIFICANT FINDINGS:

Alfalfa is still the most dependable irrigated forage for Northwestern Montana.

FUTURE PLANS Discontinue in 1969 and assemble data.

INTRODUCTION: It was hoped that by combining species, fertilizers and harvest into one study that practical recommendations for irrigated forage production would result. However, conditions at selected sites have proven to be too diverse for the one replication per location method to be particularly effective.

RESULTS AND DISCUSSION:

The plan called for the harvest of nine plots of six forage species at each of six locations. The harvest systems were imposed as treatments and three fertilizer levels used as sub treatments. In 1969 no data was obtained from three locations, partial data from two locations and complete data from only one. Partial 1968 data from two locations has also been received.

1968 - data for Corvallis
1968 - data for Frenchtown
1969 - data for Kalispell
1969 - data for Hot Springs
1969 - data for Ronan

By Location:

Corvallis: Alfalfa was the best legume, Orchard the best grass. Use of both Phos. and Phos + N appeared to encourage extra yield, however this increase was slight except in Orchardgrass.

Frenchtown: Alfalfa was the best legume, Penlate the best grass. Fertilizer response was very eratic. Medium harvest best for alfalfa and altasweede, early for Penlate.

Results and Discussion (con't)

Kalispell: Alfalfa was the best legume, Pennlate Orchard the best grass. Late harvest produced the most forage from five species. Phos. provided for additional growth of all species except Eski.

Ronan: Eski and Oahe lead. Late harvest usually best. N & P usually best except for alfalfa and Eski.

Hot Springs: Alfalfa best legume, Alkar Tall wheatgrass best grass. Late harvest generally best. N + P very much the best for all species except Eski.

By Species:

Alfalfa leads other legumes and all species in all locations except one and there only one cutting was obtained. Cutting late June and medium August usually produced more than earlier or later harvest in two cutting systems. Phos. was particualarly effective at Kalispell.

Eski sainfoin surpassed alfalfa in one late cutting at Corvallis, killed out at Frenchtown, was second to alfalfa at Kalispell, above alfalfa in one cutting at Ronan and very poor at the Hot Springs location. Delayed harvest improved yields. No place did fertilizer appear to help.

Altasweed, was second to alfalfa at Corvallis and Frenchtown. This legume responded to medium or late harvest and eraticly to fertilizer.

Pennlate Orchard led other grasses at Corvallis, Frenchtown and Kalispell, but was second at Ronan and low at Hot Springs. Late harvest improved yield but undoutedly reduced the protein content. A marked response to N + P was noted in most cases.

Oahe intermediate was high producing species at Ronan, good at Kalispell and Hot Springs, but poor at Frenchtown. At Corvallis it was good only in plots receiving medium harvest. N + P seemed to be associated with good yield.

Alkar tall wheatgrass was generally low in yield. However, at Hot Springs in late harvest it was the best species. Phos. appeared necessary, or P + N.

SUMMARY AND CONCLUSIONS:

Alfalfa remains hard to beat as an irrigated forage being the more widely adapted of the legumes used and more productive in two cuttings in most cases than the grasses. However, our study shows other species to be productive in given situations.

Table 1. Seasons yield in tons per acre at 12% moisture at Corvallis, Montana in 1968 by cutting schedule.

Species	Cutting	Check	P	NP	Total	Average
Early Harvest: Cuttings - 6/13, 7/30, 9/16						
Ladak alfalfa	1	2.72	2.80	2.93		
	2	1.74	1.57	1.75		
	3	1.02	1.12	1.29		
	Total	5.48	5.49	5.97	16.94	5.65
Eski sainfoin	1	2.56	2.62	2.67	7.85	2.62
Altaswede red clover	1	2.88	2.70	3.04		
	2	.81	.53	.60		
	3	.50	.55	.59		
	Total	4.19	3.78	4.23	12.20	4.07
Pennlate orchard	1	1.40	1.44	2.02		
	2	.41	.35	.40		
	3	.46	.41	.44		
	Total	2.27	2.20	2.86	7.33	2.44
Oahe inter. wheatgrass	1	.70*	1.10	1.11	2.91	.97
Alkar Tall wheatgrass	1	1.88	2.43	2.95	7.26	2.42
Medium Harvest: Cuttings - 6/29, 8/21						
Ladak alfalfa	1	3.28	3.43	3.04		
	2	2.36	2.34	2.40		
	Total	5.64	5.77	5.44	16.85	5.61
Eski sainfoin	1	3.47	3.60	3.54	10.61	3.54
Altaswede red clover	1	2.67	2.82	3.29		
	2	1.01	1.12	.93		
	Total	3.68	3.94	4.22	11.84	3.95
Pennlate orchardgrass	1	.93	1.48	2.46		
	2	.69	.85	1.13		
	Total	1.62	2.33	3.59	7.54	2.51
Oahe inter. wheatgrass	1	1.10	1.67	1.74		
	2	.80	.80	1.38		
	Total	1.90	2.47	3.12	7.49	2.50
Alkar tall wheatgrass	1	.22*	.68*	.44*		
	2	.57	.55	.65		
	Total	.79	1.23	1.09	3.11	1.04

Table 1 (con't)

Species	Cutting	Check	P	NP	Total	Average
	Late Harvest:	Cuttings - 7/9, 8/31				
Ladak alfalfa	1	3.66	2.95	3.47		
	2	1.56	1.67	1.64		
	Total	5.22	4.62	5.11	14.95	4.98
Eski sainfoin	1	4.66	5.18	5.40	15.24	5.08
Altaswede red clover	1	3.82	3.47	4.41		
	2	.94	.83	1.07		
	Total	4.76	4.30	5.48	14.54	4.85
Pennlate orchardgrass	1	1.66	2.06	2.73		
	2	.78	.87	1.16		
	Total	2.44	2.93	3.89	9.26	3.09
Oahe inter. wheatgrass	1	1.35	1.70	2.05	5.10	1.70
Alkar tall wheatgrass	1	1.67	1.82	1.95	5.44	1.81

* = Poor stand

Table 2. Seasons yield in tons per acre at 12% moisture from study at Frenchtown, Montana in 1968 by cutting schedule.

Species	Cutting	Check	P	NP	Total	Average
	Early Harvest:	Cuttings - 6/13, 7/31				
Ladak alfalfa	1	2.67	2.94	2.98		
	2	1.22	1.67	.76		
	Total	3.89	4.61	3.74	12.24	4.08
Eski sainfoin	No stand					
Altaswede red clover	1	2.19	2.21	2.19		
	2	.65	.92	1.30		
	Total	2.84	3.13	3.49	9.46	3.15
Pennlate orchardgrass	1	1.24	1.20	1.31		
	2	1.69	2.30	2.12		
	Total	2.93	3.50	3.43	9.86	3.29
Oahe inter. wheatgrass	No stand					
Alkar tall wheatgrass	1	1.70	1.16	1.28	4.14	1.38

Table 2 (con't)

Species	Cutting	Check	P	NP	Total	Average
	Medium Harvest:	Cuttings - 6/29, 8/26				
Ladak alfalfa	1	3.22	3.15	3.08		
	2	2.67	2.66	1.99		
	Total	5.89	5.81	5.07	16.77	5.59
Eski sainfoin	No stand					
Altaswede red clover	1	3.64	3.67	2.91		
	2	.75	.96	.66		
	Total	4.39	4.63	3.57	12.59	4.20
Pennlate orchardgrass	1	2.04	1.69	1.97		
	2	.63	.91	.59		
	Total	2.67	2.60	2.56	7.83	2.61
Oahe inter. wheatgrass	No stand					
Alkar tall wheatgrass	No stand					
	Late Harvest:	Cuttings - 7/9, 9/4				
Ladak alfalfa	1	3.73	2.39	1.76		
	2	1.75	1.31	1.06		
	Total	5.48	3.70	2.82	12.00	4.00
Eski sainfoin	No stand					
Altaswede red clover	1	3.21	2.07	1.02		
	2	1.09	1.01	.96		
	Total	4.30	3.08	1.98	9.36	3.12
Pennlate orchardgrass	1	1.30	2.63	1.25		
	2	.87	.74	.79		
	Total	2.17	3.37	2.04	7.58	2.53
Oahe inter. wheatgrass	1	1.69	No stand		1.69	.56
Alkar tall wheatgrass	1	1.73	No stand		1.73	.58

Table 3. Seasons yield in tons per acre at 12% moisture from Northwestern Montana Branch Station, Kalispell, Montana in 1969 by cutting schedule.

Species	Cutting	Check	P	NP	Total	Average
	Early Harvest: Cuttings - 6/10, 8/5					
Pennlate orchard	1	1.31	1.67	2.09		
	2	.42	.62	.54		
	Total	1.73	2.29	2.63	6.65	2.22
Eski sainfoin	1	2.00	1.85	1.81		
	2	.51	.65	.58		
	Total	2.51	2.50	2.39	7.40	2.47
Oahe inter. wheatgrass	1	.88	1.46	1.79		
	2	.12	.59	.46		
	Total	1.00	2.05	2.25	5.30	1.77
Ladak alfalfa	1	1.40	2.16	1.90		
	2	.71	1.03	.67		
	3	.27	.77	.68		
	Total	2.38	3.96	3.25	9.59	3.20
Alkar tall wheatgrass	1	.50	1.01	.96		
	2	.28	.76	.63		
	Total	.78	1.77	1.59	4.14	1.38
Altaswede red clover	1	.66	1.50	1.28		
	2	.23	.42	.53		
	Total	.89	1.92	1.81	4.62	1.54
	Medium Harvest: Cuttings - 6/23, 8/18					
Oahe inter. wheatgrass	1	1.45	1.90	3.59		
	2	.32	.32	.51		
	Total	1.77	2.22	4.10	8.09	2.70
Pennlate orchard	1	.90	1.13	2.26		
	2	.26	.69	.95		
	Total	1.16	1.82	3.21	6.19	2.06
Ladak alfalfa	1	1.44	2.19	2.39		
	2	1.05	1.93	1.29		
	Total	2.49	4.12	3.68	10.29	3.43
Eski sainfoin	1	1.69	1.52	1.61		
	2	.88	.96	.80		
	Total	2.57	2.48	2.41	7.46	2.49

Table 3 (con't)

Species	Cutting	Check	P	NP	Total	Average
Alkar tall wheatgrass	1	.40	1.28	1.88		
	2	.11	.44	.65		
	Total	.51	1.72	2.53	4.76	1.59
Altaswede red clover	1	.99	1.40	1.76		
	2	.34	.46	.64		
	Total	1.33	1.86	2.40	5.59	1.86
Late Harvest:		Cuttings - 7/9, 9/19				
Eski sainfoin	1	2.88	1.76	2.05		
	2	1.34	1.51	.93		
	Total	4.22	3.27	2.98	10.47	3.49
Oahe inter. wheatgrass	1	1.90	1.68	2.03		
	2	.16	.42	.56		
	Total	2.06	2.10	2.59	6.75	2.25
Alkar tall wheatgrass	1	1.22	.93	1.48		
	2	.15	.30	.86		
	Total	1.37	1.23	2.34	4.94	1.65
Pennlate orchard	1	1.44	2.24	4.49		
	2	.44	1.03	1.71		
	Total	1.88	3.27	6.20	11.35	3.78
Ladak alfalfa	1	3.06	2.58	2.33		
	2	1.49	1.93	2.18		
	Total	4.55	4.51	4.51	13.57	4.52
Altaswede red clover	1	1.26	2.06	1.40		
	2	.30	.53	.24		
	Total	1.56	2.59	1.64	5.79	1.93

Table 4. Seasons yield in tons per acre at 12% moisture from the Gene Allard farm, Ronan, Montana in 1969, one cutting only.

Species	Check	P	NP	Total	Average
	Early Harvest:	Cutting - 6/17			
Pennlate orchard	1.67	1.73	2.20	5.60	1.87
Altaswede red clover	1.65	1.38	1.87	4.90	1.63
Alkar tall wheatgrass	1.48	1.08	2.08	4.64	1.55
Ladak alfalfa	1.59	2.33	1.83	5.75	1.92
Oahe inter. wheatgrass	2.61	1.85	2.32	6.78	2.26
Eski sainfoin	1.80	1.79	1.82	5.41	1.80
	Medium Harvest:	Cutting - 7/1			
Pennlate orchard	1.87	1.51	1.83	5.21	1.74
Eski sainfoin	1.81	2.11	2.10	6.02	2.01
Altaswede red clover	1.13	1.83	1.41	4.37	1.46
Alkar tall wheatgrass	1.59	2.08	1.74	5.41	1.80
Ladak alfalfa	1.44	1.40	1.77	4.61	1.54
Oahe inter. wheatgrass	1.64	3.19	2.73	7.56	2.52
	Late Harvest:	Cutting - 7/10			
Alkar tall wheatgrass	1.17	2.56	2.37	6.10	2.03
Oahe inter. wheatgrass	2.46	1.99	2.51	6.96	2.32
Eski sainfoin	1.92	1.96	2.29	6.17	2.06
Pennlate orchard	2.78	1.84	3.47	8.09	2.70
Ladak alfalfa	1.90	2.07	2.25	6.22	2.07
Altaswede rec clover	2.04	1.65	1.97	5.66	1.89

Table 5. Seasons yield in tons per acre at 12% moisture from the Paul Houser farm, Hot Springs, Montana in 1969 by cutting schedule.

Species	Cutting	Check	P	NP	Total	Average
	Early Harvest:	Cuttings - 6/17, 8/6				
Oahe inter. wheatgrass	1	1.16	1.44	2.36		
	2	.11	.26	.22		
	Total	1.27	1.70	2.58	5.55	1.85
Pennlate orchard	1	1.22	1.62	2.92		
	2	.11	.21	.26		
	Total	1.33	1.83	3.18	6.34	2.11
Eski sainfoin	1	.28	.46		.74	.25
Altaswede red clover	1	.63		2.85		
	2	.11	.25	.21		
	Total	.74	.25	3.06	4.05	1.35
Alkar tall wheatgrass	1	1.44	.75	3.86		
	2	.25	.26	.22		
	Total	1.69	1.01	4.08	6.78	2.26
Ladak alfalfa	1	1.90	1.69	3.07		
	2	.62	.68	.66		
	Total	2.52	2.37	3.73	8.62	2.87
	Medium Harvest:	Cuttings - 7/1, 8/20				
Eski sainfoin	1	.47				
	2	.37				
	Total	.84			.84	
Oahe inter. wheatgrass	1	1.33	.56	2.92		
	2			.13		
	Total	1.33	.56	3.05	4.94	1.65
Altaswede red clover	1	.71	.35	1.84		
	2	.28		.33		
	Total	.99	.35	2.17	3.51	1.17
Pennlate orchard	1	1.68	.20	1.31		
	2	.13		.13		
	Total	1.81	.20	1.44	3.45	1.15
Alkar tall wheatgrass	1	1.70	1.31	1.97		
	2	.13		.13		
	Total	1.83	1.31	2.10	5.24	1.75
Ladak alfalfa	1	2.95	3.50	3.68		
	2	1.77	1.31	.46		
	Total	4.72	4.81	4.14	13.67	4.56

Table 5 (con't)

Species	Cutting	Check	P	NP	Total	Average
	Late Harvest:	Cuttings - 7/10, 9/19				
Eski sainfoin	1	.92	.96	.84		
	2	.20				
	Total	1.12	.96	.84	2.92	.97
Pennlate orchard	1	1.62	1.73	3.92		
	2	.59	.11	.11		
	Total	2.21	1.84	4.03	8.08	2.69
Oahe inter. wheatgrass	1	2.63	2.60	3.07		
	2	.10	.10	.10		
	Total	2.73	2.70	3.17	8.60	2.87
Alkar tall wheatgrass	1	2.70	4.69	3.20		
	2	.61	.53	.25		
	Total	3.31	5.22	3.45	11.98	3.99
Atlaswede red clover	1	1.77	2.98	2.32		
	2	.21	.58	.24		
	Total	1.98	3.56	2.56	8.10	2.70
Ladak alfalfa	1	2.02	2.30	3.07		
	2	.97	1.41	.97		
	Total	2.99	3.71	4.04	10.74	3.58

TITLE: Nutrient Preservation

PROJECT: Forage Investigations MS 755

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: 1970 thru 1972

OBJECTIVES:

A. To determine the extent of loss of nutrients in forage when harvested throughout the harvest period and preserved by various methods.

B. To attempt to place a practical limit on the cost of forage preservation in relation to nutrients preserved.

PROCEDURE: Twelve plots of uniform alfalfa of sufficient size to provide material for preservation by planned procedures were staked out. Three of these were harvested each week for four weeks for each of two cuttings. Harvest was by swather with a conditioner attachment. Thirty feet of swath was taken for making wilted silage. The remainder left for field cured baled hay.

SIGNIFICANT FINDINGS:

Division of area prior to cutting will be required in order to relate yield to area harvested with acceptable accuracy.

FUTURE PLANS: It would be well to consider what has been done as preliminary exploration into procedure and method and continue for three years for reliable data.

INTRODUCTION: Wilted silage and field cured bales were put up using portions of the forage produced on twelve plots harvested two time each.

Visual quality appraisal is to be supplemented by chemical analysis for protein. Extended rainy periods interfered with field curing and should make silage the more efficient method of storage for 1969.

RESULTS AND DISCUSSION:

Three alfalfa plots were harvested each week for four weeks during both the first and second cutting harvest. A swather equipped with a conditioner was used for cutting. After wilting a portion of each plot was ensiled. Drying to 65% moisture ususally took twenty-four hours. When after two to ten days, depending on the weather, the remainder was dry enough for baling, usually after turning one or more times, the hay was weighed then baled. Samples were taken after storage for from sixty to one hundred days for chemical analysis for protein.

Yields on a 12% moisture basis are shown in Table 1. This is of course, only part of the story, the remainder of which awaits analysis of stored material. The third harvest period used would appear to be best for total yield.

Table 1. Tons per acre of alfalfa hay from 10.5 x 132 ft. plots by date of harvest in 1969. (Dry lbs/p x .01758)

Harvest Date	Replications I	II	III	Total	Average
6/18	1.98	2.22	1.85		
8/ 5	1.22	1.50	1.50		
Season	3.20	3.72	3.35	10.27	3.42
6/25	2.70	2.32	2.58		
8/12	1.88	1.97	1.91		
Season	4.58	4.29	4.49	13.36	4.45
7/ 3	3.75	3.26	3.34		
8/19	2.09	1.84	1.94		
Season	5.84	5.10	5.28	16.22	5.41
7/ 9	3.44	2.61	2.89		
8/26	1.57	1.89	1.78		
Season	5.01	4.50	4.67	14.18	4.73

$\bar{x}$	3.37687
F. - Value	25.87
S.E.$\bar{x}$	.14021
L.S.D. (P. = .05)	.49
L.S.D. (P. = .01)	.74
C.V. %	4.15

TITLE: Interstate Legume Nursery

PROJECT: Forage Investigations MS 755

PERSONNEL: C. W. Roath and A. E. Carleton

LOCATION: Northwestern Montana Branch Station

DURATION: Through 1971

OBJECTIVES: Determine the effect of seedling establishment and vigor on yield.

SIGNIFICANT FINDINGS: None

FUTURE PLANS: Harvest for yield.

INTRODUCTION: A nursery containing scarified vetch seed and a selection containing few hard seeds plus suitable checks was supplied by Carleton. This was seeded and fair emergence obtained. Growth of vetches was not comparable to that of alfalfa. See Table 1.

A fall harvest the seeding year presents a measure of seeding year establishment and vigor.

Table 1. Intrastate legume (Cicer) nursery grown on the Northwestern Montana Branch Station in 1969. Nursery seeded in 1969. T/A at 12%.

Variety	I	II	III	IV	Total	Average
Cicer Sc. Br.	.52	.43	.81	.28	2.04	.51
Ladak 65	2.31	1.76	2.02	1.96	8.05	2.01
Eski sainfoin	1.61	1.52	1.67	.80	5.60	1.40
Cicer Sc. Sid.	1.13	.67	.86	.39	3.05	.76
Cicer P.C. Boz.	.53	.11	.21	.32	1.17	.29
Penngrift Cr. V.	.90	.10	.10	.10	1.20	.30

$\bar{x}$	.87958
F. - Value	39.41**
S.E.$\bar{x}$	.11002
L.S.D. (P. = .05)	.33
L.S.D. (P. = .01)	.46
C.V. %	12.50

TITLE: Animal Evaluation of Forages

PROJECT: Forage Investigations MS 755

PERSONNEL: C. W. Roath, Forage Research Committee and Consultants in Animal and Range Science

LOCATION: Northwestern Montana Branch Station

DURATION: Through 1970

OBJECTIVES: To measure forage value by livestock response.

PROCEDURES: Nine lots were constructed that will accommodate up to ten head of sheep, each with feeders, shelters and automatic waterers, and adjacent to a feeding alley which provides access to sorting pens and scales. Sheep or lambs divided as evenly as possible into nine lots provide three lots to utelize each of three rations.

SIGNIFICANT FINDINGS:

Sainfoin put gain equal to that from alfalfa on lambs when fed as green chop and as dry hay, in short trials at Northwestern Montana Branch Station.

FUTURE PLANS: Continue to evaluate these forages.

INTRODUCTION: Feeding of three legume hays to ewe lambs continued during the fall and winter of 1969-70. A preliminary report based on 76 days of feeding is being prepared at the time the supply of one of the hays, Altaswede red clover - wheatgrass is exhausted. The alfalfa-sainfoin comparison will continue until sheep are shorn in the spring.

RESULTS AND DISCUSSION:

Eighty-one whiteface ewe lambs secured from the Red Bluff Ranch were divided into nine lots of nine each for a test beginning October 2, 1969, at which time lots were quite uniform in size and weight on the average. There was however, a considerable variation between the size of individuals within lots.

Feeding was on a once a day basis adjusted to what was readily consumed. Sainfoin was noticeably the most readily and most completely utelized.

Hays were as equal as possible in quality, having been harvested by the same men and equipment on the same farm, the N.W. Montana Branch Station. However, more mold was noted in the clover hay than the alfalfa, and possibly more in alfalfa than sainfoin, simply because of ease of drying. Generally quality was better than expected in this area.

Table 1, shows comparable data for the three rations and more gain from sainfoin than from the other hays.

Table 1. Ewe lamb gains on legume hay rations, seventy-six days in 1969.

Lot	Ration	Weights (9 Lambs) Oct. 2	Dec. 17	Lot	Lamb Gain	Hay Used	Lbs/# of gain
1	Alfalfa	742	770	28	3.1	1954.0	69.8
5	"	749	764	15	1.7	2002.5	133.5
7	"	722	748	26	2.9	2031.5	78.1
	Average	738	761	23	2.6	1996.0	86.9
2	Sainfoin	735	811	76	8.4	2126.5	28.0
4	"	715	804	89	9.9	2124.0	23.9
9	"	745	799	54	6.0	2217.0	41.1
	Average	732	805	73	8.1	2155.8	29.5
3	Clover	731	759	28	3.1	2049.5	73.2
6	"	732	777	45	5.0	2132.0	47.4
8	"	738	777	39	4.3	2188.5	56.1
	Average	734	771	37	4.0	2123.3	57.4

Average by lot fails to tell the more dramatic story of the study, found only in individual weights. Individual weights show that seven lambs in the alfalfa lots and eight in the clover lots out of twenty-seven lambs made no gain. This compared to only two in twenty-seven in the sainfoin lots. This plus greater gains per lamb gaining made the difference between 8.1 and 2.6 or 4.0 pounds gain per lamb.

TITLE: Potato Seedling Evaluation

PROJECT: Potato Production and Improvement MS 757

PERSONNEL: C. W. Roath and Horticultural Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Undetermined

OBJECTIVES:
1. Screen seedling tubers and breeding material from available sources for desirable scab free material.
2. Increase and evaluate selections in comparison to standard varieties.

PROCEDURE: Evaluate seedlings in spaced single hill isolated plantings. When seed is adequate make randomized and replicated yield comparisons. Secure laboratory and commercial company appraisal of promising selections.

SIGNIFICANT FINDINGS:

Selection # 245-2 accorded commercial evaluation.

FUTURE PLANS: Continue thru 1970 without change; ie grow out Hoyman tubers and such material as Metcalf wants evaluated at this location.

RESULTS AND DISCUSSION:

In the neighborhood of 4000 seedling tubers of 26 families were recieved from Dr. Wm. G. Hoyman, Prosser, Washington and grown out in hills spaced three feet apart in isolation from other potato fields. Good stands and growth were obtained. Careful and thorough roguing was practiced all season until near harvest time. Harvest was accomplished by use of a low short chain digger that placed the tubers back on the row for observation. Montana State University Horticulturists and Montana Potato Grower representatives helped select hills, possibly 100, for further appraisal. These were all taken to Montana State University for storage.

Selections made in 1968 from Hoyman tubers were grown in single row plots under irrigation at Northwestern Montana Branch Station, along with numerous other named varieties and selections. Twelve entries for which sufficient seed was available were grown in a replicated yield study. However, a very poor stand was obtained which renders the yields subject to question. For this data see Table 1.

Table 2 presents observations of vines and tubers by variety.

In addition to varieties and selections shown in Tables 1 and 2, from two to several hills each of thirty-six other selections were grown and field notes taken.

SUMMARY AND CONCLUSION:

About 4000 seedling tubers were grown in isolation for evaluation and selection of desirable scab free material. Nearly 100 hills were selected.

Almost 100 varieties and selections were evaluated either in replicated studies or single row plantings depending on seed supply. Very poor stands were obtained of some entries and disease was obvious.

I strongly urge a policy of maintaining a source of seed of selected lines in a virus free condition for as long as these are being considered for release. And I further most strongly urge a policy of hill selection and indexing such as is followed by certified seed growers for material to be used in variety and selection evaluation.

Table 1. Named varieties and advanced selections in 1969.

Varieties	Pounds/30 foot row I	II	III	IV	Total	Average	Ave. Cwt/ A. 435.6	Average lbs/hill	Ave. hills per rep.
245-2	49	56	45	42	192	48.0	209.1	3.6	13.50
Norgold	63	74	79	58	274	68.5	298.4	3.4	20.00
35939-5	35	45	64	54	198	49.5	215.6	3.0	16.25
261	28	15	42	36	121	30.0	130.7	3.0	10.25
Lenape	14	22	27	22	85	21.0	91.5	3.7	5.75
273-2	23	26	55	60	164	41.0	178.6	4.0	10.25
Gem	72	71	70	69	282	70.5	307.1	3.4	20.75
5908-1	32	43	52	41	168	42.0	183.0	2.8	14.75
Norland	72	50	56	41	219	55.0	239.6	3.3	16.50
M6614-15	56	72	59	66	253	63.0	274.4	3.0	21.25
93.55-16	54	56	50	63	223	56.0	243.9	2.9	19.00
35939-7	18 1/	24	11	19	72	18.0	78.4	4.2 2/	3.25 2/

1/ Calculated missing plot
2/ Average for three replications

Table 2. Potato observation in 1969.

Variety	Vines (notes 8/25)	Tubers 8/29
245-2	large, thrifty	med size, oblong, russet good maturity
Norgold	med size,leaves yellow & curling	large russet with good maturity
35939-5	small vines-glazed leaves	light scab,med size,red, good maturity
261	medium size vines	small russet tubers with excellent maturity
Lenape	medium size vines	scab, lt. russet, only fair maturity
273-2	large healthy vines	large russet, good maturity
Gem	large healthy vines	med. size russet with fair maturity
5908-1	small vines, curled leaves	lt scab on med lt russet, good maturity
Norland	med. vines - glazed rolling leaves	large red with good maturity
M6614-15	large healthy vines	lt scab on small white - poor maturity
93.55-16	med vines-curling leaves	scab, med size white - fair maturity
35939-7	glazed leaves	small red with fair-good maturity
Oromonte	large healthy vines	large white with fair maturity
Cascade	medium healthy vines	large white - poor maturity
M 5978-3	very small vines-rolling leaves	small dark russet - very good maturity
M 6031	med. vines-curling leaves	small dark russet-very good maturity
LaRogue	med-lg vines- " "	scab on large red tubers-poor maturity
M6614-20	small vines-leaves rolling	lt. scab-med. size white - good maturity
M 6617	small vines-leaves curling	lt. scab-med. size white - fair maturity
B-284-24	large healthy plants	med size dark russet - excellent maturity
M 6617-3	med. size - leaves curling	lt. scab-large white-good maturity
B284-25	med. size healthy	large dark russet - very good maturity
Wyred	large dark green plants	large red tubers - fair maturity
B 286-6	medium thrifty vines	variable size, russet - good maturity
B 289-9	med size - large leaf	lt. scab on med size russet-fair maturity
B 288-1	med size thrifty vines	large white-good maturity
Alamo	large thrifty vines	lt. scab on large white - poor maturity
Pehance	med. vines-leaves curling	variable size white - poor maturity
Chiefton	large thrifty vines	scab on lg. red with fair maturity
Viking	med size - glazed leaf	variable size red - fair maturity
M 6191-18	small vine - crinkle leaf	small rough russet - good maturity
M 6641-4	med vines - rolling leaves	variable size white - good maturity
M 6641-4	med vines - rolling leaves	variable size, white - good maturity
Norchip	large healthy vines	variable size dark russet - excellent mat.
M 66117-4	small prostrate vines	small white with good maturity
B 284-1	med. thrifty vines	variable dark russet - excellent maturity
B 284-21	med. thrifty vines	lg. dark russet with excellent maturity
B 289-4	med. vines - rolling leaves	variable size dark russet - excellent mat.
b 289-5	med.thrifty vines	variable size, dark russet - excellent mat.
B 289-7	med.thirfty vines	variable size, lt. russet - fair maturity

Table 2. (con't)

Variety	Vines (notes 8/25)	Tubers 9/3
Platte	large thrifty vines	lt. scab on lg. white - good maturity
LaChipper	med. leaves curling	scab on lg. white - poor maturity
Stalley	large thrifty vines	scab on lg. white - fair maturity
Penobscot	med. size-leaves curling	variable size, some scab - fair maturity
Boz 2	large healthy vines	large russet - good maturity
Boz 4	large healthy vines	variable size, russet - good maturity
B 289-7	med prostrate vines	variable size, russet - good maturity
M 76665-7	med thrifty vines	scab on variable size, red - good maturity
M 6614-15	med size, squat vine	large smooth tuber - fair maturity
M 6665-3	large thrifty vine	variable size, red - good maturity
M 6665-10	med size-curled leaf	variable size, white - good maturity
M 6614-14	large thrifty vine	large smooth white - good maturity
P.R. 288-11	large healthy vine	scab on variable size tubers - fair mat.
W.C. 230-14	med. healthy vine	lg. smooth russet - good maturity
Boz 16	lg. healthy vine	lg. russet - good maturity
P. R. 288-5	lg. healthy vine	lg. rought, white - fair maturity
B 288-6	med. squat vine	lg. russet, very good maturity - smooth

FARM FLOCK REPORT FOR 1969

As of January 1, 1969 the Columbia farm flock at the Northwestern Montana Branch Station was composed of 38 Registered ewes over one year, ten ewes not registered and 15 ewe lambs. In addition to this 63, there were 81 ewe lambs in feed pens utelizing forages in a comparison study. Three rams were on hand and two ram lambs.

Fifty-eight lambs were raised in 1969 of which 12 were kept for replacements.

Sales of all sheep and lambs in 1969 totaled 158 head for $3773.73 or an average of near $24.00. Wool and wool payments brought in $546.15. Purchases of lambs for feeding cost $1680.00, so net cash receipts amounted to $2639.88.

The sheep inventory for January 1, 1970 is made up of 47 Registered Columbia ewes, 12 ewe lamb replacements, 2 rams and 81 whiteface ewe lambs for resale as yearlings. Twenty-three Registered ewes and 6 ewe lambs have at least a three generation history of multiple births on the Dams side of the pedigree.

As reported in the 1968 report Sainfoin was fully equal to alfalfa as feed for ewe lambs whether fed as green-chop or as dry hay. Comparisons begun in the fall of 1969 will not be completed until spring of 1970. However, weights taken after 76 days indicate an average daily gain of .10 pounds per day on alfalfa, .16 pounds per day on clover-grass hay and .32 pounds per day on sainfoin. Feed consumed per head per day was 2.92 pounds alfalfa, 3.1 pounds clover and 3.15 pounds of sainfoin.

Plans for 1970 include an attempt to give multiple birth lambs a better start by use of cold milk fed free choice, continuation of the forage evaluation work, and consideration of a transfer of "multiple birth" ewes to Bozeman where they can become a breeding line in the Animal Science Department breed improvement program.

PART II

1969

Annual Research Report

Northwestern Montana Branch

of the

Montana Agricultural Experiment Station

Kalispell, Montana

by

Vern R. Stewart

Associate Agronomist

TITLE: Chemical control of weeds in sugar beets

PROJECT: Weed Investigation MS 754

YEAR: 1969

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.

MATERIALS AND METHODS:

Ten herbicides alone and in combination at various rates were used in this study. These rates are shown in table 1. Plots were 11 feet by 35 feet, replicated three times. Herbicides applied pre plant were incorporated with a tandem disk and the plot was harrowed twice to make a firm seed bed for sugar beets. All the herbicides were applied with a small research type sprayer at a rate of 44.5 gallons of water per acre.

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 hand weeded check plot and the weedy check. The beets in the weedy check were thinned, but no weeds were removed. Beet rows were spaced 22 inches apart. Yield data and sugar percentages were obtained. Sugar analysis were made by Great Western Sugar Company.

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

The predominate weed species occurring naturally in this study were: pigweed (*Amaranthus retroflexus* L.); lambsquarter (*Chenopodium album* L.); black nightshade (*Solanum nigrum* L.). The other weed species found were pennycress (*Thlaspi arvense* L) and tumble mustard (*Sisymbrium altissimum* L.). A few grasses were noted but were not a factor in the study. No grasses were found in the check plots.

Materials and Methods (con't)

Following application of the herbicides (preplant incorporate), moisture conditions were excellent. When sugar beets were in the 2 to 4 leaf (true) stage, 1.98 inches of rain fell. Post emergence application herbicides were made two days later when moisture was at field capacity.

The 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. Three checks were included in the study to obtain the percentage of stand for beets and percent weed control.

RESULTS and DISCUSSION:

The combination of cycloate and R 11913, 2 lbs/a of each did not control weeds in this study. The reason for this was because the physical tank mix of R 11913 and cycloate were not compatiable. This combination caused the mix to "clabber" and plug up the spray equipment. Thus, the data from these plots should be disregarded.

Severe reduction in growth of the beet plants was noted in several treatments. This was particularly true of the cycloate plus Amchem 223A (223A is a combination of pyrazon and dalapon plus a surfactant) combination. All rates of this combination had an injury factor of 5 or more on a 0-10 scale, where 0 is no injury and 10 is all plants killed. This was also true of the cycloate-betanal combination and the cycloate-BASF 2430 combination. In this foregoing group the cycloate was applied preplant and incorporated and the other portion of the combination, post emergence. The post emergence applications of betanal, BASF 2430 and Amchem 223A caused severe reduction in growth of the sugar beet plant.

The reduction in growth (plant vigor) did not significantly affect yields of beets at harvest time, when the comparison is made with the hand weeded check.

Stand reduction of beets of 25% occurred in the preplant application of R 11913, 3 lbs/a. Some stand loss was noted at the 2 lbs/a rate of R 11913 (13%). Stand reductions of 10% or more occurred in post emergence applications of betanal, 2 lbs/a; Amchem 223A, 10 and 12 lbs/a. Table 6.

In table 1, are seen data for evaluation of herbicides by specific weed species.

Those treatments giving 80% or better control of nightshade were as follows:

Cycloate	3 lbs/a	Preplant incorporated[1]
"	4 "	" "
CP 52223	2 "	" "
Pyrazon	5 "	" "
Cycloate + TD 283	3 + 2 lbs/a	" "
" + diallate	3 + 1 "	" "
Cycloate[1] + Amchem 223A[2]	all rates	
Cycloate[1] + betanal[2]	3 + 1.5 lbs/a	
" "	3 + 2 "	
Betanal	1.5 "	Post emergence[2]
"	2.0 "	" "
BASF 2430	4 "	" "

Results and Discussion (con't)

Amchem 223a, R 11913, CP 53619 were not effective in the control of nightshade, nor was the combination of CP 53619 + CP 52223.

The preplant incorporate cycloate plus the post emergence application of Amchem 223A provide good control of lambsquarter. R 11913 at all rates gave excellent control whereas cycloate gave only fair control. The combination of R 11913 and cycloate did not give effective control, but this is due to the difficulty in the mixing of the two products in the spray tank. CP 52223 at 1.5 lbs/a gave no control of lambsquarter and only fair control at 2 lbs/a. The preplant incorporated pyrazon at 4 and 5 lbs/a provided fair control of lambsquarter. Good control of this species was secured with preplant incorporated cycloate plus TD 283, which also gave the best overall weed control in the study. Betanal and Amchem 223A, post emergence, were very weak in the control of lambsquarter. Table 1.

Herbicides that effectively controlled pigweed (80%) in this study are listed below with the rate.

(a)	R11913	1 lb/a	Preplant incorporated[1]
(b)	"	2 "	" "
(c)	"	3 "	" "
(d)	Pyrazon	4 "	" "
(e)	"	5 "	" "
(f)	" + ramrod	3 + 2 lbs/a	" "
(g)	cycloate + TD 283	3 + 2 "	" "
(h)	cycloate[1] + Amchem 223A[2]	all rates of this combination	
(i)	cycloate[1] + betanal[2]	" " " "	"
(j)	cycloate[1] + BSAF 2430[2]	" " " "	"
(k)	betanal	2 lbs/a	Post emergence[2]
(l)	Amchem 223A	10 "	" "
(m)	"	15 "	" "
(n)	BASF 2430	4 "	" "

A summary of overall weed control of all species grouped is found in table 6. Following is a listing of treatments set down by method of application which provided 80% or more overall weed control.

Preplant incorporated

Cycloate	3 lbs/a
"	4 "
R 11913	3 "
CP 52223	2 "
Pyrazon	5 "
Cycloate + TD 283	3 + 2 lbs/a (best overall weed control 95%)
Cycloate + diallate	3 + 1 "

Results and Discussion (con't)

Preplant incorporate[1] + Post emergence[2]

Cycloate[1] + Amchem 223A[2]	(all rates of this combination, Table 6)	
Cycloate[1] + betanal[2]	3 + 1.5	lbs/a
Cycloate[1] + betanal[2]	3 + 2	"
Cycloate[1] + BASF 2430[2]	3 + 4	"

Post emergence

Betanal	1.5	lbs/a
Betanal	2	"
Amchem 223A	15	"
BASF 2430	4	"

Statistically significant differences were found in the yield of sugar beets in this study. These differences are in relationship to the weedy check where the yield was 17.0 tons per acre. The mean for the study was 24.0 tons per acre. A reduction in yield (compared to the hand weeded check) was noted where the combination of cycloate, 3 lbs/a and TD 283, 2 lbs/a were used resulting in a yield of 20.6 tons/a. About the same reduction was seen in the post emergence treatment of BASF 2430, 4 lbs/a (20.8 T/A) Tables 3 and 6.

Sucrose content of sugar beets in the study were found to be statistically non-significant and the data seen in table 4 leaves no question. The mean was 17.0%.

The analysis of sugar production indicate no significant difference, however there is a considerable numerical difference in the weedy check compared to the other treatments, table 5 and 6. Mean for gross sugar per acre is 8150 lbs/a.

HERBICIDES USED IN SUGAR BEET STUDY

Common Name	Trade Name or Other	Chemical Name	Company
cycloate	Roneet	S-ethyl N-ethylthio-cyclohexanecarbarmate	Stauffer
	R 11913	no chemistry available	Stauffer
	CP 52223	2-chloro-N-(isobutoxymethyl)2',6'acetoxylidide	Monsanto
	CP 53619	2-chloro-2',6'-diethyl-N-(butoxymethyl) acetanilide	Monsanto
pyrazon	Pyramin	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone	BASF
	Ramrod	2-chloro-N-isopropylacet anilide	Monsanto
diallate	Avadex	S-(2,3-dichloroallyl) diisopropylthio-carbamate	Monsonto
dalapon	Dowpon	2,2 dichloropropionic acid	Dow
phenmedipham			
	Betanal	methyl m-hydroxycarbanilate methyl carbanilate	Schering
	BASF 2430	1-phenyl-4-amino-5-bromo-pyridazone	BASF

NOTE: In the tables that follow cycloate is misspelled, also the firm BASF is incorrectly written BSAF. My apologies.

Table 1. Data from sugar beet herbicide study conducted on the Homer Bailey farm, Corvallis, Montana in 1969.

Treatment	Rate/A in lbs	Plot No.	Plant Counts[1/] Sugar Beets	Night-shade	Lambs-quarter	Pig-weed	Other	Grasses
Cycolate[a]	3	101	142	8	0	2	0	0
		221	131	2	5	0	0	0
		317	124	5	0	3	0	0
	Total		397	15	5	5	0	0
	$\bar{x}$		16.54	.63	.21	.21	.00	.00
Cycolate[a]	4	102	134	8	4	3	1	0
		202	126	7	5	1	0	0
		315	110	7	1	0	0	0
	Total		370	22	10	4	1	0
	$\bar{x}$		15.42	.92	.42	.17	.04	.00
R 11913[a]	1	103	132	55	0	0	0	0
		233	121	39	0	2	2	0
		326	110	62	0	0	0	0
	Total		363	156	0	2	2	0
	$\bar{x}$		15.13	6.50	.00	.08	.08	.00
R 11913[a]	2	104	89	22	0	0	0	1
		208	94	11	3	0	2	1
		331	99	8	0	1	0	0
	Total		282	41	3	1	2	2
	$\bar{x}$		11.75	1.71	.13	.04	.08	.08
R 11913[a]	3	105	90	1	0	1	0	0
		207	78	8	1	0	0	0
		336	74	25	1	1	1	0
	Total		242	34	2	2	1	0
	$\bar{x}$		10.08	1.42	.08	.08	.04	.00
CP 52223[a]	1	106	127	8	13	5	0	1
		220	102	11	5	0	1	0
		301	114	14	7	0	1	3
	Total		343	33	25	5	2	4
	$\bar{x}$		14.29	1.38	1.04	.21	.08	.17
CP 52223[a]	2	107	98	4	2	3	1	0
		215	93	10	3	0	1	0
		305	110	4	0	0	0	0
	Total		301	18	5	3	2	0
	$\bar{x}$		12.54	.75	.21	.13	.08	.00
CP 53619[a]	1.75	108	112	10	7	6	0	0
		203	117	35	4	2	0	3
		313	112	46	1	2	1	3
	Total		341	91	12	10	1	6
	$\bar{x}$		14.21	3.79	.50	.42	.04	.25

Table 1. (con't)

Treatment	Rate/A in lbs	Plot No.	Plant Count[1/] Sugar Beets	Night-shade	Lambs-quarter	Pig-weed	Other	Grasses
CP 53619[a]	4	109	105	7	3	3	1	3
		231	103	4	2	0	1	0
		325	117	28	0	1	0	0
	Total		325	39	5	4	2	3
	$\bar{x}$		13.54	1.63	.21	.17	.08	.13
Pyrazon[a]	4	110	114	34	1	1	0	0
		201	122	16	3	0	3	3
		310	110	14	0	0	0	0
	Total		346	64	4	1	3	3
	$\bar{x}$		14.42	2.67	.17	.04	.13	.13
Pyrazon[a]	5	111	102	4	1	0	0	3
		229	104	0	2	0	1	0
		314	123	18	0	0	0	0
	Total		329	22	3	0	1	3
	$\bar{x}$		13.71	.92	.13	.00	.04	.13
Pyrazon + Ramrod[a]	3 +	112	101	8	0	1	5	0
	2	235	105	4	6	0	1	0
		311	99	25	0	1	1	0
	Total		305	37	6	2	7	0
	$\bar{x}$		12.71	1.54	.25	.08	.29	.00
Cycolate + TD 283[a]	3 +	113	107	1	1	0	0	0
	2	236	112	4	2	1	2	0
		306	127	0	0	0	0	0
	Total		346	5	3	1	2	0
	$\bar{x}$		14.42	.21	.13	.04	.08	.00
CP 52223 + CP 53619[a]	½ +	114	101	11	9	9	0	1
	1	212	101	13	4	1	1	0
		334	122	17	0	0	0	0
	Total		324	41	13	10	1	1
	$\bar{x}$		13.50	1.71	.54	.42	.04	.04
Cycolate + CP 52223[a]	2 +	115	109	5	3	1	0	0
	2	205	114	18	2	2	1	0
		309	127	16	0	4	0	0
	Total		350	39	5	7	1	0
	$\bar{x}$		14.58	1.63	.21	.29	.04	.00
Cycolate + Diallate[a]	3 +	116	118	2	6	3	1	0
	1	210	110	2	5	0	1	0
		307	117	12	0	0	1	0
	Total		345	16	11	3	3	0
	$\bar{x}$		14.38	.67	.46	.13	.13	.00

Table 1. (con't)

Treatment	Rate/A in lbs	Plot No.	Plant Count[1/] Sugar Beets	Night-shade	Lambs-quarter	Pig-weed	Other	Grasses
Cycolate + R 11913[a]	3 + 1	117	115	6	3	1	1	1
		206	111	0	1	0	0	0
		330	106	6	0	0	0	0
	Total		332	12	4	1	1	1
	$\bar{x}$		13.83	.50	.17	.04	.04	.04
Cycolate + R 11913[a]	2 + 2	118	110	44	20	12	1	0
		214	108	56	3	2	1	3
		304	101	121	1	3	1	0
	Total		319	221	24	17	3	3
	$\bar{x}$		13.29	9.21	1.00	.71	.13	.13
Cycolate + R 11913[a]	2 + 1	119	113	8	3	0	0	1
		216	83	0	7	3	0	0
		319	81	26	0	0	2	1
	Total		277	34	10	3	2	2
	$\bar{x}$		11.54	1.42	.42	.13	.08	.08
Cycolate[a]+ Amchem 223A[2/b]	3 + 10	120	119	1	1	1	0	0
		237	118	2	2	0	0	0
		328	104	0	0	0	0	0
	Total		341	3	3	1	0	0
	$\bar{x}$		14.21	.13	.13	.04	.00	.00
Cycolate[a]+ Amchem 223A[3/b]	3 + 12	121	114	1	0	0	0	0
		230	96	0	0	0	6	0
		303	108	0	0	0	0	0
	Total		318	1	0	0	6	0
	$\bar{x}$		13.25	.04	.00	.00	.25	.00
Cycolate[a]+ Amchem 223A[4/b]	3 + 15	122	92	0	0	0	3	0
		213	91	0	2	0	2	0
		308	120	0	0	0	0	0
	Total		303	0	2	0	5	0
	$\bar{x}$		12.63	.00	.08	.00	.21	.00
Cycolate[a]+ Amchem 223A[2/b]	4 + 10	123	89	0	0	0	1	0
		222	100	0	5	0	1	0
		320	113	0	0	0	0	0
	Total		302	0	5	0	2	0
	$\bar{x}$		12.58	.00	.21	.00	.08	.00
Cycolate[a]+ Amchem 223A[3/b]	4 + 12	124	111	0	3	0	0	0
		232	101	0	2	0	0	0
		321	129	0	0	0	0	0
	Total		341	0	5	0	0	0
	$\bar{x}$		14.21	.00	.21	.00	.00	.00

Table 1. (con't)

Treatment	Rate/A in lbs	Plot No.	Plant Count[1/] Sugar Beets	Night-shade	Lambs-quarter	Pig-weed	Other	Grasses
Cycolate[a]+ Amchem 223A[4/b]	4 + 15	125	117	0	1	0	1	0
		204	102	0	3	0	2	0
		322	122	0	0	0	0	1
	Total		341	0	4	0	3	1
	$\bar{x}$		14.21	.00	.17	.00	.13	.04
Cycolate[a]+ betanal[b]	3 + 1.5	126	114	0	1	0	1	0
		227	112	1	1	1	2	0
		318	119	1	0	0	0	0
	Total		345	2	2	1	3	0
	$\bar{x}$		14.38	.08	.08	.04	.13	.00
Cycolate[a]+ betanal[b]	3 + 2	127	88	0	0	1	3	0
		211	98	0	4	1	1	0
		337	118	3	0	0	1	0
	Total		304	3	4	2	5	0
	$\bar{x}$		12.67	.13	.17	.08	.21	.00
Cycolate[a]+ BSAF 2430[b]	3 + 4	128	82	1	1	0	0	0
		218	102	0	5	0	2	0
		323	111	0	0	0	0	1
	Total		295	1	6	0	2	1
	$\bar{x}$		12.29	.04	.25	.00	.08	.04
Betanal[b]	1.5	129	103	0	1	7	0	0
		223	93	0	8	0	1	1
		316	131	1	0	6	0	0
	Total		327	1	9	13	1	1
	$\bar{x}$		13.63	.04	.38	.54	.04	.04
Betanal[b]	2	130	90	0	5	1	1	0
		228	85	0	9	0	0	0
		335	95	0	4	0	0	0
	Total		270	0	18	1	1	0
	$\bar{x}$		11.25	.00	.75	.04	.04	.00
Amchem 223A[2/b]	10	131	69	11	0	0	0	0
		224	91	2	9	0	1	0
		333	114	60	0	0	0	0
	Total		274	73	9	0	1	0
	$\bar{x}$		11.42	3.04	.38	.00	.04	.00
Amchem 223A[3/b]	12	132	80	14	4	4	0	0
		226	88	9	7	0	0	0
		324	106	33	0	5	0	0
	Total		274	56	11	9	0	0
	$\bar{x}$		11.42	2.33	.46	.38	.00	.00

Table 1 . (con't)

Treatment	Rate/A in lbs	Plot No.	Plant Count 1/ Sugar Beets	Night-shade	Lambs-quarter	Pig-weed	Other	Grasses
Amchem 223A 4/b	15	133	74	11	1	1	0	0
		217	110	8	6	0	1	0
		332	119	17	0	0	0	0
	Total		303	36	7	1	1	0
	$\bar{x}$		12.63	1.50	.29	.04	.04	.00
BASF 2430b	4	134	73	13	0	0	5	0
		209	118	0	5	0	0	0
		327	107	1	0	0	0	0
	Total		298	14	5	0	5	0
	$\bar{x}$		12.41	.58	.21	.00	.21	.00
Check		135	110	14	24	6	3	0
		219	106	55	0	1	0	0
		329	106	137	0	7	2	0
	Total		322	206	24	14	5	0
	$\bar{x}$		13.42	8.58	1.00	.58	.21	.00
Handweeded Check		136	112	28	21	8	2	0
		234	98	54	0	1	3	0
		312	117	65	0	2	0	0
	Total		327	147	21	11	5	0
	$\bar{x}$		13.63	6.13	.88	.46	.21	.00
Weedy Check		137	113	38	39	5	0	0
		225	109	43	3	0	3	0
		302	101	82	0	6	5	0
	Total		323	163	42	11	8	0
	$\bar{x}$		13.46	6.79	1.75	.46	.33	.00

1/ Eight counts made per plot with a quadrant 3" x 48", totaled, $\bar{x}$ calculated by dividing by 24.
2/ Amchem 65-223A - 10/a = 3.3 pyrazon, 2.1 dalapon, 1.7 surfactant
3/ Amchem 65-223A - 12/a = 4.0 pyrazon, 2.5 dalapon, 2.0 surfactant
4/ Amchem 65-223A - 15/a = 5.0 pyrazon, 3.1 dalapon, 2.5 surfactant

Analysis of variance 1/
Sugar Beets

Source	D.F.	M.S.	F.
Replication	2	9.74622	4.71*
Treatment	36	5.13293	2.48**
Error	72	2.0713	
Total	110		

1/ Analysis calculated on mean of each individual plot.

a/ Preplant incorporated; b/ Post emergence

Table 2. Number of sugar beets from forty liner feet of beet row at harvest time in 1969.

Treatment		Number of beets, 40 liner feet					# Beets/
Herbicide	Rate in #'s	I	II	III	Total	x	100' of row
Cycolate	3	41	50	47	138	46	115
Cycolate	4	53	54	45	152	51	128
R 11913	1	33	31	30	94	31	78
R 11913	2	34	43	42	119	40	100
R 11913	3	33	38	30	101	34	85
CP 52223	1	54	43	50	147	49	123
CP 52223	2	47	26	49	122	41	103
CP 53619	1.75	36	34	39	109	36	90
CP 53619	4	38	60	34	132	33	83
Pyrazon	4	53	50	53	156	52	130
Pyrazon	5	53	51	42	146	39	98
Pyrazon + ramrod	3 + 2	47	48	46	141	47	118
Cycolate + TD 283	3 + 2	33	50	54	137	46	115
CP 52223 + CP 53619	½ + 1	38	43	41	122	41	103
Cycolate + CP 52223	2 + 2	36	47	53	136	45	113
Cycolate + diallate	3 + 1	31	46	47	124	41	103
Cycolate + R 11913	3 + 1	39	42	47	128	43	108
Cycolate + R 11913	2 + 2	42	39	39	120	40	100
Cycolate + R 11913	2 + 1	48	32	33	113	38	95
Cycolate + Amchem 223A	3 + 10	47	48	72	167	56	140
Cycolate + Amchem 223A	3 + 12	52	45	70	167	56	140
Cycolate + Amchem 223A	3 + 15	66	40	57	163	54	135
Cycolate + Amchem 223A	4 + 10	51	65	47	163	54	135
Cycolate + Amchem 223A	4 + 12	43	37	50	130	43	108
Cycolate + Amchem 223A	4 + 15	48	52	51	151	50	125
Cycolate + betanal	3 + 1.5	49	56	52	157	52	130
Cycolate + betanal	3 + 2	50	59	47	156	52	130
Cycolate + BSAF 2430	3 + 4	51	46	45	142	47	118
Betanal	1.5	49	48	45	142	47	118
Betanal	2	40	67	37	144	48	120
Amchem 223A	10	42	52	43	137	46	115
Amchem 223A	12	36	43	47	126	42	105
Amchem 223A	15	42	35	37	114	38	95
BSAF 2430	4	31	58	44	133	44	110
Check		36	47	46	129	43	108
Handweeded Check		44	34	55	133	44	110
Weedy Check		47	53	55	155	52	130

Analysis of Variance

Sourece	D.F.	M.S.	F.
Replications	2	97.05405	1.56
Treatment	36	110.56206	1.77*
Error	72	62.43368	
Total	110		

Table 3. Yield of sugar beets treated with various herbicides. Grown on the Homer Bailey farm, Corvallis, Montana in 1969.

Treatment		Tons/Acre				
Herbicide	Rate in #'s	I	II	III	Total	$\bar{x}$
Cycolate	3	17.7	25.2	27.3	70.2	23.4
"	4	21.3	26.4	27.3	75.0	25.0
R 11913	1	18.4	17.7	28.4	64.5	21.5
"	2	21.7	29.3	24.7	75.7	25.2
"	3	22.1	24.7	22.5	69.3	23.1
CP 52223	1	27.6	24.0	25.1	76.7	25.6
"	2	26.6	17.2	24.4	68.2	22.7
CP 53619	1.75	21.1	21.0	26.8	68.9	23.0
"	4	22.4	30.6	25.7	78.7	26.2
Pyrazon	4	24.7	23.3	29.3	77.3	25.8
"	5	26.2	26.0	26.2	78.4	26.1
Pyrazon + Ramrod	3 + 2	20.7	18.2	30.1	69.0	23.0
Cycolate + TD 283	3 + 2	14.1	25.2	22.4	61.7	20.6
CP 52223 + CP 53619	½ + 1	15.9	24.7	26.8	67.4	22.5
Cycolate + CP 52223	2 + 2	19.2	26.2	29.2	74.6	24.9
Cycolate + diallate	3 + 1	20.1	25.1	24.7	69.9	23.3
Cycolate + R 11913	3 + 1	22.7	25.6	28.7	77.0	25.7
" "	2 + 2	23.7	23.3	23.9	70.9	23.6
" "	2 + 1	27.8	22.1	29.5	79.4	26.5
Cycolate + Amchem 223A	3 + 10	15.9	26.7	30.3	72.9	24.3
" "	3 + 12	24.1	23.1	24.0	71.2	23.7
" "	3 + 15	22.6	26.6	29.2	78.4	26.1
" "	4 + 10	21.6	24.1	24.4	70.1	23.4
" "	4 + 12	24.4	24.2	26.3	74.9	25.0
" "	4 + 15	24.2	24.5	27.3	76.0	25.3
Cycolate + betanal	3 + 1.5	24.3	27.8	27.0	79.1	26.4
" "	3 + 2	21.5	25.1	20.3	66.9	22.3
Cycolate + BSAF 2430	3 + 4	20.0	27.3	22.3	69.6	23.2
Betanal	1.5	24.8	23.1	25.7	73.6	24.5
"	2.0	28.7	25.9	25.6	80.2	26.7
Amchem 223A	10	24.6	27.6	28.5	80.7	26.9
"	12	19.0	27.0	23.8	69.8	23.3
"	15	21.3	21.3	25.8	68.4	22.8
BSAF 2430	4	15.2	26.3	20.9	62.4	20.8
Check	0	20.3	29.1	26.6	76.0	25.3
Handweeded Check	0	26.6	16.6	26.6	69.8	23.3
Weedy Check	0	17.2	19.2	14.6	51.0	17.0

Analysis of Variance

Source	D.F.	M.S.	F.
Replications	2	139.22257	12.58*
Treatment	36	124.54965	11.25*
Error	72	11.06853	
Total	110		

Table 4. Effect of herbicides on the sucrose content of sugar beets. Grown on the Homer Bailey farm, Corvallis, Montana in 1969.

Treatment		% Sucrose				
Herbicide	Rate in #'s	I	II	III	Total	$\bar{x}$
Cycolate	3	16.2	16.5	17.0	49.7	16.6
"	4	16.6	16.4	17.1	50.1	16.7
R-11913	1	16.8	17.2	16.2	50.2	16.7
"	2	16.2	16.3	17.8	50.3	16.8
"	3	16.6	16.3	16.8 1/	49.7	16.6
CP 52223	1	16.3	16.8	17.3	50.4	16.8
"	2	17.5	17.2	17.3	52.0	17.3
CP 53619	1.75	17.4	17.0	17.5	51.9	17.3
"	4	16.9	16.6	16.6	50.1	16.7
Pyrazon	4	17.2	16.7	17.9	51.8	17.3
Pyrazon	5	16.3	14.4	17.0	47.7	15.9
Pyrazon + Ramrod	3 + 2	16.8	17.2	17.4	51.4	17.1
Cycolate + TD 283	3 + 2	16.4	17.2	17.6	51.2	17.1
CP 52223 + CP 53619	½ + 1	17.2	17.9	17.1	52.2	17.4
Cycolate + CP 52223	2 + 2	17.1	17.1	17.9	52.1	17.4
Cycolate + diallate	3 + 1	17.0	17.4	17.5	51.9	17.3
Cycolate + R 11913	3 + 1	17.3	16.8	17.6	51.7	17.2
" "	2 + 2	17.9	16.6	17.4	51.9	17.3
" "	2 + 1	17.6	16.5	17.2	51.3	17.1
Cycolate + Amchem 223A	3 + 10	16.4	17.6	16.9	50.9	17.0
" "	3 + 12	16.7	17.1	17.0	50.8	16.9
" "	3 + 15	17.3	17.1	17.7	52.1	17.4
" "	4 + 10	16.9	16.8	17.1	50.8	16.9
" "	4 + 12	16.3	16.3	16.9	49.5	16.5
Cycolate + Amchem 223A	4 + 15	16.6	15.7	17.3	49.6	16.5
Cycolate + betanal	3 + 1.5	16.7	16.1	16.8	49.6	16.5
" "	3 + 2	17.0	17.2	17.1	51.3	17.1
Cycolate + BSAF 2430	3 + 4	17.3	17.8	16.9	52.0	17.3
Betanal	1.5	17.0	17.3	17.1	51.4	17.1
"	2	17.2	16.9	17.2	51.3	17.1
Amchem 223A	10	16.3	16.5	17.8	50.6	16.9
"	12	17.2	17.2	17.2	51.6	17.2
"	15	16.8	16.9	17.8	51.5	17.2
BSAF 2430	4	16.7	16.1	17.4	50.2	16.7
Check	0	16.6	17.6	17.1	51.3	17.1
Handweeded Check	0	17.2	17.5	17.0	51.7	17.2
Weedy Check	0	16.6	17.2	15.8	49.6	16.5

1/ Calculated missing plot

Analysis of Variance

Source	D.F.	M.S.	F.
Replication	2	1.467675	6.33**
Treatment	36	.34499	1.48 N.S.
Error	71	.23180	
Total	109		

Table 5. Effect of herbicides on the gross sugar production. Conducted on the Homer Bailey farm, Corvallis, Montana in 1969.

Size of Plot: 73.3 square feet

Treatment		Pounds suar per acre				
Herbicide	Rate in #'s	I	II	III	Total	x
Cycolate	3	5735	8316	9282	23,333	7778
"	4	7072	8659	9337	25,068	8356
R 11913	1	6182	6089	9202	21,473	7158
"	2	7031	9552	8793	25,376	8459
"	3	7337	8052	7560	22,949	7650
CP 52223	1	8998	8064	8685	25,747	8582
"	2	9310	5917	8442	23,669	7890
CP 53619	1.75	7343	7140	9380	23,863	7954
"	4	7571	10159	8532	26,262	8754
Pyrazon	4	8497	7782	10489	26,768	8923
"	5	8541	7488	8908	24,937	8312
Pyrazon + ramrod	3 + 2	6955	6261	10475	23,691	7897
Cycolate + TD 283	3 + 2	4625	8669	7885	21,179	7060
CP 52223 + CP 53619	½ + 1	5470	8843	9166	23,479	7826
Cycolate + CP 52223	2 + 2	6566	8960	10454	25,980	8660
Cycolate + diallate	3 + 1	6834	8735	8645	24,214	8071
Cycolate + R 11913	3 + 1	7854	8602	10102	26,558	8853
" "	2 + 2	8485	7736	8317	24,538	8179
" "	2 + 1	9786	7293	10148	27,227	9076
Cycolate + Amchem 223A	3 + 10	5215	9398	10241	24,854	8285
" "	3 + 12	8049	7900	8160	24,109	8036
" "	3 + 15	7820	9097	10337	27,254	9085
" "	4 + 10	7301	8098	8345	23,744	7915
" "	4 + 12	7954	7889	8889	24,732	8244
" "	4 + 15	8034	7693	9446	25,173	8391
Cycolate + betanal	3 + 1.5	8116	8952	9072	26,140	8713
Cycolate + betanal	3 + 2	7310	8634	6943	22,887	7629
Cycolate + BSAF 2430	3 + 4	6920	9719	7537	24,176	8059
Betanal	1.5	8432	7994	8789	25,215	8405
"	2	9873	8754	8806	27,433	9144
Amchem 223A	10	8020	9108	10146	27,274	9091
"	12	6536	9288	8187	24,011	8004
"	15	7157	7199	9185	23,541	7847
BSAF 2430	4	5077	8469	7273	20,819	6940
Check		6740	10243	9097	26,080	8693
Handweeded Check		9150	5810	9044	24,004	8001
Weedy Check		5710	6605	4614	16,929	5643

Analysis of Variance

Source	D.F.	M.S.	F.
Replications	2	19,979,583	14.16*
Treatment	36	1,459,358	1.03
Error	72	1,410,658	
Total	110		

Table 6. Summary of weed control and yield data from sugar beet study conducted on the Homer Bailey farm, Corvallis, Montana in 1969.

Treatment Herbicide	Rate #/A	%1/ Beet Stand	%1/ Weed Control	Crop Injury 0-10	# Beet2/ per 100' of row	Yield Ton/A	% Sucrose	Gross Sugar #/A
Cycloate[a]	3	122.5	88.6	1.3	115	23.4	16.6	7778
"	4	114.2	83.1	2.3	128	25.0	16.7	8356
R 11913[a]	1	112.1	27.5	1.3	78	21.5	16.7	7158
"	2	87.0	77.8	2.0	100	25.2	16.8	8459
"	3	74.7	82.4	3.0	85	23.1	16.6	7650
CP 52223[a]	1	105.9	68.7	1.3	123	25.6	16.8	8582
"	2	92.9	87.3	2.7	103	22.7	17.3	7890
CP 53619[a]	1.75	105.3	45.6	2.3	90	23.0	17.3	7954
"	4	100.3	75.8	2.7	83	26.2	16.7	8754
Pyrazon[a]	4	106.8	65.8	.3	130	25.8	17.3	8923
"	5	101.6	86.7	.7	98	26.1	15.9	8312
" + ramrod[a]	3+2	94.1	76.5	1.3	118	23.0	17.1	7897
Cycloate+TD 283[a]	3+2	106.8	95.0	1.3	115	20.6	17.1	7060
CP52223+CP53619[a]	½+1	100.0	70.1	3.0	103	22.5	17.4	7826
Cycloate+CP52223[a]	2+2	108.0	76.4	.7	113	24.9	17.4	8660
" +diallate[a]	3+1	106.5	84.9	.3	103	23.3	17.3	8071
" +R 11913[a]	3+1	102.4	91.4	.7	108	25.7	17.2	8853
" "	2+2	98.4	00.0	.7	100	23.6	17.3	8179
" "	2+1	85.5	76.8	.7	95	26.5	17.1	9076
" [a]+Amchem223A[b]	3+10	105.3	96.7	5.3	140	24.3	17.0	8285
" "	3+12	98.1	96.8	6.7	140	23.7	16.9	8036
" "	3+15	93.6	96.8	7.7	135	26.1	17.4	9085
" "	3+10	93.2	96.8	7.3	135	23.4	16.9	7915
" "	4+12	105.3	97.7	6.0	108	25.0	16.5	8244
" "	4+15	105.3	96.3	6.3	125	25.3	16.5	8391
" +betanal[b]	3+1.5	106.5	96.4	5.7	130	26.4	16.5	8713
" "	3+2	93.9	93.6	7.3	130	22.3	17.1	7629
" +BASF2430[b]	3+4	91.0	95.5	7.0	118	23.2	17.3	8059
Betanal[b]	1.5	101.0	88.7	5.7	118	24.5	17.1	8405
"	2	83.3	91.0	5.7	120	26.7	17.1	9144
Amchem 223A[b]	10	84.6	62.4	5.0	115	26.9	16.9	9091
"	12	84.6	65.5	6.0	105	23.3	17.2	8004
"	15	93.6	79.7	7.7	95	22.8	17.2	7847
BASF 2430[b]	4	91.9	89.1	6.0	110	20.8	16.7	6940
Check		100.0	0.0	0.0	108	25.3	17.1	8693
Handweeded Check		100.0	0.0	0.0	110	23.3	17.2	8001
Weedy Check		100.0	0.0	.7	130	17.0	16.5	5643
$\bar{x}$					114.0	24.0	17.0	8150
F - Value					1.77*	11.25**	1.48	1.03
S.E.$\bar{x}$					11.4	1.9208	.278	685.7
L.S.D. (.05)					31.3	5.4	N.S.	N.S.
C.V.%					10.0	8.0	1.63	8.41

1/ Note: Parent beet stand and % weed control based on the average of three checks.

a/ Preplant incorporated
b/ Post emergence

TITLE: Chemical Weed Control in New Seedings of Legumes

PROJECT: Weed Investigations MS 754

YEAR: 1969

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:

1. 1968 Seeding - Higher yields of legume were harvested from herbicide treated plots than from the clipping or companion crop treatments. Vetch was not a high yielding crop the second year and was quite weedy.

2. 1969 Seeding - Sainfoin yields in the herbicide plots were higher than alfalfa. Some injury to alfalfa with bromoxynil.

FUTURE PLANS:

This is the second 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:

1. A discription of the 1968 seeding and treatments are found in the 1968 annual report of the Northwestern Montana Branch Station, page 79 and 80. Yields were obtained from this study in 1969. The plot size harvested was five by ten feet. A 1000 gram sample was weighed out and dried in a forage dryer. From this information yields of dry matter per plot were calculated.

2. Four herbicides were used in the 1969 program. Two checks were included in the study, which were, clipping and a companion crop. The grain yields will be part of the total income for economic measurement for the period of the experiment.

EPTC and benefin were applied pre plant incorporate, Velsicol 438 was applied post seeding and bromoxynil post emergence when the weeds were in the 2 to 3 leave stage. The plot size for the herbicide was 10' x 20', the plot size for legume was 10' x 5'. All herbicides were applied in 44.5 gallons of water per acre. Those herbicides applied preplant and incorporated were incorporated with a double disk prior to seeding. Following this operation the soil was harrowed smooth to prepare for the seed bed.

MATERIALS AND METHODS: (con't)

The experimental design was a randomized block. The legumes used were: Vernal alfalfa; Eski sainfoin and Altasweede mammoth red clover. Treatment effects were evaluated in several ways. Plant injury was visually estimated using a scale of 0-10. Population counts of weeds were made in an area 3" x 48" in eight locations within an individual plot. The legume stand was measured using an occupancy quadrant which was 3' x 2", with 2" sections in the quadrant. Weed species were recorded for the major number. Forage yields were obtained in this experiment based on the total amount of forage. Seperation of weeds and forage was made to determine the forage percentage. A representative sample was taken from each plot to make this determination. This figure was multiplied by the total amount of dry matter produced to determine the actual amount of legume produced.

Weed population in these studies were natural in origin, that is, they were not seeded. The broadleaved species were: Shepherdspurse (Capsella bursa-pastoris (L.) Medic); fanweed (Thlaspi arvense (L.); lambsquarter (Chenopodium album (L.); night-flowering catchfly (Silene noctiflora (L.); field chickweed (Cerastium arvense (L.); redroot pigweed (Amaranthus retroflexus (L.); prostrate pigweed (Amaranthus graecizans (L.); other broadleaves and miscellanous grasses. The data was analyzed using the analysis of variance technique and significant differences were measured using Duncan's Multiple Range Test.

Chemicals used were:

Common Name	Trade Name or Other	Chemical Name	Company
EPTC	Eptam	ethyl N,N-dipropylthiolcarbamate	Stauffer
Bromoxynil	Brominal	3,5-dibromo-4-hydroxybenzonitrile	Amchem
	Buctril		Chipman
Benefin	Balan	N-butyl-N-ethyl-alpha,alpha,alpha-trifluoro-2,6-dinitro-p-toluidine	Elanco
	VCS-438	chemistry not available	Velsicol

RESULTS AND DISCUSSIONS:

1968 seeding - The four crops included in this study, namely alfalfa, sainfoin, clover and vetch, will be discussed as individual crops. Only 1969 data will be considered, however, a three year summary will be made at the end of the 1970 crop year. All yields are reported on a dry matter basis and have not been corrected to the usual 12% moisture.

Alfalfa: Alfalfa yields were excellent in this study with a mean of 6.1 T/A. The lowest yielding treatment in 1969 was the companion crop treatment with 4.1 T/A. Loss of alfalfa stand due to the 4 lbs/a rate of benefin resulted in a lower yield than the other benefin treatments. The clipping treatment was 1.5 T/A higher in yield than the companion crop check. Yields from plots treated with herbicides were not significantly different one from another except the benefin rate mentioned above. See Table 1 for complete details.

RESULTS AND DISCUSSION: (con't)

Sainfoin: The bromoxynil, chloroxynil and benefin treatments gave significant increases in yield over the clipping check. The companion crop treatment resulted in very low yield of sainfoin hay in 1969. The hand weeded check is just 1.00 T/A higher than clipping treatment. These data again indicate that sainfoin is not a competitive crop and must be weed free at establishment to produce high yields. Yields of sainfoin are 1.2 T/A below that of alfalfa. Table 2.

Vetch: Mean yields of this legume were 2.4T/A. There was considerable weed growth in the vetch plots this season. Thus the yields reported include weeds and legumes. As an example the companion crop treatment is about 60% weeds by weight. It is noted that where the weed score is low the yields are also lower. In terms of weed free treatment the second year, EPTC at 6#/a, R11914 at 6#/a and MCPB at ½ and 1#/a treatments were the most effective. It is the plan to drop this legume from future evaluation in the study. Table 3.

Clover: The clover mean yield (5.5 T/A) is higher than sainfoin 4.9 T/A, but lower than alfalfa 6.1 T/A. Yield differences were found to be non-significant when analyzed statitically. Table 4.

1969 seeding - Using 80% weed control as a criteria of determining effectiveness of a herbicide we can see the results in Tables 5, 6 and 7. EPTC gave effective control of fanweed and grasses, plus some of the miscellaneous grasses. The combination of EPTC plus bromoxynil gave good control of all species, however there are some exceptions at various combinations ie, the 2 # EPTC and 5/16 # bromoxynil were not real effective on shepherdspurse and the 4# EPTC and 5/16# bromoxynil did not give good control of redroot pigweed or shepherdspurse. Benefin was a very effective compound on most weed species except fanweed and shepherdspurse. Velsicol 438 was not an effective herbicide in the overall weed spectrum, but did give good control of fanweed and some miscellaneous species found in the study. Bromoxynil was effective on all broadleaved species except field chickweed, which no doubt emerged following application of the herbicide.

Stands of all legume species were found to be non-significant when analyzed statistically these data are found in Tables 8 and 9. In Table 9 is found the over all weed control for each treatment. The combination of EPTC and bromoxynil, bromoxynil and benefin provided the best all over weed control in the study.

A visual estimate of injury to legume plants was made several days following application of the herbicide. This evaluation was made somewhat on the height of the plant. It was noted that a few days following application there was considerable burning of alfalfa plants which had been sprayed with 3/8 to ½ #/a of bromoxynil. The combination of bromoxynil and EPTC caused slightly more damage than when the compounds were used independently. Sainfoin appared to be the most tolerant to the herbicides used and red clover the most susceptible. See tables 10, 11, and 12 for complete tabulations.

Determination of legume percentage and yield of forages are found in Tables 13, 14, 15 and 16 for alfalfa, sainfoin and red clover respectively.

RESULTS AND DISCUSSION: (con't)

A high percentage of alfalfa was found in plots treated with herbicides except the Velsicol 438 treatments, the clipping check and the 4# rate of EPTC. The other treatments resulted in around 90% legume. Table 13. Alfalfa yields were found to differ significantly when measured statistically. The 3/8 # and ½ # rates of bromoxynil treatment reduced yields, which is due to injury of the alfalfa plant discribed earlier in the manuscript. Table 13. The mean for alfalfa was 3698 lbs/a or 1.85 T/A.

Sainfoin percentage in harvested material was similar to alfalfa. The highest sainfoin percentages were obtained where EPTC and bromoxynil were used in combination. Sainfoin yields are about ½ T/A higher than alfalfa. Highest yields were obtained from the benefin treated plots at 3 #/a. Yields and statistical data are seen in Table14.

Red clover percentage in harvested materials is similar to sainfoin and alfalfa, however the percentage is less than for the two previous species. Yields of red clover were found to be non-significant when analyzed statistically. Table 15.

In Table 16, is a summary of all three species used in the study, for percent legume and yield of legume harvested on a dry matter basis.

Table 1. Effect of certain herbicides on the yield of alfalfa the year following application.

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
Seed w/comp crop	0	1	2.431	6.053	5.024	13.508		
		2	2.467	6.524	5.565	14.556		
		Total	4.898	12.577	10.589	28.064	9.355	4.1
Clipping 3/	0	1	5.710	6.543	7.081	19.334		
		2	5.891	6.557	6.453	18.901		
		Total	11.601	13.100	13.534	38.235	12.745	5.6
EPTC 1/	3	1	7.475	7.142	7.902	22.519		
		2	8.100	5.441	6.656	20.197		
		Total	15.575	12.583	14.558	42.716	14.239	6.2
EPTC 1/	4	1	8.951	7.051	8.722	24.724		
		2	6.634	7.057	6.864	20.555		
		Total	15.585	14.108	15.586	45.279	15.093	6.6*
EPTC 1/	6	1	6.888	7.826	7.300	22.014		
		2	7.839	5.852	5.945	19.636		
		Total	14.727	13.678	13.245	41.650	13.883	6.0
Bromoxynil 2/	$\frac{1}{4}$	1	5.850	7.590	8.117	21.557		
		2	7.739	7.952	7.172	22.863		
		Total	13.589	15.542	15.289	44.420	14.807	6.5
Bromoxynil 2/	5/16	1	6.538	7.681	7.520	21.739		
		2	8.741	5.438	6.974	21.153		
		Total	15.279	13.119	14.494	42.892	14.297	6.2
Bromoxynil 2/	3/8	1	5.665	6.882	7.472	20.019		
		2	6.812	5.243	7.275	19.330		
		Total	12.477	12.125	14.747	39.349	13.116	5.7
Chloroxynil 2/	5/16	1	6.813	8.723	6.738	22.274		
		2	7.503	6.769	6.601	20.873		
		Total	14.316	15.492	13.339	43.147	14.382	6.3
Chloroxynil 2/	3/8	1	7.756	8.303	7.982	24.041		
		2	7.380	7.663	7.567	22.610		
		Total	15.136	15.966	15.549	46.651	15.550	6.8*
Chloroxynil 2/	$\frac{1}{2}$	1	6.559	7.671	7.390	21.620		
		2	6.383	6.529	8.131	21.043		
		Total	12.942	14.200	15.521	42.663	14.221	6.2

Table 1. (con't)

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
Chloroxynil 2/	3/4	1	6.030	7.462	8.152	21.644		
		2	6.897	7.231	6.691	20.819		
		Total	12.927	14.693	14.843	42.463	14.154	6.2
2, 4-DB 2/	½	1	5.065	7.566	7.629	20.260		
		2	5.109	6.475	6.322	17.906		
		Total	10.174	14.041	13.951	38.166	12.722	5.5
2, 4-DB 2/	1	1	7.341	8.813	8.205	24.359		
		2	6.338	7.196	5.162	18.696		
		Total	13.679	16.009	13.367	43.055	14.352	6.3
R-11914 1/	2	1	7.099	7.844	8.099	23.042		
		2	6.984	6.840	6.721	20.545		
		Total	14.083	14.684	14.820	43.587	14.529	6.3
R-11914 1/	4	1	7.566	8.233	6.604	22.403		
		2	7.020	7.930	5.928	20.878		
		Total	14.586	16.163	12.532	43.281	14.427	6.3
R-11914 1/	6	1	8.136	7.403	7.866	23.405		
		2	7.114	6.233	7.502	20.849		
		Total	15.250	13.636	15.368	44.254	14.751	6.4
Benefin 1/	2	1	7.688	6.650	7.273	21.611		
		2	6.900	7.205	7.701	21.806		
		Total	14.588	13.855	14.974	43.417	14.472	6.3
Benefin 1/	3	1	7.530	6.900	7.088	21.518		
		2	7.659	7.227	6.478	21.364		
		Total	15.189	14.127	13.566	42.882	14.294	6.2
Benefin 1/	4	1	6.288	7.003	6.450	19.741		
		2	6.401	5.440	6.410	18.251		
		Total	12.689	12.443	12.860	37.992	12.664	5.5
MCPB 2/	½	1	7.844	7.869	6.500	22.213		
		2	6.786	7.325	5.540	19.651		
		Total	14.630	15.194	12.040	41.864	13.955	6.1
MCPB 2/	1	1	8.204	8.385	7.142	23.731		
		2	7.616	9.163	6.816	23.595		
		Total	15.820	17.548	13.958	47.326	15.775	6.9*

Table 1 (con't)

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
MCPB 2/	1.5	1	8.630	7.694	8.198	24.522		
		2	7.717	7.009	7.901	22.627		
		Total	16.347	14.703	16.099	47.149	15.716	6.9*
Handweeded Check	0	1	8.214	7.219	7.338	22.771		
		2	6.237	6.827	8.543	21.607		
		Total	14.451	14.046	15.881	44.378	14.793	6.4

1/ Preplant incorporate
2/ Post emergence
3/ Used as a check treatment
* Treatment yielding significantly more than the check

$\bar{x}$	6.1
F. value for treatment comparison	2.50*
S.E.$\bar{x}$	.3604
L.S.D. (.05)	1.0
C.V. %	5.90

Table 2. Effect of certain herbicides on the yield of sainfoin the year following application.

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
Seed w/com crop	0	1	2.582	3.322	4.012	9.916		
		2	2.948	3.335	3.411	9.694		
		Total	5.530	6.657	7.423	19.610	6.537	2.8
Clipping 3/	0	1	4.473	6.342	4.766	15.581		
		2	3.853	4.677	3.285	11.815		
		Total	8.326	11.019	8.051	27.396	9.132	4.0
EPTC 1/	3	1	6.750	2.901	7.755	17.406		
		2	4.671	3.690	4.395	12.756		
		Total	11.421	6.591	12.150	30.162	10.054	4.4
EPTC 1/	4	1	6.250	7.263	6.978	20.491		
		2	4.439	3.065	4.593	12.097		
		Total	10.689	10.328	11.571	32.588	10.863	4.7

Table 2. (con't)

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
EPTC 1/	6	1	5.270	8.400	5.994	19.664		
		2	5.380	4.730	4.888	14.998		
		Total	10.650	13.130	10.882	34.662	11.554	5.0
Bromoxynil 2/	¼	1	8.481	8.676	7.913	25.070		
		2	4.744	4.598	4.106	13.448		
		Total	13.225	13.274	12.019	38.518	12.839	5.6*
Bromoxynil 2/	5/16	1	7.988	7.991	7.601	23.580		
		2	3.350	5.116	4.335	12.801		
		Total	11.338	13.107	11.936	36.381	12.127	5.3*
Bromoxynil 2/	3/8	1	7.279	8.044	6.166	21.489		
		2	5.315	5.281	3.221	13.817		
		Total	12.594	13.325	9.387	35.306	11.768	5.1*
Chloroxynil 2/	5/16	1	8.110	6.635	8.428	23.173		
		2	4.769	3.398	5.075	13.242		
		Total	12.879	10.033	13.503	36.415	12.138	5.3*
Chloroxynil 2/	3/8	1	7.568	9.380	7.253	24.201		
		2	4.508	3.842	4.750	13.100		
		Total	12.076	13.222	12.003	37.301	12.434	5.4*
Chloroxynil 2/	½	1	7.301	7.739	8.231	23.271		
		2	6.017	3.070	5.354	14.441		
		Total	13.318	10.809	13.585	37.712	12.571	5.5*
Chloroxynil 2/	3/4	1	6.948	7.465	7.403	21.816		
		2	3.413	4.684	5.222	13.319		
		Total	10.361	12.149	12.625	35.135	11.712	5.1*
2, 4-DB 2/	½	1	5.158	8.358	4.267	17.783		
		2	3.749	4.887	4.336	12.972		
		Total	8.907	13.245	8.603	30.755	10.252	4.5
2, 4-DB 2/	1	1	4.466	7.277	6.247	17.990		
		2	2.945	4.098	3.572	10.615		
		Total	7.411	11.375	9.819	28.605	9.535	4.2
R-11914 1/	2	1	4.413	5.634	4.568	14.615		
		2	4.693	3.838	3.110	11.641		
		Total	9.106	9.472	7.678	26.256	8.752	3.8

Table 2. (con't)

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
R-11914 1/	4	1	6.307	7.863	5.506	19.676		
		2	3.675	3.922	4.872	12.469		
		Total	9.982	11.785	10.378	32.145	10.715	4.7
R-11914 1/	6	1	6.170	8.295	9.130	23.595		
		2	4.428	4.593	4.800	13.821		
		Total	10.598	12.888	13.930	37.416	12.472	5.4*
Benefin 1/	2	1	7.407	6.999	7.789	22.195		
		2	4.790	4.008	5.705	14.503		
		Total	12.197	11.007	13.494	36.698	12.233	5.3*
Benefin 1/	3	1	8.031	7.708	7.504	23.243		
		2	4.914	4.676	5.230	14.820		
		Total	12.945	12.384	12.734	38.063	12.688	5.5*
Benefin 1/	4	1	8.442	7.748	9.032	25.222		
		2	4.788	4.680	4.868	14.336		
		Total	13.230	12.428	13.900	39.558	13.186	5.7*
MCPB 2/	½	1	8.720	7.916	3.794	20.430		
		2	4.959	4.814	4.247	14.020		
		Total	13.679	12.730	8.041	34.450	11.483	5.0
MCPB 2/	1	1	8.663	7.633	7.316	23.612		
		2	4.236	5.324	3.806	13.366		
		Total	12.899	12.957	11.122	36.978	12.326	5.4*
MCPB 2/	1.5	1	6.738	7.338	6.590	20.666		
		2	4.698	4.725	4.131	13.554		
		Total	11.436	12.063	10.721	34.220	11.407	5.0
Handweeded Check	0	1	8.096	5.994	7.098	21.188		
		2	3.679	3.904	4.128	11.711		
		Total	11.775	9.898	11.226	32.899	10.966	4.8

$\bar{x}$	4.9
F. value for treatment comparison	2.98**
S.E.$\bar{x}$	.3937
L.S.D. (.05)	1.1
C.V.%	8.04

1/ Preplant incorporate
2/ Post emergence
3/ Used as a check treatment

Table 3. Effect of certain herbicides on the yield of vetch the year following application.

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
Seed w/comp crop	0	1	3.116	2.378	2.452	7.946		
		2	2.349	3.568	3.117	9.034		
		Total	5.465	5.946	5.569	16.980	5.660	2.5
Clipping 3/	0	1	3.422	1.602	4.681	9.705		
		2	3.520	1.329	3.500	8.349		
		Total	6.942	2.931	8.181	18.054	6.018	2.7
EPTC 1/	3	1	2.298	3.274	2.643	8.215		
		2	2.528	2.985	2.595	8.108		
		Total	4.826	6.259	5.238	16.323	5.441	2.4
EPTC 1/	4	1	2.339	2.635	3.357	8.331		
		2	2.573	1.453	2.034	6.060		
		Total	4.912	4.088	5.391	14.391	4.797	2.1
EPTC 1/	6	1	2.434	.451	1.503	4.388		
		2	3.040	1.500	2.014	6.554		
		Total	5.474	1.951	3.517	10.942	3.647	1.6*
Bromoxynil 2/	¼	1	3.453	2.597	2.515	8.565		
		2	3.273	1.323	2.736	7.332		
		Total	6.726	3.920	5.251	15.897	5.299	2.3
Bromoxynil 2/	5/16	1	3.261	3.167	2.568	8.996		
		2	3.111	2.640	3.055	8.806		
		Total	6.372	5.807	5.623	17.802	5.934	2.6
Bromoxynil 2/	3/8	1	4.415	2.499	4.846	11.760		
		2	3.413	1.896	3.769	9.078		
		Total	7.828	4.395	8.615	20.838	6.946	3.0
Chloroxynil 2/	5/16	1	4.123	2.727	2.157	9.007		
		2	2.776	2.992	1.440	7.208		
		Total	6.899	5.719	3.597	16.215	5.405	2.4
Chloroxynil 2/	3/8	1	4.238	2.081	5.841	12.160		
		2	3.828	1.560	2.405	7.793		
		Total	8.066	3.641	8.246	19.953	6.651	2.9
Chloroxynil 2/	½	1	3.832	2.768	2.083	8.683		
		2	3.588	3.190	2.460	9.238		
		Total	7.420	5.958	4.543	17.921	5.974	2.6

Table 3 (con't)

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
Chloroxynil 2/	3/4	1	3.190	4.344	2.648	10.182		
		2	2.019	2.717	2.417	7.153		
		Total	5.209	7.061	5.065	17.335	5.778	2.5
2, 4-DB 2/	½	1	2.316	3.754	2.337	8.407		
		2	3.435	4.227	2.652	10.314		
		Total	5.751	7.981	4.989	18.721	6.240	2.7
2, 4-DB 2/	1	1	2.153	2.560	1.378	6.091		
		2	2.055	1.890	3.105	7.050		
		Total	4.208	4.450	4.483	13.141	4.380	1.9
R-11914 1/	2	1	2.022	4.165	3.359	9.546		
		2	1.811	3.069	2.806	7.686		
		Total	3.833	7.234	6.165	17.232	5.744	2.5
R-11914 1/	4	1	2.292	1.728	2.583	6.603		
		2	2.261	1.254	2.210	5.725		
		Total	4.553	2.982	4.793	12.328	4.109	1.8
R-11914 1/	6	1	2.630	2.556	3.262	8.448		
		2	.997	1.560	2.398	4.955		
		Total	3.627	4.116	5.660	13.403	4.468	2.0
Benefin 1/	2	1	4.000	3.902	2.956	10.858		
		2	2.736	4.106	1.998	8.840		
		Total	6.736	8.008	4.954	19.698	6.566	2.9
Benefin 1/	3	1	3.607	2.670	2.725	9.002		
		2	2.543	2.573	2.394	7.510		
		Total	6.150	5.243	5.119	16.512	5.504	2.4
Benefin 1/	4	1	2.931	4.320	2.941	10.192		
		2	2.178	2.550	2.507	7.235		
		Total	5.109	6.870	5.448	17.427	5.809	2.5
MCPB 2/	½	1	2.720	2.842	1.160	6.722		
		2	1.374	1.926	1.897	5.197		
		Total	4.094	4.768	3.057	11.919	3.973	1.7*
MCPB 2/	1	1	2.911	1.451	1.312	5.674		
		2	1.736	1.994	2.691	6.421		
		Total	4.647	3.445	4.003	12.095	4.032	1.8

Table 3. (con't)

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
MCPB 2/	1.5	1	2.435	2.529	3.227	8.191		
		2	.884	2.548	2.023	5.455		
		Total	3.319	5.077	5.250	13.646	4.549	2.0
Handweeded check	0	1	4.333	3.899	4.181	12.413		
		2	2.654	3.275	3.469	9.398		
		Total	6.987	7.174	7.650	21.811	7.270	3.1

* Yielding significantly less than the check

$\bar{x}$	2.4
F. Value for treatment comparison	1.77*
S.E.$\bar{x}$	.3375
L.S.D. (.05)	1.0
C.V.%	14.06*

Table 4. Effect of certain herbicides on the yield of clover the year following application.

			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
Seed w/comp crop	0	1	9.525	7.424	7.169	24.118		
		2	2.568	2.876	4.007	9.451		
		Total	12.093	10.300	11.176	33.569	11.190	4.9
Clipping 3/	0	1	9.940	9.668	8.846	28.454		
		2	3.690	2.386	4.039	10.115		
		Total	13.630	12.054	12.885	38.569	12.856	5.6
EPTC 1/	3	1	8.442	6.144	8.460	23.046		
		2	3.286	4.050	3.659	10.995		
		Total	11.728	10.194	12.119	34.041	11.347	4.9
EPTC 1/	4	1	8.980	8.913	9.559	27.452		
		2	3.304	3.528	4.001	10.833		
		Total	12.284	12.441	13.560	38.285	12.762	5.6
EPTC 1/	6	1	8.741	8.640	8.710	26.091		
		2	3.553	3.880	2.960	10.393		
		Total	12.294	12.520	11.670	36.484	12.161	5.3
Bromoxynil 2/	¼	1	8.225	8.915	7.145	24.285		
		2	3.596	3.127	2.924	9.647		
		Total	11.821	12.042	10.069	33.932	11.311	4.9

Table 4. (con't)

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
Bromoxynil 2/	5/16	1	11.501	10.091	8.065	29.657		
		2	3.030	3.890	3.744	10.664		
		Total	14.531	13.981	11.809	40.321	13.440	5.9
Bromoxynil 2/	3/8	1	8.712	9.646	8.312	26.670		
		2	3.616	3.960	3.259	10.835		
		Total	12.328	13.606	11.571	37.505	12.502	5.5
Chloroxynil 2/	5/16	1	11.003	7.883	8.177	27.063		
		2	3.320	3.497	4.070	10.887		
		Total	14.323	11.380	12.247	37.950	12.650	5.5
Chloroxynil 2/	3/8	1	9.761	7.424	8.625	25.810		
		2	2.970	2.690	3.481	9.141		
		Total	12.731	10.114	12.106	34.951	11.650	5.1
Chloroxynil 2/	½	1	9.590	9.528	8.556	27.674		
		2	3.075	3.383	3.816	10.274		
		Total	12.665	12.911	12.372	37.948	12.649	5.5
Chloroxynil 2/	3/4	1	10.851	6.743	9.140	26.734		
		2	3.136	3.371	3.834	10.341		
		Total	13.987	10.114	12.974	37.075	12.358	5.4
2, 4-DB 2/	½	1	10.194	7.433	10.105	27.732		
		2	4.681	4.107	3.469	12.257		
		Total	14.875	11.540	13.574	39.989	13.330	5.8
2,4-DB 2/	1	1	8.256	11.070	8.698	28.024		
		2	3.635	4.713	3.497	11.845		
		Total	11.891	15.783	12.195	39.869	13.290	5.8
R-11914 1/	2	1	9.220	7.331	10.556	27.107		
		2	3.582	2.964	4.523	11.069		
		Total	12.802	10.295	15.079	38.176	12.725	5.5
R-11914 1/	4	1	8.425	8.804	10.146	27.375		
		2	3.840	2.794	4.358	10.992		
		Total	12.265	11.598	14.504	38.368	12.789	5.6
R-11914 1/	6	1	9.601	11.337	7.566	28.504		
		2	3.111	2.899	3.987	9.997		
		Total	12.712	14.236	11.553	38.501	12.834	5.6

Table 4. (con't)

Treatment			Plot yields in lbs dry matter					Yield
Herbicide	Rate #/A	Cutting	I	II	III	Total	$\bar{x}$	T/A
Benefin 1/	2	1	9.318	8.576	10.303	28.197		
		2	4.587	2.432	4.377	11.396		
		Total	13.905	11.008	14.680	39.593	13.198	5.8
Benefin 1/	3	1	8.594	10.223	9.396	28.213		
		2	2.390	2.860	3.477	8.727		
		Total	10.984	13.083	12.873	36.940	12.313	5.4
Benefin 1/	4	1	10.049	8.417	9.095	27.561		
		2	3.267	3.672	2.603	9.542		
		Total	13.316	12.089	11.698	37.103	12.368	5.4
MCPB 2/	½	1	10.685	6.388	10.212	27.285		
		2	4.485	3.534	3.281	11.300		
		Total	15.170	9.922	13.493	38.585	12.862	5.6
MCPB 2/	1	1	9.983	7.595	10.261	27.839		
		2	3.360	3.030	2.985	9.375		
		Total	13.343	10.625	13.246	37.214	12.405	5.4
MCPB 2/	1.5	1	10.672	9.011	9.638	29.321		
		2	3.914	3.338	4.466	11.718		
		Total	14.586	12.349	14.104	41.039	13.680	6.0
Handweeded check	0	1	10.832	9.160	9.804	29.796		
		2	3.820	7.438	2.519	13.777		
		Total	14.652	16.598	12.323	43.573	14.524	6.3

$\bar{x}$	5.5
F. value for treatment comparison	<1
S.E.$\bar{x}$	.3644
L.S.D.(.05)	N.S.
C.V.%	6.62

1/ Preplant incorporate
2/ Post emergence
3/ Used as a check treatment

Table 5. Data from herbicide study on legumes, Field No. Y-5, Northwestern Montana Branch Station. Size of plot: 200 sq. ft. Plant counts: a quadrant 3" x 48". Eight locations per plot.

Treatment	Rate #/A	Plot No.	Redroot Pigweed	Prostrate Pigweed	Fanweed	Shepherds Purse	Lambsquarter	Chickweed	Catchfly	Other Broadleaves	Grasses
EPTC	2	101	4	1	2	6	1	23	3	2	0
		215	2	0	0	5	1	9	2	3	1
		321	14	1	4	2	1	53	0	0	0
		Total	20	2	6	13	3	85	5	5	1
		$\bar{x}$	6.7	.7	.2	4.3	1.0	28.3	1.7	1.7	.3
EPTC	4	102	8	1	2	2	2	14	4	1	0
		211	4	0	0	1	5	10	0	0	0
		302	1	0	2	5	1	14	2	1	0
		Total	13	1	4	8	8	38	6	2	0
		$\bar{x}$	4.3	.3	1.3	2.7	2.7	12.7	2.0	.7	0
EPTC	6	103	4	0	4	5	0	10	4	0	0
		216	6	1	0	1	1	13	0	0	0
		308	2	0	0	0	5	13	1	0	0
		Total	12	1	4	6	6	36	5	0	0
		$\bar{x}$	4.0	.3	1.3	2.0	2.0	12.0	1.7	0	0
EPTC + Bromoxynil	2 $\frac{1}{4}$	104	0	0	0	0	0	11	4	0	1
		219	0	0	0	1	2	12	4	0	0
		307	7	1	0	6	3	18	2	0	0
		Total	7	1	0	7	5	41	10	0	1
		$\bar{x}$	2.3	.3	0	2.3	1.7	13.7	3.3	0	.3
EPTC + Bromoxynil	4 $\frac{1}{4}$	105	0	0	0	2	1	8	0	0	0
		212	1	0	0	0	0	6	0	0	0
		320	0	1	0	0	0	5	0	0	0
		Total	1	1	0	2	1	19	0	0	0
		$\bar{x}$	.3	.3	0	.7	.3	6.3	0	0	0
EPTC + Bromoxynil	6 $\frac{1}{4}$	106	1	0	0	3	0	5	3	0	0
		208	1	0	0	0	0	5	0	0	0
		315	1	0	0	2	2	2	1	0	0
		Total	3	0	0	5	2	12	4	0	0
		$\bar{x}$	1.0	0	0	1.7	.7	4.0	1.3	0	0

Table 5. (con't)

Treatment	Rate #/A	Plot No.	Redroot Pigweed	Prostrate Pigweed	Fanweed	Shepherds Purse	Lambsquarter	Chickweed	Catchfly	Other Broadleaves	Grasses
EPTC	2	107	0	0	0	4	0	1	0	1	0
Bromxoynil	5/16	222	6	1	0	2	1	33	0	2	0
		303	0	0	0	0	0	3	0	0	0
		Total	6	1	0	6	1	37	0	3	0
		$\bar{x}$	2.0	.3	0	2.0	.3	12.3	0	1.0	0
EPTC +	4	108	3	0	1	0	0	6	0	0	0
Bromoxynil	5/16	224	9	4	0	6	2	7	1	1	0
		301	0	0	0	0	0	2	0	0	1
		Total	12	4	1	6	2	15	1	1	1
		$\bar{x}$	4.0	1.3	.3	2.0	.7	5.0	.3	.3	.3
EPTC	6	109	0	0	0	1	1	0	2	0	0
Bromoxynil	5/16	214	0	0	0	0	0	3	0	0	0
		312	0	0	0	0	0	1	0	0	1
		Total	0	0	0	1	1	4	2	0	1
		$\bar{x}$	0	0	0	.3	.3	1.3	.7	0	.3
EPTC +	2	110	3	0	0	2	1	3	0	0	0
Bromoxynil	3/8	205	1	0	0	0	0	5	0	0	2
		305	0	0	1	1	0	7	0	0	0
		Total	4	0	1	3	1	15	0	0	2
		$\bar{x}$	1.3	0	.3	1.0	.3	5.0	0	0	.7
EPTC +	4	111	0	1	0	1	0	0	0	0	0
Bromoxynil	3/8	217	0	0	0	1	0	4	0	0	0
		310	0	0	0	0	1	6	0	0	0
		Total	0	1	0	2	1	10	0	0	0
		$\bar{x}$	0	..3	0	.7	.3	3.3	0	0	0
EPTC +	6	112	0	0	0	1	0	0	0	0	0
Bromoxynil	3/8	221	6	3	1	3	0	27	0	0	0
		306	0	0	0	0	0	6	0	0	1
		Total	6	3	1	4	0	33	0	0	1
		$\bar{x}$	2.0	1.0	.3	1.3	0	11.0	0	0	.3

Table 5. (con't)

Treatment	Rate #/A	Plot No.	Redroot Pigweed	Prostrate Pigweed	Fanweed	Shepherds Purse	Lambsquarter	Chickweed	Catchfly	Other Broadleaves	Grasses
Benefin	2	113	0	1	2	16	1	0	0	0	0
		220	0	0	0	0	1	1	1	0	0
		314	1	0	0	0	0	5	0	0	0
		Total	1	1	2	16	2	6	1	0	0
		$\bar{x}$	.3	.3	.7	5.3	.7	2.0	.3	0	0
Benefin	3	114	1	0	0	5	1	2	2	1	0
		223	3	0	0	6	1	4	2	0	0
		316	0	0	0	0	0	18	0	0	0
		Total	4	0	0	11	2	24	4	1	0
		$\bar{x}$	1.3	0	0	3.7	.7	8.0	1.3	.3	0
Benefin	4	115	2	0	1	3	0	0	1	0	0
		213	0	0	0	0	0	0	0	0	0
		313	3	0	1	6	2	3	0	0	0
		Total	5	0	2	9	2	3	1	0	0
		$\bar{x}$	1.7	0	.7	3.0	.7	1.0	.3	0	0
Velsicol 438	2	116	2	2	0	4	2	13	0	2	3
		207	0	0	0	0	0	10	0	0	2
		322	9	5	2	2	2	33	3	1	1
		Total	11	7	2	6	4	56	3	3	6
		$\bar{x}$	3.7	2.3	.7	2.0	1.3	18.7	1.0	1.0	2.0
Velsicol 438	3	117	12	3	0	0	2	9	3	0	0
		206	3	2	0	3	4	30	0	1	1
		304	2	2	0	3	4	8	1	0	2
		Total	17	7	0	6	10	47	4	1	3
		$\bar{x}$	5.7	2.3	0	2.0	3.3	15.7	1.3	.3	1.0
Velsicol 438	4	118	17	3	1	2	2	16	2	1	0
		202	0	0	0	1	2	6	0	0	7
		311	6	10	0	0	0	11	2	0	0
		Total	23	13	1	3	4	33	4	1	7
		$\bar{x}$	7.7	4.3	.3	1.0	1.3	11.0	1.3	.3	2.3

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Table 5. (con't)

Treatment	Rate #/A	Plot No.	Redroot Pigweed	Prostrate Pigweed	Fanweed	Shepherds Purse	Lambsquarter	Chickweed	Catchfly	Other Broadleaves	Grasses
Clipping	0	119	4	0	1	3	5	37	1	1	1
		204	11	1	0	8	2	32	0	1	3
		318	25	3	1	5	4	36	1	0	2
		Total	40	4	2	16	11	105	2	2	6
		$\bar{x}$	13.3	1.3	.7	5.3	3.7	35.0	.7	.7	2.0
Bromoxynil	¼	121	0	0	0	1	2	10	1	0	0
		210	0	0	0	2	0	20	0	0	0
		324	1	0	0	1	0	13	0	0	0
		Total	1	0	0	4	2	43	1	0	0
		$\bar{x}$	.3	0	0	1.3	.7	14.3	.3	0	0
Bromoxynil	5/16	122	1	0	0	0	0	11	1	0	1
		209	0	0	0	0	2	20	0	0	0
		317	1	0	0	0	0	27	0	0	0
		Total	2	0	0	0	2	58	1	0	1
		$\bar{x}$	.7	0	0	0	.7	19.3	.3	0	.3
Bromoxynil	3/8	123	0	0	0	2	0	16	1	0	1
		203	0	1	0	0	0	13	1	1	7
		309	1	0	0	0	1	28	0	0	2
		Total	1	1	0	2	1	57	2	1	10
		$\bar{x}$	.3	.3	0	.7	.3	19.0	.7	.3	3.3
Bromoxynil	½	124	1	0	0	1	1	8	0	2	3
		201	0	0	0	0	0	6	2	0	1
		319	0	0	0	0	0	11	0	0	0
		Total	1	0	0	1	1	25	2	2	4
		$\bar{x}$	.3	0	0	.3	.3	8.3	.7	.7	1.3

Table 5. (con't)

Source	D.F.	Redroot Pigweed M.S.	Redroot Pigweed F.	Prostrate Pigweed M.S.	Prostrate Pigweed F.	Fanweed M.S.	Fanweed F.	Shepherds Purse M.S.	Shepherds Purse F.	Lambsquarter M.S.	Lambsquarter F.	Chickweed M.S.	Chickweed F.
Replications	2	4.797	1.03	1.6087	1.16	2.0145	NS	6.495	NS	.174	NS	159.0	2.32
Treatment	22	54.4242	11.63**	3.3307	2.40*	1.5547	NS	6.8022	NS	2.97895	2.22*	217.831	3.18*
Error	44	4.67920		1.38994		2.7207		7.4625		1.34056		68.545	
Total	68												

Source	D.F.	Catchfly M.S.	Catchfly F.	Other Broadleaves M.S.	Other Broadleaves F.	Grasses M.S.	Grasses F.
Replications	2	5.232	5.21	.97105	3.81	2.84105	1.92
Treatment	22	2.02636	2.02*	5.9025	23.19*	2.60346	1.76
Error	44	1.00461		.25442		1.47692	
Total	68						

Table 6. Summary of weed population data from herbicide application on legumes in 1969. Field No. Y-5, Northwestern Montana Branch Station

Treatment	Rate #/A	Redroot Pigweed	Prostrate Pigweed	Fanweed	Shepherds Purse	Lambs-quarter	Chick-weed	Catch-fly	Other Broadleaves	Grasses
EPTC	2	6.6bc[1/]	.7bc	.2	4.3	1.0d	28.3ab	1.7bc	1.7a	.3b
EPTC	4	4.3bcde	.3bc	1.3	2.7	2.7abc	12.7bcdef	2.0b	.7bc	.0b
EPTC	6	4.0bcdef	.3bc	1.3	2.0	2.0abcd	12.0cdef	1.7bc	.0c	.0b
EPTC + Bromoxynil	2 + ¼	2.3de	.3bc	.0	2.3	1.7abcd	13.7bcdef	3.3b	.0c	.3b
EPTC + Bromoxynil	4 + ¼	.3cef	.3bc	.0	.7	.3d	6.3cdef	.0d	.0c	.0b
EPTC + Bromoxynil	6 + ¼	1.0ef	.0c	.0	1.7	.7d	4.0cdef	1.3cd	.0c	.0b
EPTC + Bromoxynil	2 + 5/16	2.0de	.3bc	.0	2.0	.3d	12.3cdef	.0d	1.0ab	.0b
EPTC + Bromoxynil	4 + 5/16	4.0bcde	1.3bc	.3	2.0	.7d	5.0cdef	.3cd	.3bc	.3b
EPTC + Bromoxynil	6 + 5/16	.0f	.0c	.0	.3	.3d	1.3ef	.7cd	.0c	.3b
EPTC + Bromoxynil	2 + 3/8	1.3ef	.0c	.3	1.0	.3d	5.0cedf	.0d	.0c	.7b
EPTC + Bromoxynil	4 + 3/8	.0f	.3bc	.0	.7	.3d	3.3cdef	.0d	.0c	.0b
EPTC + Bromoxynil	6 + 3/8	2.0def	1.0bc	.3	1.3	.0d	11.0cdef	.0d	.0c	.3b
Benefin	2	.3ef	.3bc	.7	5.3	.7d	2.0ef	.3cd	.0c	.0b
Benefin	3	1.3ef	.0c	.0	3.7	.7d	8.0cdef	1.3cd	.3bc	.0b
Benefin	4	1.7def	.0c	.7	3.0	.7d	1.0f	.3cd	.0c	.0b
Velsicol 438	2	3.7bcdef	2.3b	.7	2.0	1.3cd	18.7cd	1.0cd	1.0ab	2.0ab
Velsicol 438	3	5.7bcd	2.3b	.0	2.0	3.3ab	15.7cde	1.3cd	.3bc	1.0b
Velsicol 438	4	7.7b	4.3a	.3	1.0	1.3cd	11.0cdef	5.7a	.3bc	2.3ab
Clipping(check)	0	13.3a	1.3bc	.7	5.3	3.7a	35.0a	.7cd	.7bc	2.0ab
Bromoxynil	¼	.3ef	.0c	.0	1.3	.7d	14.3cdef	.3cd	.0c	.0b
Bromoxynil	5/16	.7ef	.0c	.0	.0	.7d	19.3cdef	.3cd	.0c	.3b
Bromoxynil	3/8	.3ef	.3bc	.0	.7	.3d	19.0cd	.7cd	.3bc	3.3a
Bromoxynil	½	.3ef	.0c	.0	.3	.3d	8.3cdef	.7cd	.7bc	1.3ab

1/ Items having similar letters are not significantly different. Duncan's Multiple Range Test

Table 7. Summary of the effects of herbicides on weed species growing in legumes in 1969.

Treatment	Rate #/A	% Weed Control								
		Redroot Pigweed	Prostrate Pigweed	Fanweed	Shepherdspurse	Lambsquarter	Chickweed	Catchfly	Other Broadleaves	Grasses
EPTC	2	50.4	46.2	99.7	18.9	73.0	19.1	75.7	75.7	85.0
EPTC	4	67.7	76.9	98.1	49.1	27.0	63.7	71.4	99.0	100.0
EPTC	6	69.9	76.9	98.1	62.3	45.9	65.7	75.7	100.0	100.0
EPTC + Bromoxynil	2 + ¼	82.7	76.9	100.0	56.6	54.1	60.9	52.9	100.0	85.0
EPTC + Bromoxynil	4 + ¼	97.7	76.9	100.0	86.8	91.9	82.0	100.0	100.0	100.0
EPTC + Bromoxynil	6 + ¼	92.5	100.0	100.0	67.9	81.1	88.6	81.4	100.0	100.0
EPTC + Bromoxynil	2 + 5/16	85.0	76.9	100.0	62.3	91.9	64.9	100.0	85.7	100.0
EPTC + Bromoxynil	4 + 5/16	69.9	0.0	99.6	62.3	81.1	85.7	95.7	95.7	85.0
EPTC + Bromoxynil	6 + 5/16	100.0	100.0	100.0	94.3	91.9	96.3	99.0	100.0	85.0
EPTC + Bromoxynil	2 + 3/8	90.2	100.0	99.6	81.1	91.9	85.7	100.0	100.0	65.0
EPTC + Bromoxynil	4 + 3/8	100.0	76.9	100.0	86.8	91.9	90.6	100.0	100.0	100.0
EPTC + Bromoxynil	6 + 3/8	85.0	23.1	99.6	75.5	100.0	68.6	100.0	100.0	85.0
Benefin	2	97.7	76.9	0.0	0.0	81.1	94.3	95.7	100.0	100.0
Benefin	3	90.2	100.0	100.0	30.2	81.1	77.1	81.4	95.7	100.0
Benefin	4	87.2	100.0	0.0	43.4	81.1	97.1	95.7	100.0	100.0
Velsicol438	2	72.2	0.0	0.0	62.3	64.9	46.6	85.7	85.7	0.0
Velsicol438	3	57.1	0.0	100.0	62.3	10.8	55.1	81.4	95.7	50.0
Velsicol438	4	42.1	0.0	99.6	81.1	64.9	68.6	18.6	95.7	0.0
Clipping	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bromoxynil	¼	97.7	100.0	100.0	75.5	81.1	59.1	95.7	100.0	100.0
Bromoxynil	5/16	94.7	100.0	100.0	100.0	81.1	44.9	95.7	100.0	85.0
Bromoxynil	3/8	97.7	76.9	100.0	86.8	91.9	45.7	99.0	95.7	0.0
Bromoxynil	½	97.7	100.0	100.0	94.3	91.9	76.3	99.0	99.0	35.0

Table 8. Occupancy[1/] data from herbicide study on legumes in Field No. Y-5. Northwestern Montana Branch Station in 1969.

Herbicide	Rate #/A	Plot No.	Alfalfa	Clover	Sainfoin
EPTC	2	101	142	155	115
		215	146	151	123
		321	125	125	102
	Total		413	431	340
	$\bar{x}$		137.7	143.7	113.3
	%		86.1	89.8	70.8
EPTC	4	102	147	155	130
		211	137	138	102
		302	134	152	116
	Total		418	445	348
	$\bar{x}$		139.3	148.3	116.0
	%		87.1	92.7	72.5
EPTC	6	103	132	148	130
		216	147	151	108
		308	137	154	117
	Total		416	453	355
	$\bar{x}$		138.7	151.0	118.3
	%		86.7	94.4	73.9
EPTC + Bromoxynil	2 + ¼	104	135	147	117
		219	144	144	116
		307	151	152	124
	Total		430	443	357
	$\bar{x}$		143.3	147.7	119.0
	%		89.6	92.3	74.4
EPTC + Bromoxynil	4 + ¼	105	139	133	124
		212	131	144	111
		320	135	125	112
	Total		405	402	347
	$\bar{x}$		135.0	134.0	115.7
	%		84.4	83.8	72.3
EPTC + Bromoxynil	6 + ¼	106	119	141	120
		208	124	127	111
		315	148	150	129
	Total		391	418	360
	$\bar{x}$		130.3	139.3	120.0
	%		81.4	87.1	75.0
EPTC + Bromoxynil	2 5/16	107	147	132	123
		222	142	144	128
		303	148	150	117
	Total		437	426	368
	$\bar{x}$		145.7	142.0	122.7
	%		91.1	88.8	76.7

Table 8 . Con't.

Herbicide	Rate #/A	Plot No.	Alfalfa	Clover	Sainfoin
EPTC +	4 +	108	147	137	124
Bromoxynil	5/16	224	143	154	124
		301	140	125	110
	Total		430	416	358
	$\bar{x}$		143.3	138.7	119.3
	%		89.6	86.7	74.6
EPTC +	6 +	109	134	136	121
Bromoxynil	5/16	214	138	132	100
		312	144	140	96
	Total		416	408	317
	$\bar{x}$		138.7	136.0	105.7
	%		86.7	85.0	66.1
EPTC +	2 +	110	137	138	116
Bromoxynil	3/8	205	143	132	105
		305	134	144	110
	Total		414	414	331
	$\bar{x}$		138.0	138.0	110.3
	%		86.3	86.3	68.9
EPTC +	4 +	111	146	130	112
Bromoxynil	3/8	217	152	146	102
		310	150	132	101
	Total		448	408	315
	$\bar{x}$		149.3	136.0	105.0
	%		93.3	85.0	65.6
EPTC +	6 +	112	125	116	123
Bromoxynil	3/8	221	140	152	116
		306	144	132	98
	Total		409	400	337
	$\bar{x}$		136.3	133.3	112.3
	%		85.2	83.3	70.2
Benefin	2	113	142	158	117
		220	141	144	109
		314	148	139	130
	Total		431	441	356
	$\bar{x}$		143.7	147.0	118.7
	%		89.8	91.9	74.2
Benefin	3	114	140	155	129
		223	133	147	126
		316	127	149	131
	Total		400	451	386
	$\bar{x}$		133.3	150.3	128.7
	%		83.3	93.9	80.4

Table 8. Con't.

Herbicide	Rate #/A	Plot No.	Alfalfa	Clover	Sainfoin
Benefin	4	115	146	149	120
		213	122	144	111
		313	139	132	131
	Total		407	425	362
	$\bar{x}$		135.7	141.7	120.7
	%		84.8	88.6	75.4
Velsicol 438	2	116	142	158	119
		207	139	124	109
		322	143	143	126
	Total		424	425	354
	$\bar{x}$		141.3	141.7	118.0
	%		88.3	88.6	73.8
Velsicol 438	3	117	136	151	116
		206	137	141	125
		304	152	144	117
	Total		425	436	358
	$\bar{x}$		141.7	145.3	119.3
	%		88.6	90.8	74.6
Velsicol 438	4	118	138	153	118
		202	143	151	109
		311	151	145	113
	Total		432	449	340
	$\bar{x}$		144.0	149.7	113.3
	%		90.0	93.6	70.8
Clipping(check)	0	119	145	147	120
		204	145	158	133
		318	127	156	125
	Total		417	461	378
	$\bar{x}$		139.0	153.3	126.0
	%		86.9	95.8	78.8
Bromoxynil	$\frac{1}{4}$	121	150	150	109
		210	136	143	121
		324	136	144	121
	Total		422	437	351
	$\bar{x}$		140.7	145.7	117.0
	%		87.9	91.1	73.1
Bromoxynil	5/16	122	142	146	106
		209	131	145	115
		317	137	148	125
	Total		410	439	346
	$\bar{x}$		136.7	146.3	115.3
	%		85.4	91.4	72.1

Table 8 . Con't.

Herbicide	Rate #/A	Plot No.	Alfalfa	Clover	Sainfoin
Bromoxynil	3/8	123	145	149	103
		203	139	147	113
		309	141	153	107
	Total		425	449	323
	$\bar{x}$		141.7	149.7	107.7
	%		88.6	93.6	67.3
Bromoxynil	½	124	135	150	116
		201	134	142	101
		319	132	131	105
	Total		401	423	322
	$\bar{x}$		133.7	141.0	107.3
	%		83.6	88.1	67.1

1/ Occupancy based on 8 counts per plot with a quadrant 3' x 2" divided into 2" sections.

Analysis of Variance

Source	D.F.	Alfalfa M.S.	Alfalfa F.	Clover M.S.	Clover F.	Sainfoin M.S.	Sainfoin F.
Replications	2	14.61		51.785		132.97	1.87NS
Treatment	22	58.92227	1.02N.S.	101.41909	1.13N.S.	112.36227	1.58NS
Error	44	57.53295		89.64613		71.08222	
Total	68						

Table 9. Percent of legumes in herbicide study based on occupancy[1/]. Northwestern Montana Branch Station, Kalispell in 1969.

Treatment					
Herbicide	Rate #/A	Alfalfa	Clover	Sainfoin	% Weed Control
EPTC	2	86.1	89.8	70.8	60.4
EPTC	4	87.1	92.7	72.5	72.5
EPTC	6	86.7	94.4	73.9	77.2
EPTC + Bromoxynil	2 + $\frac{1}{4}$	89.6	92.3	74.4	74.3
EPTC + Bromoxynil	4 + $\frac{1}{4}$	84.4	83.8	72.3	92.8
EPTC + Bromoxynil	6 + $\frac{1}{4}$	81.4	87.1	75.0	90.1
EPTC + Bromoxynil	2 + 5/16	91.1	88.8	76.7	85.2
EPTC + Bromoxynil	4 + 5/16	89.6	86.7	74.6	75.0
EPTC + Bromoxynil	6 + 5/16	86.7	85.0	66.1	96.3
EPTC + Bromoxynil	2 + 3/8	86.3	86.3	68.9	90.4
EPTC + Bromoxynil	4 + 3/8	93.3	85.0	65.6	94.0
EPTC + Bromoxynil	6 + 3/8	85.2	83.3	70.2	81.9
Benefin	2	89.8	91.9	74.2	82.9
Benefin	3	83.3	93.9	80.4	84.0
Benefin	4	84.8	88.6	75.4	78.3
Velsicol 438	2	88.3	88.6	73.8	57.5
Velsicol 438	3	88.6	90.8	74.6	56.9
Velsicol 438	4	90.0	93.6	70.8	52.3
Clipping	0	86.9	95.8	78.8	0.0
Bromoxynil	$\frac{1}{4}$	87.9	91.1	73.1	89.9
Bromoxynil	5/16	85.4	91.4	72.1	89.9
Bromoxynil	3/8	88.6	93.6	67.3	77.1
Bromoxynil	$\frac{1}{2}$	83.6	88.1	67.1	88.1

1/ Occupancy based on 8 counts/plot with a quadrant 3' x 2" divided into 2" sections.

Table 10. Estimate of crop injury to alfalfa following application of certain herbicides in 1969.

Treatment		Crop Injury 1/				
Herbicide	Rate #/A	I	II	III	Total	$\bar{x}$
EPTC	2	2	3	5	10	3
EPTC	4	3	5	7	15	5
EPTC	6	4	5	7	16	5
EPTC + Bromoxynil	2 + ¼	5	5	6	16	5
EPTC + Bromoxynil	4 + ¼	5	6	7	18	6
EPTC + Bromoxynil	6 + ¼	5	6	8	19	6
EPTC + Bromoxynil	2 + 5/16	3	4	6	13	4
EPTC + Bromoxynil	4 + 5/16	4	4	7	15	5
EPTC + Bromoxynil	6 + 5/16	4	6	7	17	6
EPTC + Bromoxynil	2 + 3/8	4	5	7	16	5
EPTC + Bromoxynil	4 + 3/8	4	5	7	16	5
EPTC + Bromoxynil	6 + 3/8	5	4	7	16	5
Benefin	2	2	5	8	15	5
Benefin	3	2	6	8	16	5
Benefin	4	2	6	8	16	5
Velsicol 438	2	2	5	4	11	4
Velsicol 438	3	2	3	6	11	4
Velsicol 438	4	2	3	4	9	3
Clipping (check)	0	0	0	0	0	0
Bromoxynil	¼	3	6	5	14	5
Bromoxynil	5/16	3	4	7	14	5
Bromoxynil	3/8	4	4	6	14	5
Bromoxynil	½	4	5	5	14	5

1/ 0-10: 0 = no injury
10 = all plants dead

Table 11. Estimate of crop injury to clover following application of certain herbicides in 1969.

Treatment		Crop Injury 1/				
Herbicide	Rate #/A	I	II	III	Total	x
EPTC	2	3	5	5	13	4
EPTC	4	4	4	6	14	5
EPTC	6	5	6	6	17	6
EPTC + Bromoxynil	2 + ¼	6	5	5	16	5
EPTC + Bromoxynil	4 + ¼	6	7	8	21	7
EPTC + Bromoxynil	6 + ¼	7	8	7	22	7
EPTC + Bromoxynil	2 + 5/16	4	5	7	16	5
EPTC + Bromoxynil	4 + 5/16	5	3	7	15	5
EPTC + Bromoxynil	6 + 5/16	8	7	7	22	7
EPTC + Bromoxynil	2 + 3/8	6	6	8	20	7
EPTC + Bromoxynil	4 + 3/8	7	7	8	22	7
EPTC + Bromoxynil	6 + 3/8	8	5	8	21	7
Benefin	2	1	6	8	15	5
Benefin	3	2	5	6	13	4
Benefin	4	2	7	7	16	5
Velsicol 438	2	2	6	4	12	4
Velsicol 438	3	3	3	5	11	4
Velsicol 438	4	1	3	4	8	3
Clipping (check)	0	0	0	0	0	0
Bromoxynil	¼	4	6	2	12	4
Bromoxynil	5/16	4	6	7	17	6
Bromoxynil	3/8	5	5	5	15	5
Bromoxynil	½	5	6	6	17	6

1/ 0-10: 0 = no injury
10 = all plants dead

Table 12. Estimate of crop injury to sainfoin following application of certain herbicides in 1969.

Treatment		Crop Injury 1/				
Herbicide	Rate #/A	I	II	III	Total	$\bar{x}$
EPTC	2	0	0	3	3	1
EPTC	4	0	1	4	5	2
EPTC	6	2	3	5	10	3
EPTC + Bromoxynil	2 + ¼	3	3	4	10	3
EPTC + Bromoxynil	4 + ¼	3	6	5	14	5
EPTC + Bromoxynil	6 + ¼	3	6	7	16	5
EPTC + Bromoxynil	2 + 5/16	2	2	5	9	3
EPTC + Bromoxynil	4 + 5/16	4	2	5	11	4
EPTC + Bromoxynil	6 + 5/16	4	5	7	16	5
EPTC + Bromoxynil	2 + 3/8	4	4	6	14	5
EPTC + Bromoxynil	4 + 3/8	4	4	8	16	5
EPTC + Bromoxynil	6 + 3/8	6	2	8	16	5
Benefin	2	0	4	6	10	3
Benefin	3	0	1	3	4	1
Benefin	4	1	4	5	10	3
Velsicol 438	2	1	2	1	4	1
Velsicol 438	3	0	0	3	3	1
Velsicol 438	4	0	0	2	2	1
Clipping (check)	0	0	0	0	0	0
Bromoxynil	¼	2	4	5	11	4
Bromoxynil	5/16	3	4	6	13	4
Bromoxynil	3/8	4	3	6	13	4
Bromoxynil	½	3	4	6	13	4

1/ 0-10: 0 = no injury
10 = all plants dead

Table 13 . Yield data from herbicide study based on legume percentage of total dry matter produced. (Alfalfa) Grown on the Northwestern Montana Branch Station, Kalispell in 1969.

Treatment		% Legume				Legume lbs/plot				#/A
Herbicide	Rate #/A	I	II	III	$\bar{x}$	I	II	III	$\bar{x}$	Legumes
EPTC	2	74.2	75.1	92.7	81.0a-e[1]	3.53	2.55	4.41	3.50	3388a-e[1]
"	4	77.2	85.4	73.9	78.8a-e	3.97	4.72	3.73	4.14	4008a-e
"	6	89.7	87.6	95.4	90.9a-d	4.74	3.83	6.07	4.88	4724ab
EPTC+Bromoxynil	2+1/4	97.7	97.9	85.3	93.6ab	4.03	3.99	5.05	4.36	4220a-e
" "	4+1/4	98.8	88.5	96.6	94.6ab	5.52	4.18	4.53	4.74	4588a-c
" "	6+1/4	95.2	95.7	98.5	96.5ab	4.81	4.68	4.32	4.60	4453a-d
" "	2+5/16	90.2	96.4	93.0	93.2ab	4.14	3.93	5.11	4.39	4250a-e
" "	4+5/16	90.8	59.3	92.0	80.7a-e	4.79	2.49	4.37	3.88	3756a-e
" "	6+5/16	91.4	47.8	98.4	79.2a-e	4.29	2.03	4.48	3.60	3485a-e
" "	2+3/8	97.7	95.4	68.1	87.1a-d	5.42	4.46	2.87	4.25	4114a-e
" "	4+3/8	95.3	90.3	98.0	94.5ab	4.71	3.97	4.30	4.33	4191a-e
" "	6+3/8	88.7	84.7	87.5	87.0a-d	5.04	4.43	5.70	5.06	4898a
Benefin	2	80.1	96.4	97.5	91.3ab	3.36	4.72	4.14	4.07	3940a-e
"	3	92.6	88.4	99.0	93.3ab	4.11	3.87	4.17	4.05	3920a-e
"	4	96.6	98.5	98.4	97.8a	3.96	4.52	2.90	3.79	3669a-e
Velicol 438	2	70.5	77.0	98.2	81.9a-e	2.82	3.68	3.62	3.37	3262b-f
"	3	86.9	46.0	84.0	72.3b-e	3.55	2.37	3.50	3.14	3040b-f
"	4	65.7	66.5	66.0	66.1de	3.71	1.95	3.14	2.93	2836d-f
Clipping(check)	0	56.3	76.5	45.5	59.4e	1.40	2.06	2.21	1.89	1829f
Bromoxynil	1/4	86.0	94.7	84.5	88.4a-d	3.86	4.48	3.25	3.86	3736a-e
"	5/16	98.6	87.9	60.4	82.3a-e	4.05	4.54	2.75	3.78	3659a-e
"	3/8	97.1	57.5	85.9	80.2a-e	4.36	1.70	3.75	3.27	3165c-f
"	1/2	53.0	56.3	89.9	66.4c-e	.90	2.09	2.74	1.91	1849e-f

1/ Items followed by the same letter do not differ significantly at the 5% level. Duncan's Multiple Range Test.

$\bar{x}$	84.2	$\bar{x}$	3698
S.E.$\bar{x}$	7.31213	S.E.$\bar{x}$	457.45
C.V.%	8.69	C.V.%	12.38

ANALYSIS OF VARIANCE

Source	D.F.	M.S.	F.	D.F.	M.S.	F.
Replications	2	467.2	2.91	2	1.40613	2.09
Treatment	22	332.5936	2.07*	22	2.00202	2.99*
Error	44	160.3975		44	.66998	
Total	68			68		

Table 14 . Yield data from herbicide study based on legume percentage of total dry matter produced. (Sainfoin) Grown on the Northwestern Montana Branch Station in 1969.

Treatment		% Legume				Legume #/plot				#/A
Herbicide	Rate #/A	I	II	III	x̄	I	II	III	x̄	Legume
EPTC	2	84.0	70.0	72.1	75.4	4.51	3.55	3.86	3.97	3843bcd 1/
"	4	82.9	86.2	75.3	81.5	4.85	4.57	4.15	4.52	4375abc
"	6	98.0	88.9	70.1	85.7	5.63	6.20	3.93	5.25	5082abc
EPTC + Bromoxynil	2 + ¼	93.2	98.0	73.3	88.2	4.64	6.40	5.81	5.62	5440ab
" "	4 + ¼	92.0	89.8	98.1	93.3	5.47	4.80	5.35	5.21	5043abc
" "	6 + ¼	98.3	49.4	98.2	82.0	5.47	2.36	5.45	4.43	4288abc
" "	2+5/16	97.9	80.4	97.8	92.0	4.07	5.19	4.80	4.69	4540abc
" "	4+5/16	89.1	86.2	86.4	87.2	5.79	4.56	4.60	4.98	4821abc
" "	6+5/16	93.8	74.3	98.6	88.9	5.93	3.62	4.43	4.66	4511abc
" "	2+3/8	99.2	98.0	88.9	95.4	6.36	6.54	4.81	5.90	5711ab
" "	4+3/8	95.5	98.1	97.2	96.9	5.42	5.38	4.42	5.07	4908abc
" "	6+3/8	87.5	91.4	99.2	92.7	3.01	5.23	5.82	4.69	4540abc
Benefin	2	88.4	97.2	99.0	94.9	5.57	5.65	6.00	5.74	5556ab
"	3	99.0	97.8	99.6	98.8	5.71	6.87	6.31	6.30	6098a
"	4	43.1	97.9	96.0	79.0	2.46	4.75	6.30	4.50	4356abc
Velsicol 438	2	63.3	86.5	48.9	66.2	2.91	6.21	3.19	4.10	3969abc
"	3	97.2	69.7	84.2	83.7	6.68	4.56	4.66	5.30	5130abc
"	4	79.2	61.1	79.5	73.3	4.39	3.80	3.98	4.06	3930bc
Clipping(check)	0	78.5	62.9	47.5	63.0	2.15	2.42	1.94	2.17	2101d
Bromoxynil	¼	84.6	94.3	33.8	70.9	5.02	3.51	2.00	3.51	3398cd
"	5/16	98.9	86.1	95.2	93.4	6.29	4.86	5.70	5.62	5440ab
"	3/8	97.5	83.1	83.2	87.9	5.32	4.07	3.81	4.40	4259abc
"	½	91.9	70.8	90.8	84.5	4.11	3.98	5.35	4.48	4337abc

1/ Items followed by the same letter do not differ significantly at the 5% level. Duncan's Multiple Range Test.

x̄	84.98	x̄	4595
S.E.x̄	8.37056	S.E.x̄	586.21
C.V.%	9.85	C.V.%	12.78

ANALYSIS OF VARIANCE

Source	D.F.	M.S.	F.	D.F.	M.S.	F.
Replications	2	200.385	.9	2	.28187	
Treatment	22	293.41454	1.39	22	2.35256	2.13*
Error	44	210.19863		44	1.10389	
Total	68			68		

Table 15 . Yield data from herbicide study based on legume percentage of total dry matter produced. (Red Clover) Grown on the Northwestern Montana Branch Station in 1969.

Treatment		% Legume				Legume #/plot				#/A
Herbicide	Rate #/A	I	II	III	$\bar{x}$	I	II	III	$\bar{x}$	Legume
EPTC	2	95.2	73.4	45.0	71.2ab[1/]	2.98	2.32	1.49	2.26	2188
"	4	31.7	59.1	23.4	38.1bc	1.25	1.49	.88	1.21	1171
"	6	53.3	62.0	82.3	65.9abc	1.93	1.95	2.99	2.29	2217
EPTC + Bromoxynil	2 + $\frac{1}{4}$	52.2	47.6	65.2	55.0abc	1.50	1.29	3.54	2.11	2042
" "	4 + $\frac{1}{4}$	90.1	69.4	60.4	73.3a	2.62	1.59	1.48	1.90	1839
" "	6 + $\frac{1}{4}$	87.0	92.6	50.2	76.6a	2.05	2.09	1.67	1.94	1878
" "	2 +5/16	29.8	48.1	94.6	57.5abc	.76	1.48	2.47	1.57	1520
" "	4 +5/16	77.0	58.3	80.2	71.8ab	2.28	1.26	2.55	2.03	1965
" "	6 +5/16	86.6	77.4	90.3	84.8a	3.23	1.60	1.53	2.12	2052
" "	2 +3/8	75.4	84.4	62.6	74.1a	2.03	2.12	1.78	1.98	1917
" "	4 +3/8	63.3	90.5	73.3	75.7a	1.69	2.00	1.70	1.80	1742
" "	6 +3/8	89.9	59.2	98.9	82.7a	2.17	1.83	3.03	2.34	2265
Benefin	2	83.8	86.2	93.7	87.9a	3.00	1.55	1.34	1.96	1897
"	3	85.6	73.4	86.6	81.9a	3.05	2.04	3.12	2.74	2652
"	4	87.6	85.7	79.1	84.1a	2.41	1.52	1.94	1.96	1897
Velsicol 438	2	65.5	89.3	36.8	63.9abc	1.59	2.44	1.59	1.87	1810
"	3	26.6	49.3	29.6	35.2c	1.29	1.39	1.14	1.27	1229
"	4	25.5	34.0	46.0	35.2c	1.14	.86	1.69	1.23	1191
Clipping(check)	0	69.2	41.0	63.2	57.8abc	1.56	1.16	2.37	1.70	1646
Bromoxynil	$\frac{1}{4}$	70.3	94.5	81.7	82.2a	1.33	2.57	1.57	1.82	1762
"	5/16	67.7	81.2	80.8	76.6a	.89	2.21	3.73	2.28	2207
"	3/8	84.3	24.4	83.9	64.2abc	.39	.50	1.42	.77	745
"	$\frac{1}{2}$	75.2	40.2	66.2	60.5abc	1.68	.86	2.49	1.68	1626

1/ Items followed by the same letter do not differ significantly at the 5% level. Duncan's Multiple Range Test

$\bar{x}$	67.7	$\bar{x}$	1800
S.E.$\bar{x}$	10.33493	S.E.$\bar{x}$	381.58
C.V.%	15.28	C.V.%	20.17

ANALYSIS OF VARIANCE

Source	D.F.	M.S.	F.	D.F.	M.S.	F.
Replications	2	39.505		2	.95839	2.05
Treatment	22	731.88818	2.28*	22	.57669	1.23
Error	44	320.43272		44	.46621	
Total	68			68		

Table 16 . Summary of legume yields from herbicide study in 1969

Treatment		Alfalfa		Sainfoin		Clover	
Herbicide	Rate #/a	%	#/A	%	#/A	%	#/A
EPTC	2	81.0a-e[1]	3388a-e	75.4	3843bcd[1]	71.2ab[1]	2188
"	4	78.8a-e	4008a-e	81.5	4375abc	38.1bc	1171
"	6	90.9a-d	4724ab	85.7	5082abc	65.9abc	2217
EPTC + Bromoxynil	2 + ¼	93.6ab	4220a-e	88.2	5440ab	55.0abc	2042
" "	4 + ¼	94.6ab	4588abc	93.3	5043abc	73.3a	1839
" "	6 + ¼	96.5ab	4453a-d	82.0	4288abc	76.6a	1878
" "	2 + 5/16	93.2ab	4250a-e	92.0	4540abc	57.5abc	1520
" "	4 + 5/16	80.7a-e	3756a-e	87.2	4821abc	71.8ab	1965
" "	6 + 5/16	79.2a-e	3485a-e	88.9	4511abc	84.8a	2052
" "	2 + 3/8	87.1a-d	4114a-e	95.4	5711ab	74.1a	1917
" "	4 + 3/8	94.5ab	4191a-e	96.9	4908abc	75.7a	1742
" "	6 + 3/8	87.0a-d	4898a	92.7	4540abc	82.7a	2265
Benefin	2	91.3abc	3940a-e	94.9	5556ab	87.9a	1897
"	3	93.3ab	3920a-e	98.8	6098a	81.9a	2652
"	4	97.8a	3669a-e	79.0	4356abc	84.1a	1897
Velsicol 438	2	81.9a-e	3262b-f	66.2	3969abc	63.9abc	1810
"	3	72.3b-e	3040b-f	83.7	5130abc	35.2c	1229
"	4	66.1de	2836d-f	73.3	3930bc	35.2c	1191
Clipping(check)	0	59.4e	1829f	63.0	2101d	57.8abc	1646
Bromoxynil	¼	88.4a-d	3736a-e	70.9	3398cd	82.2a	1762
"	5/16	82.3a-e	3659a-e	93.4	5440ab	76.6a	2207
"	3/8	80.2a-e	3165c-f	87.9	4259abc	64.2abc	745
"	½	66.4cde	1849e-f	84.5	4337abc	60.5abc	1626

1/ Items followed by the same letter do not differ significantly at the 5% level. Duncan's Multiple Range Test

TITLE: Chemical weed control in established stands of alfalfa.

PROJECT: Weed Investigations MS 754

YEAR: 1969

PERSONNEL: Leader - Vern R. Stewart
Cooperators - State Weed Research Committee
Chemical company R & D personnel (R. Scott, D. Finnerty)

LOCATION: Tutvedt Brothers Cattle Co. ranch, N. W. of Kalispell

DURATION: Indefinite

OBJECTIVES:
1. To measure the effectiveness of certain herbicides in the control of perennial weeds in established stands of alfalfa.
2. To measure the effect of the herbicides on the yields of forage.

SIGNIFICANT FINDINGS:

Terbacil was the most effective compound for overall weed control.

Total material from harvested area was found to be statistically non-significant. This is perhaps due to the weed content of plots where weed control was limited.

FUTURE PLANS:

No plans are current at this writing for additional work on established stand of alfalfa using herbicides.

MATERIALS AND METHODS:

Herbicides were applied November 1, 1968 to an established stand of alfalfa in the dormant stage, age unknown. The stand was established long enough that the encroachment of downy bromegrass (*Bromus tectorum* L.) and dandelion (*Taraxacum officinale* Weber) was very severe.

Herbicides were applied in water at a rate of 44.5 gal/A. Plot size was 10 x 20 feet. Applications were made when the temperature was 42°F. Humidity 50%.

Weed control estimates were made on a scale of 0-10. Yield of forage was obtained from an area 3 x 16 feet (48 sq. ft.)

Herbicides used in this study:

Common Name	Trade Name or Other	Chemical Name	Company
Terbacil	Sinbar	3-*tert*-butyl-s-chloro-6-methyluracil	DuPont
Diuron	Karmex	3(3,4-dichlorophenyl)-1,1-dimethylurea	DuPont
Simazine	Princep	2-chloro-4,6-bis(ithylamino)-s-triazine	Geigy
	GS 14254	2-*sec* butylanairo-4-ethylamiro-6-methoxy-s-triazine	Geigy

RESULTS AND DISCUSSION:

Terbacil was the most effective product in terms of weed control. At the 1.5 lbs/A rate only a few dandelions remained in the plot. Cheat grass was effectively controlled by this product. GS 14254 reduced weed population, but gave only about 60% overall weed control.

Yields were found to be statistically non-significant. However, no seperation of weeds and alfalfa were made in the study and the author feels this could make considerable difference on the legume yield.

In table 1 there is a complete tabulation of the data.

Table 1. Yield and weed control data from a herbicide study conducted in alfalfa on the Tutvedt Brothers Ranch, Kalispell, Montana in 1969.

Treatment		Plot wt in pounds 1/				Yield 2/	Weed	
Herbicide	Rate #/A	I	II	Total	$\bar{x}$	T/A	Score	Remarks
GS 14254	1.5	3.2186	3.0928	6.3114	3.1557	1.6	6	dandelion, cheatgrass, reduction in stand of all species, all are present
GS 14254	2.0	3.5042	3.7891	7.2933	3.6467	1.9	6	few dandelion and cheatgrass, once in a while a shepherdspurse, most species present, most of them reduced
Terbacil	1.0	2.8085	2.4845	5.2930	2.6465	1.4	8	few dandelion plants, few cheatgrass showing up, western wheatgrass looks pretty good, doesn't seem to be injured
Terbacil	1.5	3.2516	2.1296	5.3812	2.6906	1.4	9	few scattered dandelion plants, some unthrifty cheatgrass
Simazine	1.0	3.5809	2.6388	6.2197	3.1099	1.6	2	stand of alfalfa not very good, poor weed control, all species are present, reduction in number of shepherdspurse
Simazine	1.5	2.8845	3.1547	6.0392	3.0196	1.5	5	all species present, just reduced in numbers, almost complete elimination of shepherdspurse, some evidence of control of cheatgrass, dandelions are present and numerous.
Diuron	1.0	3.2043	3.8072	7.0115	3.5058	1.8	2	all species present, reduction of shepherdspurse, very poor control
Diuron	1.5	3.4572	3.2500	6.7072	3.3536	1.7	2	reduction of shepherdspurse, predominately cheatgrass and dandelion
Check	0.0	3.4347	3.1415	6.5762	3.2881	1.7	0	

1/ Dry matter
2/ Correct to 12% moisture

$\bar{x}$	1.6	4.2
F - Value for variety comparison	1.45	12.78
S.E.$\bar{x}$	.14292	.88192
L.S.D. (P. = .05)	N.S.	3.0
C.V.%	8.91	20.88

Date applied: 11/1/68
Temperature: 42°F.
Humidity: 50%
Wind velocity: Calm
Stage of growth: Dormant

TITLE: Control of field gromwell and other winter annuals in winter wheat.

PROJECT: Weed Investigations MS 754

YEAR: 1969

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

LOCATION: Northwestern Montana Branch Station, Field No. R-8a; 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 measure the effect of weed competition on winter wheat yields.
3. To determine effect of herbicides on individual varieties.

SIGNIFICANT FINDINGS:

1. There was no interaction between herbicide and varieties. Maloran caused considerable crop damage and wild oats grew in these plots where stands were reduced.

2. Bromoxynil alone and in combination with linuron provided excellent control of Silene conidea. Highest yields were obtained with the combination of R-11913 at 1 #/a and bromoxynil at 3/8 #/a.

It is interesting to note that the high yields in both these experiments were from plots treated with R-11913, yet little or no weed control.

MATERIALS AND METHODS:

Two experiments were conducted in 1968-69. A total of 10 herbicides were used at various rates and in combination.

Experiment 1 - The research plot located in field R-8a was designed to measure the effect of a herbicide on a specific grain variety. Eight varieties and nine herbicides were used in the study. The plots were laid out 10' wide, 112' long for the herbicide and the grain seed at right angles to herbicide treatment. Grain was seeded with a field grain drill in 14' widths. Herbicides were applied post emergence in the fall, except for spring treatments which are listed in Tables 1-4. Herbicides were applied with a research sprayer using 43.2 gallons of water per acre.

Plots were harvested with a ZuZu combine with two samples being taken per treatment, a total of 24 sq. feet. Samples were cleaned and weighed to measure yields and test weights.

MATERIALS AND METHODS: (con't)

These data were analyzed statistically and Duncan's Multiple range test was used to measure significance for variety yields and treatment yields.

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

Seeding was done September 28, 1968. Herbicide applications were made in the fall, November 11, 1968 and spring applications were made April 15 and May 15, 1969. Plots were harvested August 19, 1969.

In tabular form is climatic conditions at time of herbicide applications.

Condition	Fall	Spring	Spring 1/
Temperature	40 °F	50 °F	50 °F
Humidity	65%	48%	38%
Wind Velocity	Calm	1-2 mile/hr.	Calm
Cloud Cover	Cloudy	Partly Cloudy	Clear
Date	11/5/68	4/15/69	5/7/64

1/ Spring application of 2,4-D

Experiment 2 - Located in a field of Nugaines wheat on the Burton Isch farm the study contained 14 treatments using 9 herbicides at various rates and in various combinations. The study was a randomized block design in three replications. Plots were 10' x 20 sq. feet. Two samples of 36 square feet were harvested from each plot to measure yields. The harvesting was done with a ZuZu combine.

Weed control scores were a visual observation on a scale of 0-10, where 0 was no control and 10 complete control. The primary weed species was Silene conedia.

Climatic conditions at time of spraying and dates follow in tabular form.

Condition	Spring	Spring 1/
Application Date	4/17/69	5/7/69
Temperature	48 °F	50 °F
Humidity	55%	38%
Wind Velocity	Calm	Calm
Cloud Cover	Cloudy	Clear

1/ Application of 2,4-D

MATERIALS AND METHODS: (con't)

The following chemicals were used:

Common Name	Trade Name or other	Chemical Name	Company
bromoxynil	Brominal Buctril	3,5-dibromo-4-hydroxybenzonitrile(4-cyano-2,6-dibromophenol)	Amchem Chipman
2,4-D		2,4-dichlorophenoxyacetic acid	
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	
	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	
picloram	Tordon	-4-amino-3,5,6-trichloropicolinic acid	
	R11913	no chemistry available to the author	
	Maloran	-3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea	

RESULTS AND DISCUSSION:

Experiment 1 - Yields were above average in all treatments. Significant differences were found between varieties and between herbicide treatments. The highest yielding treatment, R-11913, also was the poorest weed control, giving little or no control of field gromwell (Lithospernum arvense L.) The combination of bromoxynil plus MCPA (3/8 + 3/8 #/a) is the second highest yielding treatment and not significantly different from R-11913, however weed control was excellent in this treatment of all species present. 2,4-D caused damage to most varieties but was most severe on Delmar. It provided little weed control. The fall application of bromoxynil gave excellent control of gromwell but did not control spring emerging annuals. See Table 4 and 5 for weed control data. Maloran reduced wheat stands by 50%, which was replaced by a high population of wild oats (Anena fatua), however yields were somewhat higher than the check. R-11913, BASF 2440 and 2,4-D were not effective in the control of field gromwell.

Variety yields were significantly different as is seen in Table 2, with Nugaines being the highest yielding entry. Based on performance data from variety nurseries this yield pattern could be expected. The analysis of the data show no interaction between varieties and herbicides.

Test weight of all varieties and by treatments are found in Table . Complete tabulation of all data is found in Table 1.

RESULTS AND DISCUSSION: (con't)

Experiment 2 - Silene conidea L. emerges in early spring in fall seeded winter wheat. It is resistant to 2,4-D if sprayedat the time winter wheat can tolerate 2,4-D without injury.

Linuran and bromoxynil alone and in combination at various rates (Table 6) provide effective weed control. Linuron at 1/8 #/a + bromoxynil at 1/8 #/a caused some crop injury. This same combination at $\frac{1}{2}$ + $\frac{1}{2}$ caused thinning of stand. Tordon, 2,4-D and R-11913 did not control Silene conidea.

Yields were significantly reduced by Linuron at $\frac{1}{2}$ #/a and bromoxynil at $\frac{1}{2}$ #/a. Maloran also caused some reduction in yield. It is interesting to note that R-11913 (1 #/a) + bromoxynil (3/8 #/a) was the highest yielding treatment. R-11913 at 1 #/a was also the highest yielding treatment in Experiment 1. See Table 6 for complete details of this study.

Table 1. Yield and test weight data from herbicide study on winter wheat grown on the Northwestern Montana Branch Station, Field No. R-8a, Kalispell, Montana in 1969.

Treatment			Cheyenne					Crest				
	Rate		Yield				Test Wt	Yield				Test Wt
Herbicide	#/A		I	II	III	Total	Lbs/Bu	I	II	III	Total	Lbs/Bu
Check	0	A	86.2	64.5	43.6			57.7	57.7	46.6		
		B	69.0	49.6	53.5			59.9	48.9	58.3		
		T	155.2	114.1	97.1	366.4		117.6	106.6	104.9	329.1	
		$\bar{x}$				61.1	60.2				54.8	61.0
Bromoxynil	3/8	A	74.0	71.8	46.5			49.7	74.4	68.7		
		B	49.5	83.4	63.1			48.6	91.1	41.1		
		T	123.5	155.2	109.6	388.3		98.3	165.5	109.8	373.6	
		$\bar{x}$				64.7	60.5				62.3	61.3
G 14260	1	A	63.4	70.3	49.4			66.5	77.4	44.1		
		B	68.9	69.1	46.1			70.7	97.2	66.1		
		T	132.3	139.4	95.5	367.2		137.2	174.6	110.2	422.0	
		$\bar{x}$				61.2	60.8				80.3	61.5
Linuron	½	A	75.8	56.3	58.2			86.8	71.7	72.1		
		B	88.1	63.1	49.9			78.1	67.1	51.8		
		T	163.9	119.4	108.1	391.4		164.9	138.8	123.9	427.6	
		$\bar{x}$				65.2	61.1				71.3	61.3
Karmex	½	A	88.3	61.1	47.7			80.5	64.1	82.0		
		B	92.0	55.7	67.9			84.4	77.2	42.5		
		T	180.3	116.8	115.6	412.7		164.9	141.3	124.5	430.7	
		$\bar{x}$				68.8	60.4				71.8	60.9
R 11913	1	A	92.2	65.7	60.3			91.1	66.1	61.7		
		B	85.8	67.0	56.0			77.7	87.8	61.9		
		T	178.0	132.7	116.3	427.0		168.8	153.9	123.6	446.3	
		$\bar{x}$				71.2	60.9				74.4	61.1
MCP +	3/8	A	52.4	66.3	59.7			64.7	65.9	63.7		
Bromoxynil	3/8	B	92.0	67.1	56.9			63.9	77.3	74.2		
		T	144.4	133.4	116.6	394.4		128.6	143.2	137.9	409.7	
		$\bar{x}$				65.7	61.0				68.3	61.0
2,4-DLV	1	A	63.6	59.1	41.7			64.5	73.3	52.3		
		B	71.1	39.6	58.4			64.1	40.1	51.1		
		T	134.7	98.7	100.1	333.5		128.6	113.4	103.4	345.4	
		$\bar{x}$				55.6	60.7				57.6	61.0
BASF 2440	.9	A	88.0	75.5	52.9			75.4	80.5	47.3		
		B	91.9	69.8	44.2			79.5	80.1	47.2		
		T	179.9	145.3	97.1	422.3		154.9	160.6	94.5	410.0	
		$\bar{x}$				70.4	60.9				68.3	61.1

Table 1. (con't)

Treatment Herbicide	Rate #/A		Cheyenne Yield I	Cheyenne Yield II	Cheyenne Yield III	Cheyenne Yield Total	Cheyenne Test Wt Lbs/Bu	Crest Yield I	Crest Yield II	Crest Yield III	Crest Yield Total	Crest Test Wt Lbs/Bu
Maloran	1	A	80.5	76.4	45.1			59.2	72.3	70.6		
		B	67.5	63.7	50.2			62.5	70.7	53.7		
		T	148.0	140.1	95.3	383.4		121.7	143.0	124.3	389.0	
		$\bar{x}$				63.9	60.4				64.8	60.3
Bromoxynil	5/16	A	64.6	62.1	62.9			77.3	73.3	50.8		
		B	26.4	64.5	55.5			34.7	56.4	47.3		
		T	91.0	126.6	118.4	336.0		112.0	129.7	98.1	339.8	
		$\bar{x}$				56.0	60.4				56.6	61.5
			Delmar					Nugaines				
Check	0	A	40.8	66.1	44.8			44.7	64.1	36.5		
		B	43.6	50.3	63.7			54.9	55.1	51.1		
		T	84.4	116.4	108.5	309.3		99.6	119.2	87.6	306.4	
		$\bar{x}$				51.5	60.6				51.1	61.2
Bromoxynil	3/8	A	59.2	68.1	49.9			66.9	84.1	54.9		
		B	46.7	50.5	49.4			54.4	89.8	48.5		
		T	105.9	118.6	99.3	323.8		121.3	173.9	103.4	398.6	
		$\bar{x}$				57.0	61.0				66.4	61.3
G 14260	1	A	58.1	65.0	50.5			73.6	83.1	56.1		
		B	55.0	54.9	45.8			72.9	84.6	63.3		
		T	113.1	119.9	96.3	329.3		146.5	167.7	119.4	433.6	
		$\bar{x}$				54.9	61.0				72.3	61.2
Linuron	½	A	67.3	61.6	65.5			75.3	67.2	64.5		
		B	64.1	52.5	62.1			86.0	81.3	58.4		
		T	131.4	114.1	127.6	373.1		161.3	148.5	122.9	432.7	
		$\bar{x}$				62.2	60.5				72.1	61.3
Karmex	½	A	75.0	50.4	65.9			82.4	54.5	75.1		
		B	66.7	66.5	39.8			80.3	66.6	45.5		
		T	141.7	116.9	105.7	364.3		162.7	121.1	120.6	404.4	
		$\bar{x}$				60.7	60.6				67.4	61.6
R 11913	1	A	59.4	53.8	54.7			75.1	86.3	73.9		
		B	80.0	73.7	50.4			76.8	92.8	64.7		
		T	139.4	127.5	105.1	372.0		151.9	179.1	138.6	469.6	
		$\bar{x}$				62.0	61.0				78.3	61.1
MCP +	3/8	A	63.5	59.1	57.7			88.2	86.2	63.2		
Bromoxynil	3/8	B	68.3	67.7	59.9			71.3	92.8	62.0		
		T	131.8	126.8	117.6	376.2		159.5	179.0	125.2	463.7	
		$\bar{x}$				62.7	59.5				77.3	61.1

Table 1. (con't)

Treatment			Delmar Yield				Test Wt	Nugaines Yield				Test Wt
Herbicide	Rate #/A		I	II	III	Total	Lbs/Bu	I	II	III	Total	Lbs/Bu
2,4-DLV	1	A	68.3	65.2	57.6			59.4	78.7	53.1		
		B	59.7	46.7	51.5			64.0	39.8	60.6		
		T	128.0	111.9	109.1	349.0		123.4	118.5	113.7	355.6	
		$\bar{x}$				58.2	60.8				59.3	61.0
BASF 2440	.9	A	73.7	72.0	50.1			66.8	70.1	54.1		
		B	89.0	69.9	59.1			72.7	67.7	52.9		
		T	162.7	141.9	109.2	413.8		139.5	137.8	107.0	384.3	
		$\bar{x}$				68.9	60.7				64.0	60.5
Maloran	1	A	53.3	54.9	42.0			64.4	88.2	56.3		
		B	78.1	52.5	49.5			78.8	68.5	63.1		
		T	131.4	107.4	91.5	330.3		143.2	156.7	119.4	419.3	
		$\bar{x}$				55.0	60.4				69.9	59.5
Bromoxynil	5/16	A	76.3	61.5	57.0			84.7	87.1	61.7		
		B	47.0	66.4	52.1			38.4	97.6	51.5		
		T	123.3	127.9	109.1	360.3		123.1	184.7	113.2	421.0	
		$\bar{x}$				60.0	60.9				70.2	61.6
			McCall					Wanser				
Check	0	A	49.1	48.7	53.7			48.5	48.9	47.1		
		B	68.3	43.3	68.1			52.5	62.7	70.8		
		T	117.4	92.0	121.8	331.2		101.0	111.6	117.9	330.5	
		$\bar{x}$				55.2	61.2				55.1	61.3
Bromoxynil	3/8	A	66.1	70.1	72.3			52.1	71.9	49.7		
		B	56.4	75.9	59.0			59.5	70.3	37.0		
		T	122.5	146.0	131.3	399.8		111.6	142.2	86.7	340.5	
		$\bar{x}$				66.6	60.8				56.7	61.7
G 14260	1	A	65.7	65.8	67.8			56.5	66.3	56.1		
		B	50.1	73.8	79.7			74.6	51.9	65.5		
		T	115.8	139.6	147.5	402.9		131.1	118.2	121.6	370.9	
		$\bar{x}$				67.1	61.2				61.8	61.1
Linuron	½	A	60.6	68.5	78.8			72.6	71.3	69.8		
		B	61.3	67.1	66.1			76.0	65.5	64.4		
		T	121.9	135.6	144.9	402.4		148.6	136.8	134.2	419.6	
		$\bar{x}$				68.0	61.0				69.9	61.5
Karmex	½	A	77.1	59.0	87.1			62.5	63.3	77.6		
		B	58.1	64.1	57.1			67.8	71.5	50.8		
		T	135.2	123.1	144.2	402.5		130.3	134.8	128.4	393.5	
		$\bar{x}$				67.1	61.1				65.6	61.3

Table 1 . (con't)

Treatment Herbicide	Rate #/A		McCall Yield I	McCall Yield II	McCall Yield III	McCall Yield Total	Test Wt Lbs/Bu	Wanser Yield I	Wanser Yield II	Wanser Yield III	Wanser Yield Total	Test Wt Lbs/Bu
R 11913	1	A	75.1	57.6	85.6			63.6	80.2	70.0		
		B	61.1	73.1	77.5			76.3	89.2	78.6		
		T	136.2	130.7	163.1	430.0		139.9	169.4	148.6	457.9	
		$\bar{x}$				71.7	61.2				76.3	61.5
MCP +	3/8	A	65.8	64.1	67.0			65.1	80.0	66.1		
Bromoxynil	3/8	B	82.8	72.9	68.5			73.7	82.7	74.9		
		T	148.6	137.0	135.5	421.1		138.8	162.7	141.0	442.5	
		$\bar{x}$				70.2	61.3				73.8	61.7
2,4-DLV	1	A	64.3	65.7	59.3			57.8	78.9	52.0		
		B	71.3	28.8	64.0			53.1	62.6	63.5		
		T	135.6	94.5	123.3	353.4		110.9	141.5	115.5	367.9	
		$\bar{x}$				58.9	61.0				61.3	61.6
BASF 2440	.9	A	80.3	71.2	65.4			64.2	78.3	59.7		
		B	77.8	73.9	62.1			65.4	79.2	65.1		
		T	158.1	145.1	127.5	430.7		129.6	157.5	124.8	411.9	
		$\bar{x}$				71.8	61.4				68.6	61.5
Maloran	1	A	56.3	51.5	68.4			56.5	69.7	62.1		
		B	70.3	61.1	63.9			63.0	66.3	58.4		
		T	126.6	112.6	132.3	371.5		119.5	136.0	120.5	376.0	
		$\bar{x}$				61.9	60.7				62.6	60.7
Bromoxynil	5/16	A	102.6	60.8	57.9			84.8	74.4	49.7		
		B	53.8	64.9	67.1			53.9	76.4	37.0		
		T	156.4	125.7	125.0	407.1		138.7	150.8	86.7	376.2	
		$\bar{x}$				67.9	61.2				62.7	61.6
			Westmont					Winalta				
Check	0	A	53.7	51.4	23.5			36.3	63.7	33.3		
		B	55.1	56.1	42.7			54.7	54.0	51.7		
		T	108.8	107.5	66.2	282.5		91.0	117.7	85.0	293.7	
		$\bar{x}$				47.1	--				48.9	61.5
Bromoxynil	3/8	A	59.1	66.3	60.8			76.4	64.1	26.1		
		B	47.1	70.1	49.7			51.5	73.3	27.1		
		T	106.2	136.4	110.5	353.1		127.9	137.4	53.2	318.5	
		$\bar{x}$				58.8	61.0				53.1	61.1
G 14260	1	A	60.8	54.3	40.5			60.1	64.6	49.8		
		B	50.8	62.3	57.6			75.3	70.5	56.2		
		T	111.6	116.6	98.1	326.3		135.4	135.1	106.0	376.5	
		$\bar{x}$				54.4	60.9				62.7	60.9

Table 1. (con't)

Treatment			Westmont Yield				Test Wt	Winalta Yield				Test Wt
Herbicide	Rate #/A		I	II	III	Total	Lbs/Bu	I	II	III	Total	Lbs/Bu
Linuron	½	A	65.1	66.9	63.9			72.7	59.7	60.0		
		B	70.9	54.9	58.5			74.9	62.6	53.4		
		T	136.0	121.8	122.4	380.2		147.6	122.3	113.4	383.3	
		$\bar{x}$				63.4	60.9				63.9	61.1
Karmex	½	A	75.4	53.3	67.9			75.6	67.3	59.0		
		B	72.3	54.0	35.7			73.7	64.7	55.7		
		T	147.7	107.3	103.6	358.6		149.3	132.0	114.7	396.0	
		$\bar{x}$				59.8	60.8				66.0	61.1
R 11913	1	A	84.2	56.6	60.8			75.2	62.3	56.9		
		B	76.9	58.5	62.0			70.7	66.2	55.2		
		T	161.1	115.1	122.8	399.0		145.9	128.5	112.1	386.5	
		$\bar{x}$				66.5	61.1				64.4	60.7
MCP +	3/8	A	69.1	59.9	58.0			68.6	58.4	54.8		
Bromoxynil	3/8	B	73.6	64.9	65.1			71.3	74.0	59.1		
		T	142.7	124.8	123.1	390.6		139.9	132.4	113.9	386.2	
		$\bar{x}$				65.1	60.7				64.4	60.9
2,4-DLV	1	A	71.5	68.1	32.3			62.3	62.7	42.4		
		B	73.8	37.1	27.2			64.0	29.3	49.3		
		T	145.3	105.2	59.5	310.0		126.3	92.0	91.7	310.0	
		$\bar{x}$				51.7	60.9				51.7	60.4
BASF 2440	.9	A	69.2	68.1	24.7			67.8	60.2	43.6		
		B	70.8	65.5	32.5			62.9	55.6	49.0		
		T	140.0	133.6	57.2	330.8		130.7	115.8	92.6	339.1	
		$\bar{x}$				55.1	60.7				56.5	60.5
Maloran	1	A	50.7	67.5	60.5			53.6	64.7	46.0		
		B	60.9	54.6	53.2			60.0	67.6	47.8		
		T	111.6	122.1	113.7	347.4		113.6	132.3	93.8	339.7	
		$\bar{x}$				57.9	60.3				56.6	59.3
Bromoxynil	5/16	A	73.7	63.9	56.9			70.4	65.7	37.5		
		B	51.1	60.2	40.7			47.7	53.5	34.8		
		T	124.8	124.1	97.6	346.5		118.1	119.2	72.3	309.6	
		$\bar{x}$				57.7	61.1				51.6	59.3

Table 2. Summary of data from herbicide study on certain varieties of winter wheat conducted at the Northwestern Montana Branch Station, Kalispell, Field No. 8a, in 1969.

Treatment		Varieties										
		Yield Bushel/Acre										Weed[3]
Herbicide	Rate #/A	Nugaines	McCall	Crest	Wanser	Cheyenne	Delmar	Winalta	Westmont	$\bar{x}$	Test Wt. Bu/Acre	Score 0-10
R 11913	1	78.3	71.7	74.4	76.3	71.2	62.0	64.4	66.5	70.6a	61.1	1
MCP + Bromoxynil	3/8 + 3/8	77.3	70.2	68.3	73.8	65.7	62.7	64.4	65.1	68.4ab	60.9	10
Linuron	½	72.1	67.1	71.3	69.9	65.2	62.2	63.9	63.4	66.9a-c	61.1	10
Karmex	½	67.4	67.1	71.8	65.6	68.8	60.7	66.0	59.8	65.9a-d	61.0	10
BASF[1]	.9	64.1	71.8	68.3	68.7	70.4	69.0	56.5	55.1	65.5a-d	60.9	3
Igran	1	72.3	67.2	70.3	61.8	61.2	54.9	62.8	54.4	63.1b-d	61.1	10
Maloran	1	69.9	61.9	64.8	62.7	63.9	55.1	56.6	57.9	61.6c-e	60.2	10
Bromoxynil	5/16	70.2	67.9	56.6	62.7	56.0	60.1	51.6	57.8	60.3de	61.0	10
Bromoxynil	3/8	66.4	66.6	62.3	56.8	64.7	54.0	53.1	58.9	60.3de	61.1	10
2,4-DLV[2]	1	59.3	58.9	57.6	61.3	55.6	58.2	51.7	51.7	56.8e	60.9	2
Check	0	51.1	55.2	54.9	55.1	61.1	51.6	49.0	47.1	53.1f	61.0	0
$\bar{x}$		68.0a	66.0a	65.5a	65.0a	64.0a	59.1b	58.2b	58.0b			
Test Wt.	Lbs/Bu.	61.0	61.1	61.1	61.4	60.7	60.6	60.6	60.8			

1/ Applied April 15, 1969
2/ Applied May 7, 1969
3/ Gromwell control (see tables 4 & 5 for other details of weed control)

Table 3. Summary of test weight data from herbicide study of certain winter wheat varieties at the Northwestern Montana Branch Station, Kalispell, Field No. R 8a in 1969.

Treatment		Varieties								
	Rate	Test Weight Bushel/Acre								
Herbicide	#/A	Nugaines	McCall	Crest	Wanser	Cheyenne	Delmar	Winalta	Westmont	$\bar{x}$
R 11913	1	61.1	61.2	61.1	61.5	60.9	61.0	60.7	61.1	61.1
MCP +	3/8 +									
Bromoxynil 1/	3/8	61.1	61.3	61.0	61.7	61.0	59.5	60.9	60.7	60.9
Linuron	1/2	61.3	61.0	61.3	61.5	61.1	60.5	61.1	60.9	61.1
Karmex	1/2	61.6	61.1	60.9	61.3	60.4	60.6	61.1	60.8	61.0
BASF 1/	.9	60.5	61.4	61.1	61.5	60.9	60.7	60.5	60.7	60.9
Igran	1	61.2	61.2	61.5	61.1	60.8	61.0	60.9	60.9	61.1
Maloran	1	59.5	60.7	60.3	60.7	60.4	60.4	59.3	60.3	60.2
Bromoxynil	5/16	61.6	61.2	61.5	61.6	60.4	60.9	59.3	61.1	61.0
Bromoxynil	3/8	61.3	60.8	61.3	61.7	60.5	61.0	61.1	61.0	61.1
2,4-DLV 2/	1	61.0	61.0	61.0	61.6	60.7	60.8	60.4	60.9	60.9
Check	0	61.2	61.2	61.0	61.3	60.2	60.6	61.5		61.0
	$\bar{x}$	61.0	61.1	61.1	61.4	60.7	60.6	60.6	60.8	

1/ Applied April 15, 1969
2/ Applied May 7, 1969

Table 4. Weed control scores from herbicide study on winter wheat grown at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana. Field No. R-8a.

Treatment		Weed Control Score 2/			
Herbicide	Rate #/A	I	II	III	$\bar{x}$
Check	0	0	0	0	0
Bromoxynil	3/8	10	10	10	10
Igran	1	10	10	10	10
Linuron	½	10	10	10	10
Karmex	½	10	10	10	10
R-11913	1	0	0	3	1
MCP + bromoxynil 1/	3/8+3/8	10	9	10	10
2,4-DLV 1/	1	2	2	2	2
BASF 2440 1/	.9	3	3	3	3
Maloran 1/	1	10	10	10	10
Bromoxynil	5/16	10	10	10	10

1/ Spring applied
2/ 0 - 10: 0 = no control
10 = complete control

Table 5. Summary of weed control in herbicide study conduted at the Northwestern Montana Branch Station, Kalispell, Field No. R 8a in 1968-69.

Treatment		
Herbicide	Rate #/A	Discussion
R 11913	1	Little or no control of winter or spring broadleaved annuals.
MCP + Bromoxynil 1/	3/8 + 3/8	Excellent control of all annual broadleaved weeds.
Linuron	1/2	Spring emergence of field pennycress, wild buckwheat and mustard.
Karmex	1/2	Very limited number of spring annual emerging generally excellent overall weed control.
BASF 1/	.9	Fair control of other annuals, but poor control of gromwell.
Igran	1	Spring emergence of small podded false flax, mustard and field pennycress.
Maloran	1	Excellent weed control. Considerable injury to wheat and thinning of stand. High population of wild oats emerged later in the growing season.
Bromoxynil	5/16	Spring emergence of field pennycress, mustard and wild buckwheat.
Bromoxynil	3/8	Spring emergence of field pennycress, mustard, wild buckwheat, and small podded false flax.
2,4-DLV 2/	1	Considerable injury to wheat, some control of gromwell, effective control of other broad leaved weeds.
Check	0	High population of gromwell and other species listed above.

1/ Applied April 15, 1969
2/ Applied May 7, 1969

Table 6. Yield and weed control data from herbicide study conducted on the Burton Isch farm, Kalispell, Montana in 1969, in nugaines winter wheat. Readings made May 12, 1969.

Treatment			Yield Bushel/Acre					Weed	
Herbicide	Rate #/A		I	II	III	Total	$\bar{x}$	Score	Remarks
Linuron	½	A	51.1	77.2	43.8	172.1			
		B	56.5	71.0	47.0	174.5			
		Total	107.6	148.2	90.8	346.6	57.8cdef[1/]	9	
Bromoxynil	3/8	A	65.5	70.2	52.3	188.0			
		B	62.7	70.9	51.7	185.3			
		Total	128.2	141.1	104.0	373.3	62.2bc	10	
Linuron + Bromoxynil	1/8 + 1/8	A	59.4	64.1	26.5	150.0			
		B	58.1	68.1	48.6	174.8			
		Total	117.5	132.2	75.1	324.8	54.1def	10	some crop injury
Linuron + Bromoxynil	1/4 + 1/8	A	57.3	76.4	46.6	180.3			
		B	55.0	71.6	44.7	171.3			
		Total	112.3	148.0	91.3	351.6	58.6cde	10	some crop injury
Linuron + Bromoxynil	½ + ½	A	49.4	59.4	44.1	152.9			some thinning of plants,
		B	54.1	57.4	40.4	151.9			
		Total	103.5	116.8	84.5	304.8	50.8f	10	some crop injury
Tordon	½ oz	A	56.1	60.0	59.8	175.9			
		B	64.0	70.6	53.6	188.2			
		Total	120.1	130.6	113.4	364.1	60.7bcd	0	
Bromoxynil + MCP	3/8 + 3/8	A	63.4	58.7	41.3	163.4			
		B	62.6	61.4	37.6	161.6			
		Total	126.0	120.1	78.9	325.0	54.2def	10	
BASF 2440	1	A	63.5	52.7	55.0	171.2			
		B	61.6	53.3	51.2	166.1			
		Total	125.1	106.0	106.2	337.3	56.2cdef	1	
Maloran	1	A	64.4	54.6	38.6	157.6			poor weed control -
		B	73.3	51.5	34.9	159.7			apparent crop injury
		Total	137.7	106.1	73.5	317.3	52.9ef	10	thinning of stand
R 11913	1	A	75.9	62.2	71.1	209.2			maybe wheat injury,
		B	68.3	58.5	71.3	198.1			leaving some plants
		Total	144.2	120.7	142.4	407.3	67.9ab	3	
R 11913 + Bromoxynil	1 + 3/8	A	70.3	73.9	74.6	218.8			
		B	64.8	74.1	66.1	205.0			
		Total	135.1	148.0	140.7	423.8	70.6a	10	

Table 6. (con't)

Treatment Herbicide	Rate #/A		Yield Bushel/Acre I	II	III	Total	$\bar{x}$	Weed Score	Remarks
Tordon	½ oz +	A	67.0	66.2	51.2	184.4			Some wheat injury
Bromoxynil	1/8	B	64.4	69.7	41.5	175.6			leaving some
		Total	131.4	135.9	92.7	360.0	60.0cde	9	plants
2,4-DLV 2/	½	A	64.4	57.8	59.6	181.8			sprayed later with
		B	61.2	56.6	58.0	175.8			2,4-D,doesn't look
		Total	125.6	114.4	117.6	357.6	59.6cde	2	like any control
Check	0	A	64.9	60.1	45.2	170.2			
		B	69.2	60.1	45.2	174.5			
		Total	134.1	120.2	90.4	344.7	57.5cdef	0	

1/ values followed by letters not in common are significantly different at the 5% level by Ducan's multiple range test.

$\bar{x}$	58.8	6.7
F. value for treatment comparison	11.33**	40.50**
S.E.$\bar{x}$	2.30592	.68784
C.V.%	3.92	10.24

Application Date:	4/17/69	5/7/69 2/
Temperature:	48° F	50° F
Wind velocity:	calm	calm
Humidity:	55	38
Cloud cover:	cloudy	clear

TITLE: Control of annual weeds in spring barley

PROJECT: Weed Investigations MS 754

YEAR: 1969

PERSONNEL: Leader: Vern R. Stewart
Cooperators: Weed Research Committee, chemical company R & D personnel (C. H. Slater)

LOCATION: M. C. Roberts farm (later in season this was acquired by the experiment station)

DURATION: One year

OBJECTIVES: To determine the effect of incorporating triallate and 2,4-D for the control of wild oat (Avena fatua) and many other broadleaved species.

SIGNIFICANT FINDINGS:

Little or no weed control was obtained with the combination of Avadex B.W. and 2,4-D preplant incorporated. A slight yield reduction was noted where 2,4-D and triallate were used in combination.

FUTURE PLANS: None

MATERIALS AND METHODS:

The herbicides S-2,3,3-trichloroallyl N,N-diisopropylthiolcarbmate (triallate) and 2,4 dichlorophenoxyacetic acid (2,4-D) were surface incorporated in a seed field in spring barley, cultivar 'Ingrid'. This incorporation was done with a spike tooth harrow, by harrowing in two directions at right angles.

Applications were made with a McGregor field type sprayer. Plots were 22 feet wide and approximately 1200 feet long. The plots were harvested with a self-propelled combine. An area of 11,584 square feet (16' x 724') was harvested for yield.

Weed evaluations were made early in the growing season using a scale of 0-10 with 0 being no control and 10 complete control.

RESULTS AND DISCUSSIONS:

The wild oat population in this field was not as high as was anticipated, by the author, therefore the effectiveness of triallate in this test was not a good measure for wild oat control. Broadleaf weed control was not satisfactory with 2,4-D alone or in combination with triallate.

Barley yields from plots treated with triallate alone and in combination with 2,4-D were 9.6 bu/a to 19.6 bu/a below the check (95.3 bu/a).

Plots treated with 2,4-D at .75 lb/a and 1.00 lb/a were slightly higher in yield than the check (95.3 bu/a) with a range of 2.2 bu/a to 6.2 bu/a, however the 1.25 lb/a rate caused only a very small reduction in yield which is probably not significant. Table 1.

Table 1. Yield and weed control data from herbicide study on spring barley (Cultivar 'Ingrid') grown on the M. C. Roberts farm, Kalispell, Montana in 1969.

Planting date: May 5, 1969
Herbicide Application: May 9, 1969
Size of plot: 11,584 square feet

Treatment		Weed[1/] Score	Plot Yield	Yield
Herbicide	Rate #/A	0-10	Pound	Bu/A
Triallate	1.25	0	1135	83.8
Triallate + 2,4-D	1.25 + .75	1	1160	85.7
Triallate + 2,4-D	1.25 + 1.0	1	1205	75.7
Check	0	0	1290	95.3
2,4-D	.75	2	1375	101.5
2,4-D	1.0	2	1320	97.5
2,4-D	1.25	2	1285	94.9
			$\bar{x}$	90.6

1/ 0-10 (0 = no control; 10 = complete control)

Climatic data at application:

Temperature	(air):	55°
	(soil 2")	51°
	(soil 4")	50°
Wind		Calm

TITLE: Small Grain Investigations

PROJECT: Spring Barley MS 756

YEAR: 1969

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

LOCATION: Northwestern Montana Branch Station, Field A-1a, Y-6, off station locations in Ravalli, Lake, Missoula and Flathead 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. Ingrid continues as the outstanding irrigated variety, however the varieties Zepher and Centennial are also high yielding varieties.
2. There are several varieties under dryland conditions that are equal to or superior to Piroline. However, most of these have been grown only two years.
3. C.I. 11868 is the leading variety under irrigation for yield in western Montana in 1969.

FUTURE PLANS: Continue to cooperatie 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 provided by Ramage of Arizona and Suneson of the East Lake Shore were grown on the station. Selections and bulk harvests were made from these materials.

Fourteen individual tests were conducted in 1969 under dryland and irrigated conditions. The Interstate nurseries contained 32 entries (dry and irrigated). The four off station nurseries consisted of ten entries. The Composite Cross II yield nursery, dry and irrigated, contained sixteen entries, the remaining six experiments were genetic on various plant characteristics.

One and one-half inches of water was applied June 23, to just 2/3 of the area in the nursery plots. During this period a heavy rainfall occurred and a decision was made that there was adequate moisture for the crop and additional irrigation would result in considerable damage.

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 were above average in 1969. Zepher and Ingrid were the highest yielding entries. Hembar, a hybrid line, was just 7 bushel less in yield than Ingrid, however this difference was not statistically significant. Table 1. Betzes was the highest yielding entry in the dryland nursery. In spite of the variance in yields the data were found to be non-significant when analyzed statistically. The yield difference and high C.V. are difficult to explain. Could have been in part due to stand and possible early spring emergence. Table 2.

Off Station:

Missoula County - Yields in this location were somewhat lower than would be expected under irrigated conditions. The yields were non-significant. Quackgrass in part of the nursery affected yields greatly. UT 174216, Shabet and Ingrid were the three top yielding entries. Table 3.

Ravalli County - None of the entries were significantly higher or lower in yield than Ingrid which is used as a check. See Table 4 for complete details.

Lake County - Growing conditions were excellent in this location. Yields were quite high, but not statistically significant. C.I. 11868 is the highest yielding entry. Table 5.

Flathead County - This test was grown under favorable moisture conditions and is included as an irrigated nursery for evaluation. Yields were found to be non-significant when analyzed statistically. Unitan is the highest yielding entry. Table 6.

Table 7,gives a summary of irriaged barley yields at the Northwestern Montana Branch Station, 1957-69 (ten years). For the ten years listed Ingrid is the leading variety when compared with Vantage, Betzes, Piroline and Unitan. Centennial, Zephyr and Hembar fora a period of one or two years are 100% or better in yield than Vantage which is used as a long time standard. Using Ingrid as the check, Centennial and Zepher, for a two year period, are the only varieties that exceed Ingrid in yield.

The dryland intra-state nurseries are summarized in Table 8. Most entries in the summary are superior in yield to Compana. Using Piroline as the long term check, several lines show promise and are superior in yield to it.

A summary of performance of 10 spring barley varieties is given in Table 9. C.I. 11868 is the leading variety for yield-74.2 bu/a, followed with Ingrid at 73.5 bu/a. Ingrid and Piroline are equal in test weight followed by C.I. 11868. Lodging was not a great factor considering all locations, but at the station UT 174216 had the weakest straw.

A yield trial of material from Composite Cross II was grown under both dryland and irrigated conditions. This cross is material developed by C. A. Suneson. The lines are in the F-15 to F-36 generation. Tables 10 and 11 show the generation and number of years grown at each particular location.

The standard varieties in the irrigated nursery out yields all the CC II lines except for Dekap. Test weights were superior in Ingrid and Unitan to CC II lines. These tow varieties had a higher % of plump kernels, however the protein levels were higher in the CC II lines. Table 10.

Results and Discussion (con't):

Yields were non-significant in the dryland study. Test weight of Ingrid, Unitan and Dekap were significantly higher than most CC II lines. Protein for the same varieties was lower than the CC II lines. Table 11.

The latin square design for the genetic materials were harvested and material sent to Bozeman for physical and statical analysis. These will be reported by Mr. R. F. Eslick in his section of the annual report.

Selection of male sterile plants were made from the bulk population provided by Ramage and Eslick. In addition a portion of the bulk was also harvested for future use.

The bulk population planted by Suneson was harvested, cleaned and sent to E. A. Hockett to be included with material grown at Bozeman.

Table 1. Agronomic data from intrastate irrigated barley yield nursery grown on the Northwestern Montana Branch Station, Kalispell, Montana in 1969. Field No. Y-6. Experimental design - random block, five replications.

Planting date: May 5, 1969 Harvest date: September 3, 1969
Size of plot : 16 square feet

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	6/64 Sieve Size
MT 510669	Zephyr	110.8	53.8	189	39.4	9.0	2.8	92.2
CI 10083	Ingrid 1/	109.3	53.5	191	42.8	28.0	3.2	94.6
CD 5914	Centennial	106.9	51.8	190	39.6	28.0	3.2	95.8
CI 6976	Glacier	105.9	47.6	180	37.8	76.0	4.6	95.4
CI 13334	Bet x HH 2x Pir 7698-62	103.8	52.1	187	40.0	22.0	3.2	92.8
CI 11868	BetxHaisaII2xPir 7155-60	103.0	52.5	187	41.4	32.0	4.0	92.0
AZ 31817	Hembar	102.2	49.0	170	37.0	46.0	5.0	77.2
MT 285086	Delta	100.7	53.8	187	37.8	25.0	1.6	96.0
CI 7324	Vantage	96.0	50.5	185	47.0	27.0	2.6	92.2
ID 614965	Pir x Aust 61AB4965	95.3	50.9	191	44.6	26.0	3.2	92.4
CI 13109	Primus	93.3	50.1	174	43.8	7.0	1.8	95.6
CI 10421	Unitan	92.1*	45.5	183	41.4	62.0	5.6	88.8
MT 204723	Ingrid x Betzes	91.9*	53.9	190	42.4	27.0	4.8	95.6
UT 174216	Bonn/Nepal//Bonn Dwarf	91.6*	50.2	183	34.0	35.0	7.4	93.2
MT 46669	Semi Smooth Awn Titan	91.4*	49.4	185	44.4	46.0	2.6	94.2
MT 63013	Bet x Pir IB 6-29	90.1*	52.3	186	40.4	47.0	4.0	89.2
MT 207111	Freja x Betzes	89.8*	52.0	189	41.6	19.0	2.8	94.8
CI 12233	Bet x Firl III 60AB2057	89.3*	53.3	188	41.0	16.0	2.2	95.6
MT 72131	Bet x Pall DB 5-116	88.6*	52.1	188	42.8	65.0	4.4	93.0
CI 9558	Piroline	85.3*	51.9	187	39.6	23.0	5.6	86.8
CI 6398	Betzes	82.7*	53.1	187	41.0	64.0	5.2	86.8
CD 744011	Paragon	82.4*	50.5	187	45.6	47.0	4.2	87.2
MT 72132	Bet x Pall DB 5-120	82.1*	53.9	186	39.8	62.0	6.4	92.8
CI 10968	Dickson	81.1*	51.5	187	45.4	34.0	5.4	77.4
CA 647	Synthetic F_1& F_2 CCxII	80.9*	46.4	178	40.4	26.0	3.4	92.6
MT 204738	Ingrid x Betzes	80.8*	52.9	188	38.6	36.0	5.8	91.4
CI 13827	Shabet	80.4*	53.0	188	39.6	68.0	6.0	84.6
MT 72654	Erectoides Betzes II	79.9*	51.7	185	36.6	37.0	5.4	87.4
CI 13826	Erbet	76.4*	51.4	174	36.0	60.0	6.6	85.0
CI 5438	Compana	72.3*	50.0	182	30.6	47.0	8.0	91.2
MT 207772	Betzes x Compana	71.4*	50.2	190	37.2	59.0	7.0	80.0
MT 659256	High Tillering Titan	64.1*	49.3	183	36.6	61.0	9.0	54.6
$\bar{x}$		89.7	51.3	185	40.2	39.6	4.6	89.3
F - Value for variety comparison		4.00**	0.0	140.56**	7.72**	3.18**	4.36**	16.80**
S.E.$\bar{x}$		5.8	0.0	0.4	1.3	10.4	.9	2.0
L.S.D. (P. = .05)		16.31	0.0	1.20	3.56	29.20	2.48	5.59
C.V.%		6.49	0.0	.23	3.16	26.34	19.31	2.23

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

Table 2. Agronomic data from intrastate dryland barley yield nursery grown at the Northwestern Montana Branch Station, Kalispell, Montana in 1969. Field No. A-1a. Experimental design - random block, four replications.

Planting date: April 28, 1969 Harvest date: August 22, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Lodging % Prev	Lodging Sev 0-9	6/64 Sieve Size
CI 6398	Betzes	76.4	52.2	31.5	55.0	4.0	87.0
ID 614965	Pir x Aust 61AB4965	70.6	50.6	29.8	30.0	4.3	92.5
CI 11758	Grande	67.2	45.9	33.5	40.0	5.0	97.3
CI 13826	Erbet	66.3	52.5	24.5	58.8	3.3	94.3
CI 10421	Unitan	64.5	48.8	30.8	30.0	4.3	94.5
CD 5914	Centennial	64.3	51.0	27.3	45.0	3.3	95.5
MT 204723	Ingrid x Betzes	62.7	52.4	27.0	43.8	4.5	96.5
CI 11772	Hypana	61.0	49.5	30.8	37.5	2.8	98.5
MT 285086	Delta	60.5	53.0	25.3	36.3	3.8	96.8
MT 510669	Zephyr	60.5	53.3	26.3	22.5	4.3	96.0
CI 11868	BetxHaisaII2xPir 7155-60	58.4	51.5	29.5	28.8	3.0	88.3
MT 204738	Ingrid x Betzes	58.2	51.5	30.0	66.3	5.8	95.0
CI 13827	Shabet	57.8	52.4	29.0	71.3	5.8	93.8
ID 623786	Bet x Mun 62AB3786	57.6	51.6	26.8	77.5	5.8	92.3
MT 72654	Erectoides Betzes II	57.6	52.0	27.5	85.0	4.5	88.3
AZ 31817	Hembar	57.5	49.8	24.0	32.5	4.8	90.8
CI 13334	Bet x HH 2x Pir 7698-62	56.6	51.1	28.8	25.0	3.8	89.3
MT 207772	Betzes x Compana	55.6	51.1	31.0	82.5	6.8	93.5
CD 744011	Paragon	55.2	50.5	35.0	30.0	3.5	88.5
CI 3351	Dekap	53.8	51.9	26.0	62.5	4.8	94.8
MT 207111	Freja x Betzes	53.8	52.6	28.8	66.3	5.8	95.0
CI 12130	Lico x Ogalitsu	52.5	47.3	29.8	11.3	3.5	97.0
MT 659256	High Tillering Titan	52.2	50.9	25.3	40.0	5.0	79.5
CA 647	Synthetic F_1 & F_2 CCxII	52.0	44.5	28.3	11.3	2.8	96.5
MT 63013	Bet x Pir IB 6-29	50.6	52.2	28.5	70.0	6.0	94.0
CI 9558	Piroline 1/	50.4	53.3	28.8	20.0	2.5	93.0
CI 5438	Compana	44.9	50.6	24.0	76.3	5.0	98.3
CI 13109	Primus	44.6	49.2	28.8	10.0	2.3	95.3
MT 46669	Semi Smooth Awn Titan	43.9	44.9	31.5	27.5	2.8	93.0
MT 72131	Bet x Pall DB 5-116	43.7	52.0	29.8	76.3	6.5	97.3
MT 72132	Bet x Pall DB 5-120	43.1	52.0	29.5	75.0	5.8	94.0
UT 174216	Bonn/Nepal//Bonn Dwarf	35.4	48.9	22.0	81.3	6.5	98.3
	$\bar{x}$	55.9	50.7	28.4	47.7	4.4	93.6
	F - Value for variety comparison	1.07	0.0	6.69**	6.71**	3.45**	4.50**
	S.E.$\bar{x}$	8.5	0.0	1.1	9.2	.7	1.9
	L.S.D. (P.=.05)	N.S.	0.0	3.09	25.77	1.95	5.37
	CV %	15.16	0.0	3.86	19.21	15.60	2.04

1/ Check variety

Table 3. Agronomic data from off station irrigated barley nursery grown in Missoula County on the A. D. Nielson farm, Missoula, Montana in 1969. Experimental design - random block, four replications.

Planting date: April 29, 1969 Harvest date: August 28, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Lodging % Prev	Lodging Sev 0-9	6/64 Sieve Size
UT 174216	Bonn/Nepal//Bonn Dwarf	64.7	48.5	24.3	93.3	5.0	96.0
CI 13827	Shabet	63.1	52.5	29.7	56.7	4.0	97.3
CI 10083	Ingrid 1/	61.4	53.2	29.7	41.7	4.7	98.0
CI 11868	BetxHaisaII2xPir 7155-60	57.4	54.0	29.7	30.0	1.3	96.7
CI 10421	Unitan	56.7	48.5	29.7	58.3	3.3	95.3
CI 9558	Piroline	55.4	53.5	29.0	3.3	1.7	97.3
CI 11772	Hypana	54.9	49.6	30.0	35.0	2.7	97.3
MT 204738	Ingrid x Betzes	54.0	52.9	27.0	96.3	5.7	98.3
CI 6398	Betzes	53.9	52.3	27.0	46.7	5.0	94.0
MT 72654	Erectoides Betzes II	48.9	51.8	25.0	61.7	4.0	92.0
	$\bar{x}$	57.0	51.7	28.1	52.3	3.7	96.2
	F - Value for variety comparison	.48	0.0	2.51	1.77	1.34	4.80
	S.E.$\bar{x}$	6.9	0.0	1.3	21.1	1.3	0.9
	L.S.D. (P. = .05)	N.S.	0.0	3.98	N.S.	N.S.	2.68
	C.V.%	12.15	0.0	4.76	40.41	33.83	.94

1/ Check variety

Table 4. Agronomic data from off station irrigated barley nursery grown in Ravalli County on the Western Montana Branch Station, Corvallis, Montana in 1969. Experimental design - random block, four replications.

Planting date: April 29, 1969 Harvest date: August 13, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu	6/64 Sieve Size
CI 11868	BetxHaisaII2xPir 7155-60	67.6	53.0	95.5
MT 204738	Ingrid x Betzes	65.1	51.4	97.0
CI 13827	Shabet	63.8	52.6	96.5
CI 9558	Piroline	61.2	53.0	96.5
CI 6398	Betzes	59.5	51.5	93.0
CI 10421	Unitan	58.5	47.4	93.8
CI 10083	Ingrid 1/	56.3	51.6	97.0
MT 72654	Erectoides Betzes II	52.8	49.9	90.8
CI 11772	Hypana	45.0	49.4	99.0
UT 174216	Bonn/Nepal//Bonn Dwarf	45.0	45.4	90.8
1/ Check variety				
	$\bar{x}$	57.5	50.5	95.0
	F - Value for variety comparison	2.57	0.0	7.43
	S.E.$\bar{x}$	4.9	0.0	1.0
	L.S.D. (P. = .05)	14.21	0.0	2.98
	C.V.%	8.52	0.0	1.08

Table 5. Agronomic data from off station irrigated barley grown in Lake County on the James Fleming farm, Pablo, Montana in 1969. Experimental design - random block, four replications.

Planting date: April 29, 1969 Harvest date: August 28, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Sieve Size 6/64
CI 11868	BetxHaisaII2xPir 7155-60	92.9	51.6	28.8	84.8
CI 6398	Betzes	86.4	51.4	26.5	80.0
UT 174216	Bonn/Nepal//Bonn Dwarf	84.4	49.3	23.3	91.8
CI 13827	Shabet	83.1	48.5	27.3	74.3
CI 10083	Ingrid 1/	81.7	52.5	27.3	89.8
CI 11772	Hypana	81.2	48.8	28.3	90.0
MT 72654	Erectoides Betzes II	80.7	51.6	24.8	76.3
MT 204738	Ingrid x Betzes	80.2	51.2	27.5	84.3
CI 10421	Unitan	78.4	47.6	27.8	87.8
CI 9558	Piroline	70.2	52.3	26.3	83.3
	$\bar{x}$	81.9	50.5	26.8	84.2
	F - Value for variety comparison	.78	0.0	1.44	6.71
	S.E.$\bar{x}$	6.6	0.0	1.4	2.3
	L.S.D. (P. = .05)	N.S.	0.0	N.S.	6.63
	C.V.%	8.01	0.0	5.17	2.71

1/ Check variety

Table 6. Agronomic data from off station irrigated barley nursery grown on the M. C. Roberts farm, Kalispell, Montana in 1969. Experimental design random block, four replications.

Planting date: May 1, 1969 Harvest date: August 22, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height	Lodging % Prev	Lodging Sev 0-9	6/64 Sieve Size
CI 10421	Unitan	71.0	49.4	34.0	0.0	0.0	95.5
CI 6398	Betzes	67.7	53.0	33.8	0.0	0.0	96.0
CI 13827	Shabet	64.7	52.5	34.5	0.0	0.0	97.5
CI 10083	Ingrid 1/	58.8	53.9	31.5	0.0	0.0	96.8
MT 204738	Ingrid x Betzes	58.5	53.5	34.0	0.0	0.0	96.3
MT 72654	Erectoides Betzes II	55.3	53.1	27.8	36.3	3.0	94.0
CI 9558	Piroline	53.9	54.0	32.3	0.0	0.0	95.8
UT 174216	Bonn/Nepal//Bonn Dwarf	52.9	48.9	26.0	92.5	6.8	94.5
CI 11772	Hypana	52.7	48.7	34.8	0.0	0.0	98.8
CI 11868	BetxHaisaII2xPir 7155-60	50.3	54.9	31.3	0.0	0.0	95.0
$\bar{x}$		58.6	52.2	32.0	12.9	1.0	96.0
F - Value for variety comparison		1.19	0.0	6.30**	19.39*	16.65*	3.2*
S.E.$\bar{x}$		6.4	0.0	1.2	6.9	0.5	0.8
L.S.D.(P.= .05)		N.S.	0.0	3.44	19.91	1.59	2.27
C.V.%		10.97	0.0	3.71	53.28	56.24	.81

1/ Check variety

Table 7. Summary yields for irrigated intrastate and station yield nursery grown on the Northwestern Montana Branch Station, Kalispell, Montana from 1957-1969.

Variety	Number	1957	1958	1959	1960	1961	1965	1966	1967	1968	1969	Station Years	% of Vantage
Betzes	6398	62.8	71.9	93.0	65.0	66.9	88.5	67.6	104.7	63.2	82.7	10	91
Vantage	7324	70.4	81.9	90.4	55.8	71.5	101.6	67.8	119.2	90.3	96.0	10	100
Compana	5438	50.0	60.1	88.7	65.4	46.0	70.7	60.0	85.5	63.4	72.3	10	78
Piroline	9558	85.8	80.4	94.2	72.4	78.7	95.9	87.3	108.8	93.3	85.3	10	104
Unitan	10421	67.9	78.9	102.7	73.0	80.4	84.4	90.8	128.4	98.4	92.1	10	106
Ingrid	10083	94.2	94.4	101.7	68.8	90.8	92.0	88.9	111.7	80.6	109.3	10	110
Glacier	6976	82.6	53.2				95.0	85.2	84.1	78.9	105.9	7	93
BetxHaisaII2xPir 7155-60	11868						84.9	68.8	110.0	79.4	103.0	5	94
BetxFirl III 60AB2057	12233								115.2	85.9	89.3	3	95
BetxHH2xPir 7698-62	13334								109.2	74.5	103.8	3	94
Delta	285086								105.3	86.3	100.7	3	96
Erbet	13826								91.4	73.3	76.4	3	79
Centennial	5914									106.5	106.9	2	114
Ingrid x Betzes	204738									95.5	80.8	2	95
Zephyr	510669									95.0	110.8	2	110
Pir x Aust 61AB4965	614965									90.0	95.3	2	99
Synthetic F_1& F_2 CCxII	647									82.4	80.9	2	88
Primus	13109									76.3	93.3	2	91
Erectoides Betzes II	72654									74.9	79.9	2	84
Ingrid x Betzes	204723									70.7	91.9	2	88
Paragon	744011									63.4	82.4	2	79
Hembar	31817										102.2	1	106
Bonn/Nepal//Bonn Dwarf	174216										91.6	1	95
Semi Smooth Awn Titan	46669										91.4	1	95
Bet x Pir IB 6-29	63013										90.1	1	94
Freja x Betzes	207111										89.8	1	94
Bet x Pall DB 5-116	72131										88.6	1	92
Bet x Pall DB 5-120	72132										82.1	1	86
Dickson	10968										81.1	1	84
Shabet	13827										80.4	1	83
Betzes x Compana	207772										71.4	1	74
High Tillering Titan	659256										64.1	1	67

Table 8. Summary of yields for dryland intrastate and station yield nurseries grown on the Northwestern Montana Branch Station, Kalispell, Montana from 1958 - 1969.

Variety	Number	1958	1959	1960	1961	1964	1965	1966	1967	1968	1969	Station Years	% of Compana
Compana	5438	38.9	43.3	45.5	34.9	57.1	79.8	62.9	58.2	89.1	44.9	10	100
Unitan	10421	74.5	51.9	50.0	37.9	65.5	80.4	72.6	60.7	90.1	64.5	10	117
DeKap	3351	65.1	38.6	52.8	45.7	56.8	72.5	56.5	52.4	86.7	53.8	10	105
Betzes	6398	53.5	43.9	46.1	31.6	61.7	73.9	69.9	56.5	90.4	76.4	10	109
Piroline	9558	60.6	43.0	46.9	54.1	75.3	80.8	69.1	58.3	96.5	50.4	10	114
Hypana	11772				50.2	69.2	75.8	66.2	55.3	85.3	61.0	7	108
Grande	11578						75.7	73.5	68.7	89.8	67.2	5	112
BetxHaisaII 2xPir 7155-60	11868						68.0	71.9	49.4	93.3	58.4	5	102
BetxHH2xPir 7698-62	13334								60.8	101.6	56.6	3	114
BetxMun 62AB 3786	623786								60.8	91.3	57.6	3	109
Zepher	510669								60.9	94.8	60.5	3	112
Pir x Aust 61AB4965	614965									105.4	70.6	2	131
Centennial	5914									101.4	64.5	2	124
Freja x Betzes	207111									96.8	53.8	2	112
Erectoides Betzes II	72654									94.8	57.6	2	114
Bet x Pir IB 6-29	63013									94.0	50.6	2	108
Primus	13109									90.7	44.6	2	101
Paragon	744011									89.4	55.2	2	108
Synthetic F_1& F_2 CCxII	647									86.6	52.0	2	103
Erbet	13826										67.2	1	143
Ingrid x Betzes	204723										62.7	1	140
Delta	285086										60.5	1	135
Ingrid x Betzes	204738										58.2	1	130
Shabet	13827										57.8	1	129
Hembar	31817										57.5	1	128
Betzes x Compana	207772										55.6	1	124
Lico x Ogalitsu	12130										52.5	1	117
High Tillering Titan	659256										52.5	1	117
Semi Smooth Awn Titan	46669										43.9	1	98
Bet x Pall DB 5-116	72131										43.7	1	97
Bet x Pall DB 5-120	72132										43.1	1	96
Bonn/Nepal//Bonn Dwarf	174216										35.4	1	79

Table 9. Summary of agronomic data from nurseries grown in Western Montana 1969.

Variety	C.I. or State No.	Station	Location[1/] Missoula	Ravalli	Lake	Flathead	$\bar{x}$	Rank
				YIELD BU/A				
Ingrid	10083	109.2	61.4	56.3	81.7	58.7	73.5	2
Unitan	10421	92.1	56.7	58.5	78.4	71.0	71.3	3
Piroline	9558	85.3	55.4	61.2	70.2	53.9	65.2	7
Betzes	6398	82.7	53.9	59.5	86.4	67.7	70.0	5
Hypana	11772		54.9	45.0	81.2	52.7	58.5	9
Shabet	13827	80.4	63.1	63.8	83.1	64.7	71.0	4
Erectodies Betzes II	MT 72654	79.9	48.9	52.8	80.7	55.3	63.5	8
Ingrid x Betzes	MT 204738	80.8	54.0	65.1	80.2	58.5	67.7	6
Bet x Naisa II2 x Piroline	11868	103.0	57.4	67.6	92.9	50.3	74.2	1
Bonn/Nepal//Bonn Dwarf	UT 174216	91.6	64.7	45.0	84.4	52.9	67.7	6
L.S.D. Bu/A			N.S.	14.2	N.S.	N.S.		
C.V. %			12.15	8.52	8.01	10.97		
				TEST WT. LBS/BU				
Ingrid	10083	53.5	53.2	51.6	52.5	53.9	52.9	1
Unitan	10421	45.5	48.5	47.4	47.6	49.4	47.7	8
Piroline	9558	51.9	53.5	53.0	52.3	54.0	52.9	1
Betzes	6398	53.1	52.3	51.5	51.4	53.0	52.3	3
Hypana	11772		49.6	49.4	48.8	48.7	49.1	6
Shabet	13827	53.0	52.5	52.6	48.5	52.5	51.8	4
Erectodies Betzes II	MT 72654	51.7	51.8	49.9	51.6	53.0	51.6	5
Ingrid x Betzes	MT 204738	52.9	52.9	51.4	51.2	53.0	52.3	3
Bet x Naisa II2x Piroline	11868	52.5	54.0	53.0	51.6	54.9	53.2	2
Bonn/Nepal//Bonn Dwarf	UT 174216	50.2	48.5	45.4	49.3	48.9	48.5	7

Table 9 . (con't)

Variety	C.I. or State No.	Location[1] Station	Missoula	Ravalli	Lake	Flathead	$\bar{x}$	Rank
				SIEVE SIZE 6/64				
Ingrid	10083	95	98	97	90	97	95.4	2
Unitan	10421	89	95	94	88	96	92.4	6
Piroline	9558	87	97	97	83	96	92.0	7
Betzes	6398	87	94	93	80	96	90.0	9
Hypana	11772		97	99	90	99	96.3	1
Shabet	13827	85	97	97	74	98	90.2	8
Erectodies Betzes II	MT 72654	87	92	91	76	94	88.0	10
Ingrid x Betzes	MT204738	91	98	97	84	96	93.2	4
Bet x Naisa II2 x Piroline	11868	92	97	96	85	95	93.0	5
Bonn/Nepal//Bonn Dwarf	UT174216	93	96	91	92	95	93.4	3

		LODGING													
		Prev[2]	Sev[3]	Prev	Sev	Prev	Sev	Prev	Sev	Prev	Sev	Prev	Sev	Prev	Sev
Ingrid	10083	28	3	42	5	0	0	0	0	0	0	14	2	6	2
Unitan	10421	62	6	58	3	0	0	0	0	0	0	24	2	4	2
Piroline	9558	23	6	3	2	0	0	0	0	0	0	5	2	9	2
Betzes	6398	64	5	47	5	0	0	0	0	0	0	22	2	5	2
Hypana	11772	-	-	35	3	0	0	0	0	0	0	9	1	8	1
Shabet	13827	68	6	57	4	0	0	0	0	0	0	25	2	3	2
Erectodies Betzes II	MT 72654	37	5	62	4	0	0	0	0	36	3	27	2	1	2
Ingrid x Betzes	MT 204738	36	6	96	6	0	0	0	0	0	0	26	2	2	2
Bet x Naisa II2 x Piroline	11868	32	4	30	1	0	0	0	0	0	0	12	1	7	1
Bonn/Nepal//Bonn Dwarf	UT 174216	35	7	93	5	0	0	0	0	93	7	25	2	3	2

1/ location by county
2/ in percent
3/ 0-9

Table 10 . CC II Yield Trial Nursery, irrigated conditions, Kalispell, Field No. Y-6 in 1969.

Planting date: May 5, 1969 Harvest date: September 2, 1969 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 %	Lodging Sev	Tiller 1/	Kernel Spike 2/	Kernel Weight 3/	% Plump	% Thin	% Protein
CI 10421	Unitan	117.6	51.9	183	39.3	60.0	3.0	586.8	45.0	45.1	90.3	3.1	11.5
CI 10083	Ingrid	103.7	54.9	192	39.0	37.5	2.5	1140.5	23.0	39.6	88.8	2.8	12.2
MT 8356	CCII F22 15YrM+4YrB	100.0	48.3	183	38.3	72.5	6.8	669.0	45.5	42.4	81.4	6.9	12.4
MT 83510	CCII F37 24YrD+12"	99.8	48.3	183	40.5	50.0	5.0	588.5	39.3	44.0	85.7	5.7	12.7
MT 8355	CCII F19 12YrM+4 "	96.4	48.3	181	38.8	52.5	5.0	684.0	40.0	42.9	85.3	4.1	12.0
MT 8359	CCII F32 24YrD+8 "	96.1	47.6	181	37.8	42.5	6.0	600.5	40.5	45.3	87.3	4.6	12.8
CI 3351	Dekap	94.0	52.1	183	33.5	80.0	7.8	1225.5	17.3	39.8	76.7	9.3	12.8
MT 8358	CCII F29 24YrD+4 "	93.9	47.2	182	38.3	46.3	5.8	535.0	38.8	45.5	88.0	3.7	12.9
MT 83512	CCII F36 35Yr Davis	92.8	48.0	182	38.0	28.8	4.3	536.0	38.8	47.0	92.4	2.2	12.9
MT 8357	CCII F27 20Yr M+4YrB	86.8	49.0	182	35.0	65.0	6.5	580.5	39.8	41.8	81.5	6.3	13.0
MT 8352	CCII F19 16 Yr MOC	86.7	48.7	180	36.3	72.5	5.5	671.5	37.5	40.2	77.0	9.3	13.0
MT 83511	CCII F25 24Yr Davis	86.3	47.3	182	40.3	37.5	5.8	550.0	41.3	46.5	91.7	2.9	13.0
MT 8353	CCII F23 20 Yr MOC	85.6	48.8	180	37.3	62.5	6.0	777.5	39.5	41.2	78.3	7.7	13.1
MT 8351	CCII F15 12 Yr MOC	81.3	48.9	182	34.0	66.3	5.5	698.5	38.3	41.0	76.9	9.1	13.1
MT 8354	CCII F27 24 Yr MOC	78.0	48.3	181	35.5	55.0	6.5	667.0	38.5	42.6	78.5	7.8	13.0
MT 8361	CCII Parental Mix	75.2	50.1	183	38.8	36.3	4.3	687.5	37.0	41.1	79.8	7.2	13.8
$\bar{x}$		92.1	49.2	182	37.5	54.1	5.4	699.9	37.5	42.9	83.7	5.8	12.7
F.-value for variety comparison		2.58**	25.49**	27.50**	2.68*	1.57	3.65**	29.43**	23.26**	9.42**	7.20**	3.64**	5.00**
S.E.$\bar{x}$		6.6	.4	.5	1.3	12.1	.7	37.0	1.5	.8	2.1	1.3	.2
L.S.D. (.05)		18.83	1.17	1.43	3.68	N.S.	2.04	105.80	4.29	2.25	5.94	3.72	.68
C.V.%		7.16	.83	.27	3.43	22.38	13.27	5.29	4.01	1.83	2.49	22.50	1.87

1/ Tiller in 16 liner feet
2/ Kernels on one head
3/ In mg, per head

Table 11. CC II Yield Trail Nursery, dryland conditions, Kalispell, Field No. A-1a in 1969. Experimental design-random black, four replications.

Planting date: April 28, 1969 Harvest date: August 27, 1969 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 %	Lodging Sev	1/ Tiller	Kernel Spike 2/	Kernel Weight 3/	% Plump	% Thin	% Protein
MT 83511	CCII F25 24Yr Davis	51.9	47.6	169	28.5	82.5	5.8	340.0	32.3	45.9	91.0	2.2	10.9
MT 8357	CCII F27 20Yr M+4Yr B	49.3	49.6	170	28.3	76.3	6.0	353.5	33.8	41.0	81.8	5.7	10.7
CI 3351	Dekap	46.1	53.6	172	23.3	81.3	7.5	630.0	16.0	40.5	84.3	3.6	9.9
MT 8356	CCII F22 15Yr M+4Yr B	45.3	48.5	173	30.8	58.8	5.0	318.0	37.8	39.6	75.3	7.1	10.1
MT 8358	CCII F29 24Yr D+4Yr B	45.3	47.7	169	26.8	55.0	6.3	349.5	30.5	45.1	90.1	2.7	11.7
MT 8355	CCII F19 12Yr M+4Yr B	43.8	47.0	169	28.3	60.0	5.3	367.0	32.5	41.1	81.9	4.8	10.4
MT 8353	CCII F23 20 Yr MOC	41.9	49.1	169	30.0	73.8	4.8	344.0	33.0	40.9	82.7	4.9	10.7
MT 83512	CCII F36 35Yr Davis	41.4	46.7	169	25.5	52.5	6.3	330.5	29.5	46.3	92.8	1.7	11.2
MT 8354	CCII F27 24 Yr MOC	41.3	49.4	169	28.5	85.0	5.8	355.5	33.0	40.2	82.1	5.3	10.8
CI 10083	Ingrid	40.8	55.2	182	26.3	81.3	6.3	569.0	18.8	37.5	90.8	2.1	9.5
MT 83510	CCII F37 24Yr D+12Yr B	38.7	48.6	169	27.5	56.3	6.5	315.5	32.8	44.5	90.1	2.8	10.3
MT 8352	CCII F19 16 Yr MOC	37.2	48.7	170	29.8	60.0	5.3	369.0	36.0	40.0	81.6	4.7	10.2
MT 8351	CCII F15 12 Yr MOC	36.9	49.0	169	26.3	82.5	5.8	316.0	32.0	40.1	85.5	4.1	11.1
MT 8359	CCII F32 24 Yr D 8Yr B	35.0	47.8	169	26.3	78.5	6.3	289.0	32.0	44.6	91.3	2.2	10.8
CI 10421	Unitan	34.6	50.0	170	25.5	32.5	4.0	272.0	36.8	41.4	86.6	3.8	9.5
MT 8361	CCII Parental Mix	26.4	51.2	169	27.8	68.8	5.5	325.5	29.0	40.2	80.8	5.6	10.9
$\bar{x}$		41.0	49.4	170	27.4	67.8	5.8	365.3	31.0	41.8	85.5	4.0	10.5
F. - value for variety comparison		1.61	28.2**	90.20**	1.91*	1.93*	1.61	10.35**	15.53**	11.45**	12.46**	1.82*	8.13*
S.E.$\bar{x}$		4.9	.4	.4	1.4	10.7	.6	29.8	1.5	.9	1.1	0.6	0.3
L.S.D. (.05)		N.S.	1.23	1.0	4.01	30.44	1.82	85.06	4.22	2.15	2.68	1.39	.67
C.V.%		11.67	1.02	.84	3.34	25.34	1.52	70.83	3.52	2.17	1.32	14.82	2.69

1/ Tiller in 16 liner feet
2/ Kernels on one head
3/ In mg, per head

TITLE: Small Grains Investigations

PROJECT: Winter Barley MS 756

YEAR: 1969

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

LOCATION: Northwestern Montana Branch Station Field No. E-2, R-6 and off station locations in Missoula, Ravalli, Lake, Mineral, Sanders and Flathead Counties.

DURATION: Indefinite

OBJECTIVES: To determine the adaptability of new and introduced winter barley varieties in Western Montana.

SIGNIFICANT FINDINGS:

1. Alpine is the outstanding variety. Schuyler and Lakeland show promise and should be further studied.
2. Jefferson and Harrison should be dropped from the testing program.

FUTURE PLANS: Use of hybrid materials (male sterile) for developing adaptable varieties using the bulk method of breeding. Continue winter hardiness studies and variety nurseries.

METHODS AND MATERIALS:

The 1968-69 winter barley research program consisted of variety nurseries, a winter hardiness test and three generations of hybrid breeding material in bulk plots.

The uniform winter barley nursery which is grown in several locations in the United States was grown at the Northwestern Montana Branch Station. This nursery contained 34 entries and was grown under dryland conditions.

Six off station type nurseries were seeded in the fall of 1968 in six locations in Montana. These were grown in Flathead, Missoula, Lake, Mineral and Sanders Counties. These nurseries contained 14 entries.

The variety yield nurseries were seeded in four row plots, 12 feet long in four replications with a randomized block design. Sixteen square feet were harvested for yield.

The winter hardiness test was seeded in single rows, 18 feet long, two replications. Only survival data was secured from this study.

RESULTS AND DISCUSSION:

The winter of 1968-69 was one of the colder winters on record. There was a high incidence of snow mold in barley fields and nurseries. These factors, no doubt contributed to the severe stand loss of winter barley in most locations. This resulted in yields that were 40 bushels less than in 1968.

Uniform Nursery:

Alpine was the highest yielding entry in this nursery with a yield of 67.3 bu/a. The test weight of 50.3 lbs/bu is quite high for winter barley and in particular this variety. C.I. 11887, a variety which has shown promise was second in yield in this nursery in 1969. Table 1.

Off Station:

Missoula County - One replication in this nursery was affected in part by residue from herbicide applications. Yields were fair, test weight very good and stands 83 to 94%, which are quite good. Sieve sizes are quite variable in the study. C.I. 11887 is the highest yielding entry, 54.2 bu/a. Table 2.

Lake County - Stands were very poor in this nursery, which caused uneveness in ripening and loss of heads at harvest time. Olympia had a high percent of head loss. Harrison and Jefferson did not perform very satisfactorily in this location. Yields were probably due to very low tiller numbers. Green tillers were noted in some varieties which no doubt contributes to the low test weight. On file in the field book is a listing of conditions related to yield components (tiller, no head loss and green tillers). Alpine is the leading entry in this nursery. See Table 3 for complete data.

Mineral County - As seen in Table 4, there is considerable variance in all agronomic characters measured. Most of which are statistically significant. Ellis is the highest yielding entry, but not significantly higher than Alpine, the recommended variety. Test weights are excellent for most entries.

Flathead County - Alpine is the high yielding variety in this nursery. Stands in the study were fair and fairly uniform for all varieties. Test weights are about average that we find in winter barley in this location. Table 5.

Sanders County - This nursery was abandoned because of a perennial and annual weed population in it.

Table 6 is a summary of varieties grown in western Montana in 1969. Alpine is the leading variety for yield followed by Schuyer and Lakeland. N.Y. 6005AB-4B-C has the highest test weight of all varieties grown. Alpine and Ellis have the best stand of all entries. Olympia and Alpine are the largest seeded varieties of all entries.

Table 1. Agronomic data from uniform winter barley nursery grown on the Northwestern Montana Branch Station, Field No. E-3 in 1969. Experimental design - random block, four replications.

Planting date: September 19, 1968 Size of Plot: 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Lodging % Prev	Lodging Sev 0-9	% Stand	Sieve Size	Days Jan.1 to Heading	Jan. 1 to Maturity Date
CI 9578	Alpine1/	67.3	50.3	30.3	12.5	0.8	71.3	90.5	162	216
CI 11887	Schuyler	60.1	52.5	21.3	0.3	1.8	68.8	84.3	155	216
CI 13734	Lakeland	59.1	46.7	28.3	0.0	0.0	47.5	72.0	157	216
CI 6107	Olympia	57.1	46.0	31.3	18.8	3.5	66.3	92.8	154	209
CI 12250	OAC 35-1	48.5	49.6	27.0	2.5	0.5	56.3	88.3	155	216
	Okla. S-633806	47.7	48.5	23.3	0.0	0.0	62.5	84.3	154	216
CI 6561	Reno	47.4	44.6	29.5	11.3	3.0	85.0	91.0	149	209
	N.J. 5B02-6-2	45.9	52.0	28.5	1.3	0.5	51.3	82.5	151	216
	Mich. 62-447-30	45.1	50.7	28.3	17.5	0.3	56.3	92.0	155	209
CI 11905	Ky. 62-3721	44.1	50.8	25.0	7.5	1.0	61.3	89.8	152	209.
CI 13735	Cass	44.1	51.7	27.8	2.5	0.5	72.5	94.3	155	209
CI 8067	Hudson	42.8	48.5	27.5	0.5	3.3	42.8	74.8	150	216
CI 6050	Kentucky 1	42.2	49.5	29.0	40.0	6.8	66.3	92.8	156	209
	Mo. B1780	41.0	43.5	28.8	20.0	3.8	47.5	87.8	149	209
	Mo. B1597	40.6	48.6	27.3	12.5	3.8	73.8	92.3	151	209
	N.Y. 6005-19	40.2	44.6	24.0	0.0	0.0	8.0	78.5	150	216
	Purd. 5924A7-14-1	40.0	45.4	19.3	0.0	0.0	72.5	66.8	148	216
	Mich 62-447-34	39.5	51.4	27.3	2.5	0.3	75.0	88.3	155	216
	Mo. B1773	39.0	46.0	26.5	10.0	4.3	82.5	89.3	151	209
	Kans. 66217	38.0	48.6	24.0	0.0	0.0	71.3	90.8	151	209
	Mo. B1590	36.7	44.8	25.8	12.5	2.5	73.8	90.3	150	209
CI 9168	Mo. B-475	36.4	46.5	28.0	12.5	4.3	45.0	84.0	150	216
CI 11902	Jefferson	35.9	48.0	26.5	0.0	0.0	66.3	81.0	151	209
	Purd. 5716A28-1-4	35.8	47.1	26.5	2.5	0.3	46.3	73.5	151	216
CI 7580	Kearney	35.4	46.6	29.0	21.3	5.3	60.0	71.8	151	209
	N.Y. 6005-16	34.2	43.7	31.0	0.0	0.0	1.0	67.3	161	216
	N.Y. 6005-18	33.8	44.7	28.0	15.0	1.0	7.5	81.0	150	216
	Mo. B1770	33.1	47.0	25.8	17.5	0.8	70.0	92.8	147	209

Table 1. continued

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Lodging % Prev	Lodging Sev 0-9	% Stand	Sieve Size	Days Jan.1 to Heading	Jan.1 to Maturity Date
CI 10667	Harrison	32.3	48.5	25.3	0.0	0.0	33.8	86.5	151	216
CI 11662	Purd. 5621RC3-13-1	32.1	42.3	24.0	5.0	0.5	40.0	71.3	153	216
CI 11904	Barsoy	30.9	51.0	22.5	1.3	0.3	78.8	88.0	140	209
	Okla. S-633815	18.3	46.5	19.5	7.5	0.3	66.3	84.5	112	216
	N.Y. 6005-15	17.4	0.0	25.3	0.0	0.0	0.8	62.5	155	216
CI 11910	Ky. 63-686	16.9	0.0	21.8	0.0	0.0	45.0	83.5	146	209
	$\bar{x}$	40.0	47.6	26.3	7.5	1.4	55.1	83.5	150.8	212.7
	F - Value for variety comparison	3.29	0.0	4.47	2.94	6.17	13.21	22.74	1.56	
	S.E.$\bar{x}$	6.1	0.0	1.4	5.3	.7	6.3	1.8	6.4	
	L.S.D. (P. =.05)	17.07	0.0	4.02	14.93	2.09	17.54	5.13	17.94	
	C.V.%	15.25	0.0	5.46	71.17	51.98	11.36	2.19	4.25	

1/ Check variety

Table 2. Agronomic data from off station winter barley nursery grown in Missoula County on the Al Goodan farm, Missoula, Montana in 1969. Experimental design - random block, four replications.

Planting date: September 26, 1968 Harvest date: July 21, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height	% Stand	Sieve Size
CI 11887	Schuyler	54.2	46.8	26.0	93.8	67.8
	N.Y. 6005AB-4B-C	51.2	53.2	26.5	88.8	76.3
CI 13734	Lakeland	51.1	52.1	27.8	95.0	64.8
CI 9578	Alpine 1/	46.6	49.0	25.0	98.8	84.0
CI 8067	Hudson	45.8	53.4	28.8	91.3	63.3
CI 11902	Jefferson	45.6	50.7	29.3	91.3	74.3
CI 51571	OAC Strain	45.5	52.1	27.5	92.5	75.5
CI 6107	Olympia	43.8	51.6	27.8	87.5	87.8
CI 10667	Harrison	43.3	51.6	24.5	83.8	73.5
CI 11893	Nebr. 62281	39.8	48.6	28.0	88.8	74.8
CI 9529	Ellis	35.0	50.8	26.5	91.3	68.3
	Purd. 5716 A28-1-4	34.7	51.0	24.5	91.3	58.0
	Purd. 5924 A7-14-1	33.3	50.5	23.3	91.3	58.3
CI 7580	Karney	29.1	49.6	26.8	92.5	50.8
	$\bar{x}$	42.5	50.8	26.6	91.3	69.8
	F - Value for variety comparison	2.28*	0.0	1.30	2.22*	4.39*
	S.E.$\bar{x}$	4.9	0.0	1.5	2.4	4.9
	L.S.D. (P. = .05)	14.1	0.0	N.S.	6.78	13.98
	C.V.%	11.53	0.0	5.79	2.60	7.01

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

Table 3. Agronomic data from the off station winter barley nursery grown in Lake County on the Walter Mangles farm, Pablo, Montana in 1969. Experimental design - random block, four replications.

Planting date: September 26, 1968 Harvest date: August 11, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Lodging % Prev.	Lodging Sev. 0-9	% Stand	Sieve Size
CI 9578	Alpine1/	43.4	47.4	26.3	10.0	9.0	70.0	79.3
CI 6107	Olympia	36.5	50.9	28.3	15.0	7.0	65.0	92.3
CI 11887	Schuyler	33.1	47.4	23.3	0.3	2.3	58.8	72.0
CI 11893	Nebr. 62281	33.0*	48.2	26.3	9.0	5.8	77.5	87.8
CI 9529	Ellis	32.9*	47.9	24.5	0.3	2.3	65.0	77.3
CI 7580	Karney	31.8*	46.9	31.3	53.8	6.0	66.3	69.8
CI 51571	OAC Strain	31.1*	47.6	22.5	2.8	6.8	63.8	74.8
CI 13734	Lakeland	30.5*	47.6	23.8	2.5	4.5	55.0	65.3
	N.Y. 6005AB-4B-C	30.2*	47.2	23.5	7.8	7.3	67.5	81.0
CI 8067	Hudson	28.9*	49.3	25.5	9.0	5.3	62.5	73.8
	Purd. 5924 A7-14-1	22.7*	45.6	19.8	0.0	0.0	70.0	59.3
CI 11902	Jefferson	16.9*		24.5	0.0	0.0	40.0	74.0
CI 10667	Harrison	11.9*		21.0	17.5	4.3	20.0	74.5
	Purd. 5716 A28-1-4	11.4*		22.0	7.5	4.5	21.3	62.3
	$\bar{x}$	28.1	47.8	24.4	9.7	4.6	57.3	74.5
	F - value for variety comparison	6.66*	0.0	5.18*	6.69*	2.45*	6.24*	8.15*
	S.E.$\bar{x}$	3.6	0.0	1.3	5.4	1.7	7.1	3.2
	L.S.D.(P. = .05)	10.21	0.0	3.73	15.35	4.91	20.32	9.05
	C.V.%	12.81	0.0	5.34	55.58	37.12	12.40	4.25

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

Table 4. Agronomic data from the off station winter barley nursery grown in Mineral County on the George Johnson farm, Tarkio, Montana in 1969. Experimental design - random block, four replications.

Planting date: September 27, 1968 Harvest date: August 12, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Lodging % Prev.	Lodging Sev. 0-9	% Stand	Sieve Size
CI 9529	Ellis	66.4	51.9	29.5	72.0	1.3	85.0	77.0
CI 8067	Hudson	66.3	52.8	29.5	97.0	3.0	77.5	63.0
CI 9578	Alpine 1/	56.3	50.7	27.3	0.3	2.3	77.5	79.3
	N.Y. 6005AB-4B-C	55.5	53.6	26.3	15.0	0.5	71.3	74.0
CI 6107	Olympia	50.9	51.9	30.5	98.0	3.8	82.5	88.3
CI 11887	Schuyler	45.6	51.2	19.5	2.5	4.5	58.8	61.8
CI 11902	Jefferson	40.7	50.6	29.3	2.5	1.3	62.5	72.5
CI 13734	Lakeland	39.1	50.2	25.3	5.0	2.3	52.5	52.0
CI 10667	Harrison	35.6	51.3	26.3	24.8	0.0	48.8	76.5
	Purd. 5716 A28-1-4	32.0*	48.7	26.0	0.0	0.0	45.0	53.3
CI 51571	OAC Strain	31.2*	47.4	25.5	26.3	2.8	50.0	72.3
CI 7580	Karney	30.4*	47.3	27.8	79.5	5.8	78.8	43.3
	Purd. 5924 A7-14-1	28.7*	44.6	22.0	0.0	0.0	70.0	44.3
CI 11893	Nebr. 62281	23.0*	45.5	25.8	26.0	2.5	51.3	78.3

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

$\bar{x}$	43.0	49.8	26.4	32.1	2.1	65.1	66.8
F - Value for variety comparison	3.76*	0.0	5.39*	7.66*	1.49	2.82*	13.22*
S.E.$\bar{x}$	7.3	0.0	1.3	13.6	1.4	8.3	3.9
L.S.D. (P. = .05)	20.83	0.0	3.68	38.82	4.13	23.86	11.04
C.V.%	19.96	0.0	4.87	42.37	67.99	12.83	5.78

Table 5. Agronomic data from off station winter barley nursery grown in Flathead County on the J.C. Buller farm, Kalispell, Montana in 1969. Experimental design-random block, four replication.

Planting date: September 30, 1968 Harvest date: August 5, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Plant Height	Lodging % Prev.	Lodging Sev. 0-9	% Stand	Sieve Size
CI 9578	Alpine 1/	63.7	47.0	37.0	2.8	6.3	81.3	85.3
CI 13734	Lakeland	54.5	46.5	30.5	0.0	0.0	83.8	73.3
CI 9529	Ellis	48.9*	46.7	29.3	22.5	2.0	83.8	75.0
CI 11887	Schuyler	46.8*	47.4	25.0	2.5	0.5	80.0	79.0
CI 8067	Hudson	45.8*	45.5	29.3	3.8	3.3	81.3	64.8
CI 6107	Olympia	42.7*	44.5	33.5	9.5	4.0	76.3	90.5
	N.Y. 6005AB-4B-C	39.0*	46.6	28.3	1.5	1.8	76.3	83.3
CI 7580	Karney	34.0*	45.0	26.5	35.0	6.8	72.5	65.0
CI 10667	Harrison	32.1*	46.0	23.5	2.5	0.5	77.5	79.0
CI 11893	Nebr. 62281	31.8*	39.0	28.0	3.0	3.3	68.8	82.3
CI 11902	Jefferson	29.5*	44.0	25.0	3.8	1.3	80.0	59.3
CI 51571	OAC Strain	28.9*	40.5	25.5	0.0	0.0	80.0	80.8
	Purd. 5924 A7-14-1	23.1*	40.5	18.3	0.0	0.0	81.3	51.3
	Purd. 5716 A28-1-4	15.0*	0.0	22.0	0.0	0.0	60.0	41.5
	$\bar{x}$	38.3	41.4	27.3	6.2	2.0	77.3	72.1
	F - Value for variety comparison	12.67*	0.0	24.09*	35.81*	5.89*	3.84*	11.60*
	S.E.$\bar{x}$	3.7	0.0	1.0	1.7	.9	3.3	4.1
	L.S.D. (P.=.05)	10.44	0.0	2.75	4.86	2.68	9.49	11.77
	C.V.%	9.55	0.0	3.54	27.42	46.08	4.29	5.71

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

Table 6. Summary of agronomic data from winter barley nurseries grown in western Montana in 1969.

Variety	C.I. or State No.	Location[1/] Station	Missoula	Lake	Mineral	Flathead	$\bar{x}$	Rank
		YIELD BU/A						
Schuyler	11887	60.1	54.2	43.4	45.6	46.8	50.0	2
Alpine	9578	67.3	46.6	33.1	56.3	63.7	53.4	1
Hudson	8067	42.7	45.8	28.9	66.3	45.8	45.9	5
Olympia	6107	57.1	43.8	36.5	50.9	42.7	46.2	4
Ellis	9529		35.0	32.9	66.4	48.9	45.8	6
Kearney	7580	35.4	29.1	31.8	30.4	34.0	32.1	10
Jefferson	11902	35.9	45.6	16.9	40.7	29.5	33.7	9
Harrison	10667	32.3	43.3	11.9	35.6	32.1	31.0	12
N.Y. 6005AB-4B-C			51.2	30.2	55.5	39.0	44.0	7
Lakeland	13734	59.1	51.1	30.5	39.1	54.5	46.9	3
Purdue 5716A28-1-4		35.8	34.7	11.4	32.0	15.0	25.8	14
Purdue 5924-A7-14-1		40.0	33.3	22.7	28.7	23.1	29.6	13
OAC Strain	51571		45.5	31.1	31.2	28.9	34.2	8
Nebraska 62281	11893		39.8	33.0	23.0	31.8	31.9	11
		TEST WEIGHT LBS/BU						
Schuyler	11887	52.5	46.8	47.0	51.2	47.4	49.0	4
Alpine	9578	50.3	49.0	47.4	50.7	47.0	48.9	5
Hudson	8067	48.5	53.4	49.3	52.8	45.5	49.9	2
Olympia	6107	46.0	51.6	50.9	51.9	44.5	49.0	4
Ellis	9529		50.8	47.9	51.9	46.7	49.3	3
Kearney	7580	46.6	49.6	46.9	47.3	45.0	47.1	9
Jefferson	11902	48.0	50.7		50.6	44.0	48.3	8
Harrison	10667	48.5	51.6		51.3	46.0	49.4	3
N.Y. 6005AB-4B-C			53.2	47.2	53.6	46.6	50.2	1
Lakeland	13734	46.7	52.1	47.6	50.2	46.5	48.6	7
Purdue 5716A28-1-4		47.1	51.0		48.7		48.9	6
Purdue 5924-A7-14-1		45.4	50.5	45.6	44.6	40.5	45.3	9
OAC Strain	51571		52.1	47.6	47.4	40.5	46.9	8
Nebraska 62281	11893		48.6	48.2	45.5	39.0	45.3	9
		PERCENT STAND						
Schuyler	11887	69	94	59	59	80	72.2	7
Alpine	9578	71	99	70	78	81	79.8	2
Hudson	8067	43	91	63	78	81	71.2	9
Olympia	6107	66	88	65	83	76	75.6	6
Ellis	9529		91	65	85	84	81.3	1
Kearney	7580	72	93	66	79	73	76.6	4
Jefferson	11902	66	91	40	63	80	68.0	10
Harrison	10667	34	84	20	49	78	53.0	12
N.Y. c005AB-4B-C			89	68	71	76	76.0	5
Lakeland	13734	48	95	55	53	84	67.0	11
Purdue 5716A28-1-4		46	91	21	45	60	52.6	13
Purdue 5924-A7-14-1		73	91	70	70	81	77.0	3
OAC Strain	51571		93	64	50	80	71.8	8
Nebraska 62281	11893		89	78	51	69	71.8	8

Table 6 .(con't)

Variety	C.I. or State No.	Location 1/ Station	Missoula	Lake	Mineral	Flathead	$\bar{x}$	Rank
			SIEVE SIZE (top 6/64)					
Schuyler	11887	84.3	67.8	72.0	61.8	79.0	73.0	8
Alpine	9578	90.5	84.0	79.3	79.3	85.3	83.7	2
Hudson	8067	74.8	63.3	73.8	63.0	64.8	67.9	10
Olympia	6107	92.8	87.8	92.3	88.3	90.5	90.3	1
Ellis	9529		68.3	77.3	77.0	75.0	74.4	7
Kearney	7580	71.8	50.8	69.8	43.3	65.0	60.1	12
Jefferson	11902	81.0	74.3	74.0	72.5	59.3	72.2	9
Harrison	10667	86.5	73.5	74.5	76.5	79.0	78.0	5
N.Y. 6005AB-4B-C			76.3	81.0	74.0	83.3	78.7	4
Lakeland	13734	72.0	64.8	65.3	52.0	73.3	65.5	11
Purdue 5716 A28-1-4		73.5	58.0	62.3	53.3	41.5	57.7	13
Purdue 5924-A7-14-1		66.8	58.3	59.3	44.3	51.3	56.0	14
OAC Strain	51571		75.5	74.8	72.3	80.8	75.9	6
Nebraska 62281	11893		74.8	87.8	78.3	82.3	80.8	3
			PLANT HEIGHT INCHES					
Schuyler	11887	21.3	26.0	23.3	19.5	25.0	23.0	
Alpine	9578	30.3	25.0	26.3	27.3	37.0	29.2	
Hudson	8067	27.5	28.8	25.5	29.5	29.3	28.1	
Olympia	6107	31.2	27.8	28.3	30.5	33.5	30.3	
Ellis	9529		26.5	24.5	29.5	29.3	27.5	
Kearney	7580	29.0	26.8	31.3	27.8	26.5	28.3	
Jefferson	11902	26.5	29.3	24.5	29.3	25.0	26.9	
Harrison	10667	25.3	24.5	21.0	26.3	23.5	24.1	
N.Y. 6005AB-4B-C			26.5	23.5	26.3	28.3	26.2	
Lakeland	13734	28.3	27.8	23.8	25.3	30.5	27.1	
Purdue 5716 A 28-1-4		26.5	24.5	22.0	26.0	22.0	24.2	
Purdue 5924-A7-14-1		19.3	23.3	19.8	22.0	18.3	20.5	
OAC Strain	51571		27.5	22.5	25.5	25.5	25.3	
Nebraska 62281	11893		28.0	26.3	25.8	28.0	27.0	
			JANUARY 1 to HEADING DATE					
Schuyler	11887	162						
Alpine	9578	155						
Hudson	8067	150						
Olympia	6107	153						
Ellis	9529	none						
Kearney	7580	151						
Jefferson	11902	151						
Harrison	10667	147						
N.Y. 6005AB-4B-C		none						
Lakeland	13734	157						
Purdue 5716 A28-1-4		151						
Purdue 5924-A7-14-1		148						

1/ by counties

Table 7. Eight year yield summary of winter barley nurseries grown at the Northwestern Montana Branch Station from 1960 thru 1969.

Variety	C.I or State No.	1960	1961	1962	1964	1966	1967	1968	1969	Sta. Yrs.	% of Alpine	$\bar{x}$
Alpine	9578	62.3	63.2	69.5	69.4	67.1	74.1	99.8	67.3	8	100	71.6
Olympia	6107	69.8	99.7	48.5	71.3	99.9	60.6	91.7	57.1	8	104	74.8
Kearney	7580	50.2	57.7	39.1				51.9	35.4	5	65	46.9
Schuyler	11887					118.7	72.3	114.7	60.1	4	119	91.4
Jefferson	11902							120.1	35.9	2	93	78.0
Prud 5924A7-14-1	5924							119.8	40.0	2	96	79.9
Harrison	10667							119.3	32.3	2	91	75.8
Hudson	8067							109.7	42.8	2	91	76.2
Prud 5621RC 3-13-1	11662							95.9	32.1	2	77	64.0
Ky. 62-3721	11905							92.9	44.1	2	78	65.5
OAC 35-1	12250							89.6	48.5	2	83	69.1
Reno	6561							85.3	47.4	2	80	66.4
Ky 63-686	11910							85.2	16.9	2	61	51.1
N.J. 5B02-6-2	5026							81.8	45.9	2	76	63.9
Kentucky 1	6050							65.9	42.2	2	65	54.1
Barsoy	11904							57.2	30.9	2	53	44.1
Lakeland	13734							125.4	59.1	2	110	92.2
Cass	13735							92.7	44.1	2	82	68.4
Mo. B 1780								70.1	41.0	2	67	55.6
Mo. B 1597								75.5	40.6	2	70	58.1
Mo. B 1590								93.5	36.7	2	78	65.1
Mo. B 475	9168							81.0	36.4	2	70	58.7
Purd. 5716A28-1-4								101.6	35.8	2	82	68.7
Okla. S-633806									47.7	1	71	47.7
Mich. 62-447-30									45.1	1	67	45.1
N. Y. 6005-19									40.2	1	59	40.2
Mich. 63-447-34									39.5	1	59	39.5
Kans. 66217									38.0	1	56	38.0
N. Y. 6005-16									34.2	1	51	34.2
N. Y. 6005-18									33.8	1	50	33.8
Mo. B 1770									33.1	1	49	33.1
Okla. S-633815									18.3	1	27	18.3
N. Y. 6005-15									17.4	1	26	17.4
Mo. B 1773									39.0	1	58	39.0

Table 8. Data from winter hardiness nursery grown at the Northwestern Montana Branch Station, Field No. R-6 in 1968-69.

CI No.	Variety	Survival % Rep. I	Rep. II	$\bar{x}$	National Average
6034	Tenn. Winter (check)	1	1	1	38
6561	Reno	25	50	38	72
	Kans. 66217	1	5	3	68
	Kans. 65111 (a)	5	0	2	66
	Kans. 66160 (b)	5	1	3	62
	ms CC 182 Sel. Mad. -4	10	1	6	73
	ms CC 182 Sel. Mad. -5	35	90	63	76
	ms CC 182 Sel. Mad. -10 (c)	2	10	6	74
	ms CC 182 Sel. Mad. -11	1	1	1	72
	ms CC 182 Sel. Mad. -15 (c)	5	25	15	71
6034	Tenn. Winter (check)	1	1	1	
7580	Kearney	5	1	3	73
	Nebr. 62204	5	10	8	66
1442	Kharkof (wheat)	95	90	93	90
	Harrow 1	70	25	48	71
	Harrow 9	65	15	40	74
	Harrow 12	60	10	35	73
11171	Harrow 14	1	1	1	73
936	Trebi	0	1	1	14
	Ore. 6818 (d)	5	20	13	58
6034	Tenn. Winter (check)	1	5	3	
11897	Ill. 62-23	5	1	3	69
11898	Ill. 62-25	60	75	68	67
11899	Ill. 62-33	50	30	40	72
	Ill. 62-39	10	10	10	72
	Ill. 62-17	1	1	1	68
	Ill. 62-27	1	5	3	70
	Ill. 62-6	3	15	10	68
	Ill. 62-37	2	1	2	70
5529	Dicktoo	5	10	8	75
6034	Tenn. Winter (check)	1	5	3	
	Isogenic)bb (e)	70	70	70	55
	pair)BB (e)	50	60	55	53
	Isogenic)bb (f)	40	30	35	47
	pair)BB (f)	20	40	30	52
	Isogenic)bb (g)	60	10	35	50
	pair)BB (g)	10	20	15	50
	Okla. S-633717 (h)	1	5	3	41
	Okla. S-653524 (i)	1	5	3	25
	Okla. S-653537 (i)	1	1	1	22

Table 8. (con't)

CI No.	Variety	Survival % Rep. I	Rep. II	$\bar{x}$	National Average
6034	Tenn. Winter (check)	1	1	1	
6050	Kentucky 1	1	10	5	66
	Ohio B67-22 (j)	5	5	5	64
	Ohio B67-23 (j)	5	1	3	67
	Ohio B67-17 (k)	10	45	28	66
	Va. 65-42-33	10	1	6	55
	Va. 66-42-45	10	25	18	56
6728	Wong	15	10	13	65
11887	Schuyler	10	0	5	66
	N.Y. 6005-15	5	1	3	50
6034	Tenn. Winter (check)	5	10	8	
	N.Y. 6005-16	1	10	6	42
	N.Y. 6005-18	15	15	15	49
	N.Y. 6005-19	1	1	1	54
10667	Harrison	5	5	5	59
11902	Jefferson	1	0	1	63
11662	Purd. 5621RC3-13-1	1	15	8	61
	Purd. 5924A7-14-1	5	25	15	66
	Purd. 5716A28-1-4	5	10	8	64
12218	Blackhawk wheat	90	95	93	86
6034	Tenn. Winter (check)	5	1	3	
6051	Mo. Ey. Bdls.	5	15	10	58
9168	Mo. B-475	40	50	45	63
	Mo. B1590	5	15	10	63
	Mo. B1597	10	35	23	62
	Mo. B1766	10	45	28	59
	Mo. B1770	5	10	8	65
	Mo. B1780 (l)	15	15	15	59
	Wyo. 60126	1	5	3	71
	Wyo. 60130	1	0	1	66
6034	Tenn. Winter (check)	1	10	6	
	Tex. 66A3-17 (q)	1	1	1	54
	Tex. 65A17-3 (q)	1	5	3	37
12252	OAC 39-21	65	5	35	65
	OAC 41-14	50	5	28	66
13789	Belts. 66-807 (m)	25	5	15	53
13790	Belts. 67-814 (m)	10	10	10	57
13793	Belts. 66-1449 (n)	5	5	5	48
13788	Belts. 67-829 (o)	10	0	5	31
13784	Belts. 67-876 (p)	5	1	3	39
6034	Tenn. Winter (check)	1	0	1	
12251	OAC 36-14	85	50	68	70
	OAC 36-18	45	1	23	62

Table 8. (con't.)

Parentage or origin of new entries:

(a) Rogers x Kearney (E4)

(b) Rogers x Kearney (E5)

(c) Selection from 18 parent male sterile composite cross 2d cycle (E8, 10)

(d) Olympia x Alpine (E20)

(e) Isogenic pair, white vs. black lemma (E32 bb; E33 BB)

(f) Isogenic pair, white vs. black lemma (E34 bb; E35 BB)

(g) Isogenic pair, white vs. black lemma (E36 bb; E37 BB)

(h) Rogers 2x Rogers x Omugi (E38)

(i) Rogers 2x Will x Hull-less (naked) (E39, 40)

(j) Dayton x CI 10907 (E43, 44)

(k) Dayton x Harrison (E45)

(l) CI 10663 x Decatur (E68)

(m) Jaydee x^4 Hudson (E76, 77)

(n) Jaydee x^4 Wong (E78)

(o) Jotun x^4 Rogers (E79)

(p) Jotun x^4 Dayton (E80)

(q) Aim x Will (E72, 73)

TITLE: Small Grains Investigations

PROJECT: Spring Oats MS 756

YEAR: 1969

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

LOCATION: Northwestern Montana Branch Station, Field No. Y-6.

DURATION: Indefinite

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

SIGNIFICANT FINDINGS:

Cayuse and ID 654547 are outstanding in yield in 1969 with yields of 190 bushels/acre or more.

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 1969. 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:

Yields of oats were extremely high this season with yields up to 198 bushels per acre. The Uniform Northwestern States nursery had a high of 190.7 bu/acre for ID 654547 and a low of 120.0 for Markton. The mean was 144.2 bu/acre. The range of 70 bu/acre was not found to be statistically significant. Lodging differences were statistically significant with Kelsey, Rodney and Victory being the most susceptible varieties. Table 1.

Cayuse at 198 bu/acre was the highest yielding entry in the Intrastate nursery. All other entries except ID 654547 were significantly lower in yield then Cayuse. ID 654547 has excellent straw strength being somewhat superior to Cayuse. Table 2.

Using Park as a long term standard, a comparison of varieties is found in Table 3. Only four varieties exceed Park in yield when comparing the same years. They are Basin, Cayuse, ID 654547 and Fraser. Stormont and Glen are equal to Park in yield.

Table 1. Uniform Northwestern States oat nursery grown on the Northwestern Montana Branch Station, Kalispell, Field No. Y-6 in 1969. Experimental Design - random block, 3 replications.

Planting date: May 6, 1969 Harvest date: September 6, 1969
Size of plot: 16 sq. ft.

C.I 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 654547	65AB4547 Park x Russell	190.7	35.9	195	53.0	30.0	3.3
CI 6611	Park	171.4	36.9	193	46.7	43.3	5.3
CI 7706	Sierra	163.1	31.4	189	47.0	50.0	4.3
CI 8318	Fraser	161.1	36.5	195	51.0	36.7	4.0
WS 99541	Wisc. x 995-4-1 Wisc	158.5	34.4	194	50.0	13.3	3.3
CI 5346	Basin	151.5	36.7	192	46.3	53.3	5.3
CI 8304	Minn. II-54-109 Minn.	150.6	37.5	185	44.0	23.3	2.0
CI 4259	Clinton 59	148.7	34.1	192	51.7	76.7	7.3
CI 2611	Bridger	147.9	33.3	197	58.0	75.0	6.7
CI 7811	Orbit	147.4	34.2	189	45.7	53.3	3.3
CI 7652	Glen	146.7	36.2	189	52.0	76.7	6.3
CI 2874	Minn. II-22-220	145.8	32.8	192	44.0	55.0	7.3
ID 637868	63AB7868 RodneyxShelby	143.6	31.5	190	51.0	71.7	7.0
CI 8170	Stormont	143.2	36.1	186	50.0	23.3	3.3
OT 0611	Kelsey Manitoba	142.5	32.7	191	49.3	70.0	8.0
CI 8263	Cayuse	138.1	36.2	191	42.3	40.0	7.3
ID 654602	65AB4602 Park x Russell	135.0	57.8	192	43.0	10.0	1.3
CI 2027	Gopher	134.9	39.2	187	47.7	78.3	6.0
ID 635100	63AB5100-1 Cx20 2xSAXSI	133.7	37.2	191	49.0	43.3	5.3
CI 8172	Sioux	132.5	38.5	190	45.3	66.7	6.0
CI 7561	Lodi	128.8	37.1	192	51.0	41.7	3.7
CI 6661	Rodney	126.2	33.9	194	51.7	48.3	8.0
CI 1145	Victory	122.2	36.0	197	56.7	86.7	8.3
CI 6662	Garry	121.5	35.9	191	48.3	61.7	6.7
CI 2053	Markton	120.2	32.9	191	53.7	66.7	7.3
	$\bar{x}$	144.2	36.2	191.3	49.1	51.8	5.5
	F. Value for variety comparison	1.42	1.49	47.12**	9.13**	3.57**	3.89**
	S.E.$\bar{x}$	17.8	4.1	.4	1.3	11.3	1.0
	L.S.D. (.05)	N.S.	N.S.	1.24	3.80	32.27	2.89
	C.V.%	12.33	11.20	.23	2.71	21.80	18.47

Table 2. Intrastate small oat nursery grown on the Northwestern Montana Branch station, Kalispell, Field No. Y-6 in 1969. Experimental design - random block, three replications.

Planting date: May 6, 1969 Harvest date: September 6, 1969
Size of plot: 16 sq. ft.

C.I. 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	8263	Cayuse 1/	198.4	37.9	190	44.7	18.3	3.7
ID	4547	Park x Russell 65AB4547	178.6	39.3	193	54.7	6.7	1.3
CI	8318	Fraser	165.7*	38.1	194	48.7	13.3	2.7
CI	6611	Park	165.0*	37.7	192	46.0	20.0	2.7
CI	5346	Basin	157.6*	37.4	192	47.7	16.7	3.0
CI	7706	Sierra	153.8*	33.1	188	46.0	11.7	6.0
CI	6661	Rodney	149.1*	36.0	192	51.0	63.3	6.7
CI	2027	Gopher	148.3*	39.5	186	46.0	15.0	1.7
CI	2611	Bridger	139.6*	36.7	196	58.3	40.0	7.3
CI	6662	Garry	135.0*	34.7	191	52.0	80.0	9.0
$\bar{x}$			159.1	37.0	191.4	49.5	28.5	4.4
F. Value for variety comparison			6.40**	7.99**	38.18**	12.56**	7.10**	3.20*
S.E.$\bar{x}$			7.5	.7	.5	1.3	9.3	1.5
L.S.D. (.05)			21.36	2.01	1.29	3.58	26.48	4.22
C.V.%			4.70	1.90	.24	2.53	32.51	33.58

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

Table 3. Summary of oat yield data from uniform oat nursery, Northwestern Montana Branch Station, 1956-69.

Variety	C.I. or State No.	1956	1957	1958	1959	1960	1962	1964	1967	1968	1969	Station Years	% Park
Rodney	6661	92.5	30.8	141.1	51.6	15.9	84.8	73.0	126.2	121.4	126.2	10	95
Park	6611	112.1	46.3	63.5	99.4	17.5	89.5	80.5	108.3	120.3	171.4	10	100
Victory	1145	123.2	64.8	49.4	92.5	18.1	78.8	62.8	81.2	114.2	122.2	10	89
Garry	6662	97.0	46.6	54.0	112.2	11.6	87.8	100.3	112.2	112.8	121.5	10	94
Markton	2053	114.3	47.2	52.5	89.7	16.9	74.7	89.1	89.9	101.7	120.2	10	88
Clinton 59	4259	86.9	32.4	60.1	73.5	13.8	33.2	97.1	103.5	98.7	148.7	10	82
Gopher	2027	66.5	30.1		49.7	10.6	61.6	46.2	116.8	101.0	134.9	9	73
Basin	5346	122.7	51.1			15.0	89.5	120.7	120.2	149.1	151.5	8	110
Bridger	2611	121.9	49.7				91.8	87.1	95.7	104.5	147.9	7	96
Lodi	7561								105.8	144.3	128.8	3	95
Stormont	8170								118.7	137.5	143.2	3	100
Glen	7652								118.9	134.9	146.7	3	100
Orbit	7811								116.3	133.4	147.4	3	99
Cayuse	8263								142.6	130.0	138.1	3	103
Sioux	8172								103.3	125.0	132.5	3	90
Sierra	7706								115.4	118.1	163.1	3	99
Minn. II-22-220	2874								122.9	96.1	145.8	3	91
65AB4547 Park x Russell	654547									153.8	190.7	2	118
Fraser	8318									136.2	161.1	2	102
63AB5100-1Cx20 2xSax SI	635100									123.9	133.7	2	88
Wisc. x 995-4-1 Wisc.	99541										158.5	1	92
Minn. II-54-109 Minn.	8304										150.6	1	88
63AB7868 Rodney x Shelby	637868										143.6	1	84
Kelsey - Manitoba	0611										142.5	1	83
65AB4602 Park x Russell	654602										135.0	1	79

TITLE: Plant Growth Regulators on Spring Barley

PROJECT: Small Grains Investigations MS 756

YEAR: 1969

PERSONNEL: Leader Vern R. Stewart
Cooperator - Kenneth Dunster from Amchem Corp.

LOCATION: Northwestern Montana Branch Station, M. C. Roberts Farm

DURATION: Indefinite

OBJECTIVES: To determine the effects of growth regulator on the agronomic characteristics of spring barley.

SIGNIFICANT FINDINGS:

Yields were increased slightly when ethrel was applied at the first joint stage.

Tiller numbers increased as rate of ethrel increased and when applied at the first joint stage with a surfactant.

Height of barley decreased as rate of ethrel increased, applied at the first joint stage.

Seed size was reduced as rate of ethrel was increased, applied at the first joint stage.

Lodging was affected by the ethrel treatments but as an interaction between rate and stage of growth.

MATERIALS AND METHODS:

Spring barley was seeded for this study in 12 row plots, 20 feet long. Betzes and Ingrid were the varieties seeded. Betzes was seeded in four replications and Ingrid in one. Making a total of five replications. The seeding rate was 50 pounds per acre. The growth regulator covered a swath of 10 feet using 5 nozzles spaced 20 inches, nozzle sizes T-jet 8003. The machine was calibrated to apply 43.5 gallons per acre volume. The boom was set for 19 to 21 inches above the grain, at all stages of growth. Applications were with and without a surfactant at two stages of plant growth. (1) Tillering stage, (2) first joint stage.

Measurements obtained in the 1969 study were; yields, bushel weight, lodging, tiller number, sieve size and height. All data were obtained from row numbers 3, 5 and 7 in the plot. The bushel weights were determined from the material obtained from the three rows in each plot. All the data was analyzed statistically using the variance of analysis technique.

RESULTS AND DISCUSSION:

For a permanent record data from this study in the raw form are found in Tables 1, 2 & 3.

All yields were found to be nonsignificant in the study when sub sampling was included in the analysis, however when sub sampling was not used as a part of the analysis the stage of growth when ethrel was applied was significantly different. In Table 4, are the data for yields. The tillering stage of growth resulted in a slightly lower yield than when applied at the first joint stage of growth. Rates of ethrel and the surfactant had no effect on yields in this test.

Tillering was affected by the rate of ethrel with the $\frac{1}{2}$ and 1 pound rates increasing tiller numbers. Surfactant had no effect on tiller numbers, however when applied at the first joint stage of growth tiller numbers were increased. Table 5.

The height of spring barley was affected by rate of ethrel, stage of growth when applied and the surfactant. There was also an ineraction between stage of growth and rate. The $\frac{1}{4}$, $\frac{1}{2}$ and 1 lbs/a rates reduced plant heights significantly. Using the surfactant also reduced heights significantly. When applied at the first joint stage the height was reduced by 2.6 inches. These data show that eithrel applied at any rate at the first joint stage did reduce the height of these two barley varieties. Table 6.

The rate of ethrel and when applied reduced the kernel size significantly. As the rate of ethrel was increased seed size decreased. Application at the first joint stage decreased seed size significantly. Table 7.

There were not any significant effects of rates, stage of growth or surfactant on lodging revelence, however an interaction was found between stage of growth and surfactant; and rates and stage of growth. One-half pound applied at first joint stage did reduce lodging prevelence some, however these data are somewhat difficult to interpret. An interaction was found between stage of growth and the surfactant for lodging severity.

Ethrel applied with a surfactant in the first joint stage resulted in a lower severity rating for lodging. Table 8.

Replication number one in this study was Ingrid barley the remaining four were Betzes. There is significant difference due to replication in some of the measurements made. Tiller number was significantly higher for Ingrid than for Betzes. yields between replication are significantly different, but it can not be attributed to either variety. Height, sieve size difference are not due to variety. Lodging prevelance and lodging severity are less for Ingrid in replication one than the other replications where Betzes were grown.

Table 1. Yield and tiller data from growth regulator (Ethrel) study grown at the Northwestern Montana Branch Station, Kalispell, Montana in 1969. (M.C. Roberts) Twelve rows, five replications

Date planted: May 6, 1969 Date Harvested: August 27, 1969 Size of plot: 16 sq. ft.

Stage of Growth	Rate #/A		Grams/Plot I	II	III	IV	V	Total	Yield Bu/A	Tiller No.[1/] I	II	III	IV	V	Total	Tiller x̄
Tillering	0	A	591	708	695	511	472	2977		917	826	878	756	756	4133	
		B	751	523	503	495	527	2799		916	757	856	700	729	3958	
		C	748	535	568	668	741	3260		931	860	738	773	876	4178	
		Total	2090	1766	1766	1674	1740	9036	75.3	2764	2443	2472	2229	2361	12269	818
"	¼	A	654	607	628	635	675	3199		869	808	756	758	902	4093	
		B	622	564	611	643	866	3306		920	791	776	871	947	4305	
		C	753	492	633	777	631	3286		1009	894	810	763	763	4239	
		Total	2029	1663	1872	2055	2172	9791	81.6	2798	2493	2342	2392	2612	12637	843
"	½	A	651	612	563	709	323	2858		841	874	755	835	753	4058	
		B	723	753	605	686	684	3451		1007	840	798	859	863	4367	
		C	574	703	589	596	584	5046		983	899	805	836	948	4471	
		Total	1948	2068	1757	1991	1591	9355	78.0	2831	2613	2358	2530	2564	12896	860
"	1	A	787	648	711	821	760	3727		978	902	932	785	906	4503	
		B	538	604	635	607	521	2905		721	957	857	738	829	4102	
		C	537	612	515	675	346	2685		790	767	781	743	1059	4140	
		Total	1862	1864	1861	2103	1627	9317	77.0	2489	2626	2570	2266	2794	12745	850
"	0[2/]	A	535	717	649	567	712	3180		943	889	841	968	835	4476	
		B	600	546	689	658	697	3190		755	807	863	798	972	4195	
		C	600	557	636	589	598	2980		847	691	859	719	744	3860	
		Total	1735	1820	1974	1814	2007	9350	77.9	2545	2387	2563	2485	2551	12531	835
"	¼[2/]	A	523	657	709	603	646	3138		899	886	880	777	966	4408	
		B	604	577	800	726	474	3181		819	870	873	969	825	4356	
		C	553	576	759	672	586	3146		942	778	882	914	834	4350	
		Total	1680	1810	2268	2001	1706	9465	78.9	2660	2534	2635	2660	2625	13114	874

Table 1. Yield and tiller data (con't)

Stage of Growth	Rate #/A		Grams/Plot I	II	III	IV	V	Total	Yield Bu/A	Tiller No.[1] I	II	III	IV	V	Total	Tiller x̄
Tillering	½[2]	A	632	689	708	636	708	3373		957	834	926	852	829	4398	
		B	658	677	607	642	619	3203		969	881	774	749	899	4272	
		C	569	582	648	619	712	3130		930	922	899	797	750	4298	
		Total	1859	1948	1963	1897	2039	9706	80.9	2856	2637	2599	2398	2478	12968	865
"	1[2]	A	664	558	554	450	714	2940		918	895	828	812	948	4401	
		B	481	583	680	620	628	2992		931	802	908	814	830	4285	
		C	602	747	645	703	714	3411		962	994	927	878	910	4671	
		Total	1747	1888	1879	1773	2056	9343	77.9	2811	2691	2663	2504	2688	13357	891
1st joint	0	A	627	681	494	605	751	3158		958	897	670	714	874	4113	
		B	583	574	548	598	652	2955		973	892	781	706	844	4196	
		C	548	729	632	680	584	3173		895	950	884	660	867	4256	
		Total	1758	1984	1674	1883	1987	9286	77.4	2826	2739	2335	2080	2585	12565	838
"	¼	A	629	529	717	717	586	3178		893	812	925	903	858	4391	
		B	598	564	545	636	728	3071		905	699	956	832	831	4223	
		C	630	573	615	676	771	3265		935	812	922	830	811	4310	
		Total	1857	1666	1877	2029	2085	9514	79.3	2733	2323	2803	2565	2500	12924	862
"	½	A	585	621	745	621	702	3274		873	888	867	827	853	4308	
		B	698	545	819	648	784	3494		938	878	926	837	944	4523	
		C	759	593	691	627	682	3352		1053	844	977	829	889	4592	
		Total	2042	1759	2255	1896	2168	10120	84.4	2864	2610	2770	2493	2686	13423	895
"	1	A	735	598	698	710	793	3534		953	911	1030	923	973	4790	
		B	777	572	596	861	659	3465		1081	878	918	1057	836	4770	
		C	663	628	655	773	858	3577		1028	964	747	965	812	4516	
		Total	2175	1798	1949	2344	2310	10576	88.2	3062	2753	2695	2945	2621	14076	939
"	0[2]	A	630	565	712	516	585	3008		938	806	807	841	773	4165	
		B	675	584	756	673	747	3435		1045	806	968	832	839	4490	
		C	696	621	786	717	564	3384		964	893	985	901	844	4587	
		Total	2001	1770	2254	1906	1896	9827	81.9	2947	2505	2760	2574	2456	13242	883

Table 1. Yield and tiller data (con't)

Stage of Growth	Rate #/A		Grams/Plot I	II	III	IV	V	Total	Yield Bu/A	Tiller No.[1] I	II	III	IV	V	Total	Tiller x̄
1st joint	¼[2]	A	629	461	607	760	941	3398		1012	894	916	948	828	4598	
		B	645	702	634	594	754	3329		1005	917	989	887	784	4582	
		C	670	576	614	538	760	3158		1044	1005	903	792	839	4583	
		Total	1944	1739	1855	1892	2455	9885	82.4	3061	2816	2808	2627	2451	13763	918
"	½[2]	A	590	668	506	518	815	3097		1005	950	735	781	1001	4472	
		B	733	612	540	621	751	3257		943	814	737	771	933	4198	
		C	663	533	580	648	917	3341		999	809	930	729	1107	4574	
		Total	1986	1813	1626	1787	2483	9695	80.8	2947	2573	2402	2281	3041	13244	883
"	1[2]	A	755	525	481	676	754	3191		1162	891	826	760	885	4524	
		B	831	555	610	693	755	3444		1098	734	974	913	939	4658	
		C	720	563	508	705	776	3272		1109	974	972	949	876	4880	
		Total	2306	1643	1599	2074	2285	9907	82.6	3369	2599	2772	2622	2700	14062	938

1/ eight liner feet
2/ with surfactant

Table 2. Height and seive size data from growth regulator (Ethrel) study grown at the Northwestern Montana Branch Station, Kalispell, Montana in 1969 (M.C. Roberts) Twelve row plots, five replications.

Date planted: May 6, 1969 Date harvested: August 27, 1969
Size of plot: 16 sq. ft.

Stage of Growth	Rate #/A		Height in Inches I	II	III	V	IV	Total	$\bar{x}$	Seive Size I	II	III	IV	V	Total	$\bar{x}$
Tillering	0	A	42	36	40	40	40	198		99	98	99	98	99	493	
		B	43	41	36	39	43	202		98	97	97	98	98	488	
		C	43	40	38	38	42	201		99	95	99	98	99	490	
		Total	128	117	114	117	125	601	40	296	290	295	294	296	1471	98
"	¼	A	43	40	37	40	42	202		98	98	98	98	97	489	
		B	45	40	39	40	42	206		96	98	98	99	97	488	
		C	45	39	40	40	42	206		98	98	98	98	99	491	
		Total	133	119	116	120	126	614	41	292	294	294	295	293	1468	98
"	½	A	41	39	40	41	40	201		98	96	97	95	93	479	
		B	41	38	38	41	42	200		96	97	98	99	97	487	
		C	43	40	36	38	44	201		99	98	97	97	95	486	
		Total	125	117	114	120	126	602	40	293	291	292	291	285	1452	97
"	1	A	44	38	40	40	41	203		98	96	98	97	99	488	
		B	36	40	40	40	41	197		99	97	97	97	94	484	
		C	36	40	38	41	40	195		99	98	98	97	87	479	
		Total	116	118	118	121	122	595	40	296	291	293	291	280	1451	97
"	0 1/	A	36	41	41	39	42	199		98	97	93	95	98	481	
		B	39	40	39	40	43	201		99	97	97	99	99	491	
		C	38	41	41	38	40	198		99	98	98	99	94	488	
		Total	113	122	121	117	125	598	40	296	292	288	293	291	1460	97
"	¼ 1/	A	41	36	40	41	42	200		97	97	99	98	96	487	
		B	41	39	40	40	40	200		97	97	97	99	99	489	
		C	39	38	40	41	40	198		99	97	97	99	98	490	
		Total	121	113	120	122	122	598	40	293	291	293	296	293	1466	98
"	½ 1/	A	41	40	36	41	40	198		96	98	99	98	97	488	
		B	41	39	35	40	40	195		95	97	98	99	99	488	
		C	36	40	38	39	39	192		99	97	98	97	99	490	
		Total	118	119	109	120	119	585	39	290	292	295	294	295	1466	98
"	1 1/	A	37	40	40	37	40	194		97	93	97	97	97	481	
		B	40	39	40	40	41	200		99	96	97	98	98	488	
		C	39	39	38	40	37	193		96	97	98	99	93	483	
		Total	116	118	118	117	118	587	39	292	286	292	294	288	1452	97

Table 2. Height and seive size data (con't)

Stage of Growth	Rate #/A		Height in Inches I	II	III	IV	V	Total	$\bar{x}$	Seive Size I	II	III	IV	V	Total	$\bar{x}$
1st joint	0	A	41	41	37	36	40	195		97	97	98	96	91	479	
		B	41	41	38	41	42	203		98	97	96	97	93	481	
		C	36	40	38	40	41	195		99	97	96	97	98	487	
		Total	118	122	113	117	123	593	40	294	291	290	290	282	1447	96
"	¼	A	31	40	39	36	39	185		98	97	97	99	98	489	
		B	34	39	36	37	40	186		98	97	98	98	96	487	
		C	36	38	38	37	41	190		97	98	97	99	97	488	
		Total	101	117	113	110	120	561	37	293	292	292	296	291	1464	98
"	½	A	36	39	36	34	39	184		97	94	94	97	97	479	
		B	36	39	40	36	42	193		98	99	96	97	91	481	
		C	40	39	38	34	40	191		99	97	96	97	92	481	
		Total	112	117	114	104	121	568	38	294	290	286	291	280	1441	96
"	1	A	39	36	34	36	38	183		98	97	97	97	95	484	
		B	39	39	39	36	39	192		94	98	97	96	97	482	
		C	36	38	40	36	39	189		93	97	96	95	97	478	
		Total	114	113	113	108	116	564	38	285	292	290	288	289	1444	96
"	0 1/	A	40	39	40	37	37	193		96	98	97	95	97	483	
		B	39	39	41	38	38	195		97	96	98	96	96	483	
		C	41	40	41	37	36	195		99	99	96	95	96	485	
		Total	120	118	122	112	111	583	39	292	293	291	286	289	1451	97
"	¼ 1/	A	37	35	34	35	38	179		98	97	95	99	97	486	
		B	36	37	37	38	37	185		98	96	95	98	98	485	
		C	37	36	35	35	41	184		98	94	96	98	98	484	
		Total	110	108	106	108	116	548	37	294	287	286	295	293	1455	97
"	½ 1/	A	33	35	32	35	40	175		97	95	95	98	93	478	
		B	35	38	36	35	36	180		98	96	95	95	95	479	
		C	36	38	37	35	39	185		97	96	98	95	88	474	
		Total	104	111	105	105	115	540	36	292	287	288	288	276	1431	95
"	1 1/	A	35	35	31	35	34	170		92	92	85	92	93	454	
		B	38	34	32	36	40	180		96	97	94	97	94	478	
		C	37	35	33	35	39	179		94	93	89	96	93	465	
		Total	110	104	96	106	113	529	35	282	282	268	285	280	1397	93

1/ with surfactant

Table 3. Lodging data from growth regulator (Ethrel) study, grown at the Northwestern Montana Branch Station, Kalispell, Montana in 1969 (M.C. Roberts) Twelve row plots, five replications.

Date planted: May 6, 1969 Date harvested: August 27, 1969

Stage of Growth	Rate #/A	Prevelence in %							Severity 0-9						
		I	II	III	IV	V	Total	$\bar{x}$	I	II	III	IV	V	Total	$\bar{x}$
Tillering	0	85	99	99	99	99	481	96	3	8	7	6	5	29	6
"	¼	90	95	95	80	99	459	92	6	7	7	5	7	32	6
"	½	90	99	99	99	99	486	97	7	7	6	7	8	35	7
"	1	90	99	99	85	99	472	94	3	8	7	6	8	32	6
"	0 1/	90	95	95	99	95	474	95	3	8	8	7	6	32	6
"	¼ 1/	95	99	99	85	99	477	95	5	6	5	6	8	30	6
"	½ 1/	99	99	99	99	99	495	99	5	6	7	7	8	33	7
"	1 1/	95	95	99	99	99	487	97	6	7	7	7	7	34	7
1st joint	0	95	99	99	99	99	491	98	7	7	7	7	8	36	7
"	¼	95	99	99	99	99	491	98	4	6	7	7	7	31	6
"	½	85	99	99	99	99	481	96	4	6	7	7	8	32	6
"	1	95	99	99	99	99	491	98	6	6	6	7	7	32	6
"	0 1/	95	99	99	99	99	491	98	6	7	7	7	6	33	7
"	¼ 1/	95	95	99	99	99	487	97	2	7	6	7	7	29	6
"	½ 1/	75	90	95	99	99	458	92	3	5	6	6	8	28	6
"	1 1/	99	95	85	99	99	477	95	1	3	5	6	8	23	5

1/ with surfactant

Table 4. Summary of yield data as related to stage of growth, surfactant and rate of Ethrel in 1969.

	Yield Bushels/Acre				
	Rate of Ethrel				
	0	$\frac{1}{4}$	$\frac{1}{2}$	1	
Stage of growth					$\bar{x}$ for stage of growth
Tillering	76.6	80.3	79.4	77.8	78.5
First joint	79.7	80.9	82.7	85.4	82.2
$\bar{x}$ for rate of ethrel	78.2	80.5	81.0	81.5	
Surfactant					$\bar{x}$ for surfactant
without	76.4	80.5	81.2	82.9	80.3
with	79.9	80.7	80.9	80.3	80.4
$\bar{x}$ for rate of ethrel	78.2	80.5	81.0	81.5	

	Surfactant		
	W/O	With	
Stage of growth			$\bar{x}$ for stage of growth
Tillering	78.2	78.9	78.5
First joint	82.3	81.9	82.2
$\bar{x}$ for surfactant	80.3	80.4	

Table 5. Summary of tillering data as related to stage of growth, surfactant and rate of ethrel in 1969.

	Tiller Number/16 ft. row				
	Rate of Ethrel #/A				
	0	¼	½	1	
Stage of growth					x̄ for stage of growth
Tillering	827	858	862	870	854b
First joint	860	889	888	937	894a
x̄ for rate of ethrel	843b 1/	873b	876ab	904a	
Surfactant					x̄ for surfactant
Without	828	852	877	894	862
With	859	895	873	913	886
x̄ for rate of ethrel	843b	873b	876ab	904a	

	Surfactant		
	W/O	With	
Stage of growth			x̄ for stage of growth
Tillering	843	866	854
First joint	883	905	894
x̄ surfactant	862	886	

1/ Items having similar numbers do not differ significantly at the 5% level. Duncan's Multiple range test.

Table 6. Summary of height data as related to stage of growth surfactant and rate of ethrel in 1969.

	Height in Inches				
	Rate of ethrel #/a				
	0	¼	½	1	
Stage of growth					x̄ stage of growth
Tillering	40.0a[1/]	40.4a	39.6a	39.4a	40.0a
First joint	39.2a	37.0b	37.0b	36.4b	37.4b
x̄ for rate of ethrel	39.6a	38.7ab	38.3b	37.9b	
Surfactant					
Without	39.8	39.2	39.0	38.6	39.1a
With	39.4	38.2	37.5	37.2	38.1b
x̄ for rate of ethrel	39.6a	38.7ab	38.3b	37.9b	

	Surfactant		
	W/O	With	
Stage of growth			x̄ for stage of growth
Tillering	40.2	39.5	40.0a
First joint	38.1	36.7	37.4b
x̄ for surfactant	39.2a	38.1b	

1/ Items having similar numbers do not differ significantly at the 5% level. Duncan's Multiple Range Test.

Table 7. Summary of sieve size data related to stage of growth, surfactant and rate of ethrel in 1969.

	Sieve Size in % Top of a 6/64				
	Rate of ethrel #/a				
	0	$\frac{1}{4}$	$\frac{1}{2}$	1	
Stage of growth					$\bar{x}$ stage of growth
Tillering	97.7	97.8	97.3	96.8	97.4a[1/]
First joint	96.6	97.3	95.7	94.7	96.1b
$\bar{x}$ for rate of ethrel	97.2ab	97.6a	96.5b	95.7c	
Surfactant					
Without	97.3	97.7	96.4	96.5	97.0
With	97.0	97.4	96.6	95.0	96.5
$\bar{x}$ for rate of ethrel	96.6	97.6	96.5	95.7	

	Surfactant		
	W/O	With	
Stage of growth			$\bar{x}$ for stage of growth
Tillering	97.4	97.4	97.4a
First joint	96.6	95.6	96.1b
$\bar{x}$ for surfactant	97.0	96.4	

1/ Items having similar numbers do not differ significantly at the 5% level. Duncan's Multiple Range Test.

Table 8. Summary of lodging data related to stage of growth, surfactant and rate of ethrel in 1969.

	Lodging Prevelence %				
	Rate of ethrel #/a				
	0	¼	½	1	
Stage of growth					$\bar{x}$ stage of growth
Tillering	95.5bc[1/]	93.6c	97.7ab	96.3ab	95.8
First joint	98.2a	97.8ab	93.9c	96.8ab	96.7
$\bar{x}$ for rate of ethrel	96.9	95.7	95.8	96.6	
Surfactant					
Without	97.2	95.0	96.7	96.3	96.3
With	96.5	96.4	94.9	96.8	96.2
$\bar{x}$ for rate of ethrel	96.9	95.7	95.8	96.6	

	Surfactant		
	W/O	With	
Stage of growth			
Tillering	94.9	96.7	95.8
First joint	97.7	95.7	96.7
$\bar{x}$ for surfactant	96.3	96.1	

	Lodging Severity				
Stage of growth					$\bar{x}$ stage of growth
Tillering	6.1	6.2	6.9	6.6	6.5
First joint	6.9	6.0	6.0	5.5	6.1
$\bar{x}$ for rate of ethrel	6.5	6.1	6.5	6.1	
Surfactant					
Without	6.5	6.3	6.7	6.4	6.5
With	6.5	5.9	6.2	5.7	6.1
$\bar{x}$ for rate of ethrel	6.5	6.0	6.5	6.1	

	Surfactant		
	W/O	With	
Stage of growth			$\bar{x}$ for stage of growth
Tillering	6.4a	6.5a	6.5
First joint	6.5a	5.7b	6.1
x for surfactant	6.5	6.1	

1/ Items having similar numbers do not differ significantly at the 5% level. Duncan's Multiple Range Test.

TITLE: Spring Wheat

PROJECT: Small Grains Investigations MS 756

YEAR: 1969

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

LOCATION: Northwestern Montana Branch Station - Field No. Y-6. Off station locations as listed in the manuscript.

DURATION: Indefinite

OBJECTIVE:
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. Fortuna is the best hard red variety for yield and performance, being 120% of Sheridan, the check variety. It was also the outstanding hard red variety in 1969 in an overall average in western Montana.
2. ID 0015 and ID 0006, white varieties, were outstanding in yield throughout western Montana in 1969 and are potential replacements for Idaed 59.

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-6 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 Pubescent Glume Yield Nursery containing 19 entries; the Isogenic Height Level Nursery, 5 entries (four located off station) and a Semi-dwarf Observation Nursery. Three off station nurseries consisting of 16 entries were seeded in Lake, Missoula and Ravalli Counties.

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

RESULTS AND DISCUSSION:

June precipitation was 2 inches above the mean, with July and August being about half of the mean. These moisture conditions helped to produce high yields of dryland spring wheat.

Advanced Yield Nursery: Six entries in this nursery were significantly higher in yield than Sheridan, which is the check variety. They were Petic 62, MN 6261, ND 6579, Fortuna, MT 6830, MT 6834 and MT 6833. Test weights on these entries were very good except Petic 62, which was green at harvest time. Petic 62 is a high yielding variety, but is late in maturity and has very poor quality. MT 6830 has excellent straw strength and is highly resistant to stripe rust. Based on agronomic characteristics MT 6830 is promising material if quality evaluations are equal to Centana. Table 1.

Over a six year period Fortuna is 120% of Sheridan as seen in table 2. The semi-dwarf types are for the most part superior in yield to the recommended variety Sheridan.

Western Regional White Nursery: Yields were quite high in this nursery with a mean of 80.5 bu/a. The high yielding entry was UT 256002 at 113.0 bu/a. Aberdeen selections, ID 0015 and ID 0020 were outstanding in yield this season. They have excellent stripe rust resistance and good straw strength. These two selections are about five days later than Idaed 59, but about the same as Lemhi which has a satisfactory maturity range for Northwestern Montana. ID 0015 and ID 0020 were suceptible to leaf rust this season as were many other entries in this nursery. See table 3.

In table 4, is a summary of the Western Regional White Wheat Nursery since 1959. Over a two year period ID 0015 is 126% of Idaed. UT 256002 is 124% of Idaed for a 3 year period. UT 256002 could be a possible replacement for Idaed. It has good straw strength, stripe and leaf rust resistance, is light in test weight and some 8 days later in heading date than Idaed 59.

Pubescent Glume Yield Nursery: In addition to the usual agronomic data, tiller counts, spikelets per head and 200 kernel weights were obtained in this nursery. Low CV's were calculated for all measurements made. The yield range was 48.3 bu/a to 83.9 bu/a. A gain in all characteristic or measurements are found in the PI 24500 x B 52-91 cross except test weight where a slight loss is noted.

In the Pugsley x B 52-91 a rather large yield gain is noted, which is no doubt due to the yield component of tillering. The three inch increase in height is listed as a loss by the author.

The yield loss of 4.9 bu/a in the Centana x PI 176217 cross cannot be easily explained because there is a fair increase in tiller numbers. See tables 5 and 6 for complete tabulation of data.

Results and Discussion (con't)

Isogenic Height Level Nurseries: Five nurseries were seeded in various locations in Western Montana. Four of the five were harvested. The nursery located in Ravalli County was severely damaged by birds, and for this reason it was abandoned. Tables 7, 8, 9 and 10 are the individual tabulations and analysis for each location. Only in one location, Northwestern Montana Branch Station, were yields found statistically significant. Plant height was significant at all four locations. The short type Centana headed considerately later than the other isogenic lines. Straw weights for the short type were significantly less than other types. There were no others with this magnitude of difference. Tiller counts and spikelets per head were not significant in the two locations where these measurements were made. Test weights were a bit lower for the short type on an average for the four locations. The short type was the lowest in grain yield for the four locations. Table 11 gives a complete summary of data for measurements made at the four locations.

Flathead County: The top yielding entries at this location were the soft white types followed by two hard red types. These entries were significantly higher in yield than Sheridan which is used as a check. They were ID 0016, ID 0015, ID 0006 (white), MT 6722 and Fortuna (red). Test weights were low on ID 0006 and ID 0015. Table 12.

Missoula County: Three white entries ID 0015, ID 0006 and ID 0016 were significantly higher in yield than the check. A durm variety, Wells was also in this group. The mean on this nursery is low because of a rather severe quackgrass infestation in part of the nursery. Test weights tend to be low for the white wheats at this yield level. Table 13.

Lake County: Three white entries in the Lake County location were significantly higher in yield than Sheridan which is used as a check. They were ID 0015, ID 0016 and Idaed 59. A complete tabulation of data are found in table 14.

Ravalli County: Bird damage was very severe in this location. Because of this damage the nursery was not harvested for yield,nor were any other agronomic measurements made.

A summary of spring (16) varieties grown in western Montana in 1969 are given in table 15. Fortuna ranks number one for the hard red entries and ID 0015 for the soft white entries. The test weights of the hard red entries are very good based on the 60 pound standard, however the white entries tend to be slightly lower in this measurement.

Semi-dwarf Observation Nursery: Twenty-five semi-dwarf lines were grown in four row plots, one replication, for observation. Yields were obtained as was plant height. When there was sufficient seed bushel weight measurements were made. Sn 64A// Tzpp/Nai 60 was the highest yielding entry with 94.7 bu/a, but several lines did approach this yield level. Table 16.

Male Sterile Ergot Study: The purpose of this study was to determine the affect ergot would have on male sterile wheats. The ergot level was quite low in the area in 1969 and only two varieties showed any ergot. Table 17.

Table 1. Agronomic data from the advanced yield nursery grown at Northwestern Montana Branch Station in 1969. Field No. Y-6. Experimental design-random block, four replications.

Planting date: May 6, 1969 Harvest date: September 16, 1969 Size of plot: 16 square feet

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	Stripe Rust Type 0-9	Stripe Rust % Sev.
CI 13927	Pitic 62	101.1*	51.0	196	38.8	76.0	6.3	0.0	0.0
MN 6261	Minnesota II-62-61	93.1*	62.0	192	36.3	52.5	3.3	1.5	2.8
ND 6579	Fta/61-107,S6579	90.9*	61.6	188	42.3	60.0	3.3	5.5	8.8
CI 13596	Fortuna	88.9*	61.5	189	47.5	96.8	8.5	0.5	0.3
MT 6830	SI/3/Nrnl0/Bvrl4//5*Cnt	87.0*	60.5	187	37.5	0.0	0.0	0.0	0.0
MT 6834	SI/3/Nrnl0/Bvrl4//5*Cnt	86.7*	60.5	189	40.3	72.0	5.5	3.8	6.3
MT 6833	SI/3/Nrnl0/Bvrl4//5*Cnt	85.3*	60.1	189	43.5	94.3	8.3	2.8	0.8
MT 6722	Nrnl0/Bvrl4//6*Cnt	82.6	60.0	189	37.8	61.0	4.0	1.8	1.5
MT 676	Nrnl0/Bvrl4//6*Cnt	81.7	60.2	190	39.3	23.8	0.8	2.8	15.3
MT 6839	Ftr/3/Nrnl0/Bvrl4//5*Cnt	80.9	58.5	191	42.0	67.5	2.0	4.0	1.8
MT 6831	SI/3/Nrnl0/Bvrl4//5*Cnt	78.6	60.8	186	39.3	15.0	0.8	4.3	19.0
MT 6829	SI/3/Nrnl0/Bvrl4//5*Cnt	78.6	61.0	186	38.0	38.8	4.0	0.0	0.0
MT 677	Nrnl0/Bvrl4//6*Cnt	75.6	60.0	190	37.8	48.5	1.8	2.5	7.5
MT 6626	B52-91//K338/Lee	74.9	60.5	185	47.0	85.8	6.8	0.5	0.3
RL 4200	Rl 4125 x Rl 4008	74.2	61.0	187	50.0	95.8	5.5	6.3	25.3
MT 6836	Crim/3/nl0/Bvrl4//4*Cnt	73.5	59.5	185	35.8	57.5	3.0	1.5	1.3
MT 6723	Nrnl0/Bvrl4//6*Cnt	71.9	59.9	191	38.5	31.3	1.8	2.8	10.3
CI 13586	Sheridan[1]	71.8	58.6	190	47.5	99.0	8.8	3.8	1.8
MT 6616	K338 x Lee	71.7	59.0	185	45.5	93.5	7.5	0.0	0.0
MT 6634	Kf/Cnt//B52-91	70.9	61.5	183	46.8	94.8	4.5	0.5	0.3
CI 14193	Red River 68	70.7	62.5	185	37.5	72.3	4.0	0.0	0.0
CI 13775	Manitou, R.L. 4159	70.7	59.9	188	45.3	88.3	6.5	0.0	0.0
CI 10003	Thatcher	69.5	59.5	188	47.5	96.8	7.8	0.0	0.0
MT 6617	B52-91//Kf/Cnt	67.7	60.4	185	46.8	83.5	5.0	0.0	0.0
CI 13333	Wells	64.8	61.0	190	51.0	82.3	3.8	0.0	0.0
CI 13773	Polk	64.3	60.6	190	46.8	99.0	9.0	0.8	2.5
CI 13958	Waldron	62.0	59.4	187	44.8	63.5	2.3	0.0	0.0
CI 12974	Centana	62.0	59.8	189	50.3	97.0	7.3	3.5	1.8
MT 6842	Nl0/Bl4//5*Cnt/3/58-29-4	60.0	60.0	190	38.5	0.0	0.0	1.3	1.3
CI 13768	Leeds	49.4	60.5	189	48.5	49.8	1.8	1.5	1.5

Table 1. continued

	Yield Bu/A	Test Wt. Lbs/Bu.	Days Jan.1 to Heading	Plant Height	Lodging % Prev.	Lodging Sev. 0-9	Stripe Rust Type 0-9	Stripe Rust % Sev.
$\bar{x}$	75.4	60.0	188	42.9	66.5	4.4	1.7	3.7
F - Value for variety comparison	6.44**	0.0	21.48**	8.96**	3.70**	5.25**	5.03**	2.33**
S.E.$\bar{x}$	4.4	0.0	0.6	1.6	15.5	1.2	0.8	4.1
L.S.D.(P.=.05)	12.39	0.0	1.64	4.50	43.67	3.38	2.29	11.55
C.V.%	5.84	0.0	.31	3.72	23.34	27.02	47.49	112.27

1/ Check variety

* Varieties yielding signifcantly more than the check (P.=.05)

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 1960-1969.

Number	Variety	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	Sta. Years	% Thatcher	% Sheridan
12974	Centana	33.5	28.3	59.1	34.3	47.8	61.1	50.4	54.5	66.1	62.0	10	98	95 1/
10003	Thatcher	29.0	27.4	49.7	34.7	46.7	65.4	62.2	60.6	63.4	69.5	10	100	98 1/
13586	Sheridan		38.5	59.4	36.9	50.6	72.8	50.9	54.5	54.4	71.8	9	102	100
13333	Wells			52.6	33.7	57.0	58.4	67.9	62.8	63.1	64.8	8	102	102
13596	Fortuna					62.9	76.8	66.2	56.4	74.7	88.9	6	116	120
13775	Manitou R.L. 4159					50.8	62.2	67.5	57.5	57.6	70.7	6	100	103
13773	Polk							51.4	52.3	57.2	64.3	4	88	97
6617	B52-91//Kf/Cnt								62.3	71.2	67.6	3	104	111
13768	Leeds								58.1	58.2	49.4	3	85	92
6634	Bkf/Cnt//B52-91								54.1	65.4	70.9	3	98	105
6722	Nrn10/Bvr14//6 * Cnt									85.8	82.6	2	127	133
676	Nrn10/Bvr14//16* Cnt									85.8	81.7	2	126	133
677	Nrn10/Bvr14//16* Cnt									83.5	75.6	2	120	126
6723	Nrn10/Bvr14//16* Cnt									71.8	71.9	2	108	114
13927	Pitic 62										101.1	1	145	141
6261	Minnesota 11-62-61										93.1	1	134	130
6579	Fta/61-107,S6579										90.9	1	131	127
6830	Si/3/Nrn10/Bvr14//5 * Cnt										87.0	1	125	121
6834	Si/3/Nrn10/Bvr14//5 * Cnt										86.7	1	125	121
6833	Si/3/Nrn10/Bvr14//5 * Cnt										85.3	1	123	119
6839	Ftr/3/Nrn10/Bvr14//5* Cnt										80.9	1	116	113
6831	Si/3/Nrn10/Bvr14//15* Cnt										78.6	1	113	109
6829	Si/3/Nrn10/Bvr14//5* Cnt										78.6	1	113	109
6626	B52-91//K338/Lee										74.9	1	108	104
4200	RL 4125 x RL 4008										74.2	1	107	103
6836	Crim/3/N10/Bvr14//4* Cnt										73.5	1	106	102
6616	K338 x Lee										71.7	1	103	100
14193	Red River 68									81.8	70.7	2	115	121
13958	Waldron										62.0	1	89	86
6842	N10/B14//5*Cnt/3/58-29-4										59.8	1	86	83

1/ Nine years

Table 3. Agronomic data from the western regional white spring wheat nursery grown at Northwestern Montana Branch Station in 1969. Field No. Y-6. Experimental design- random block, four replications.

Planting date: May 6, 1969 Harvest date: September 16, 1969 Size of plot: 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Days Jan.1 to Heading	Plant Height	Lodging 1/ % Prev.	Lodging 1/ Sev. 0-9	Stripe Rust 2/ Type 0-9	Stripe Rust 2/ % Sev.	4/ Leaf Rust
UT 256002	Svn/4/Lee/3/N10/Bvr//Ut	113.0*	52.4	195	38.8	0.0	0.0	0.0	0.0	
CI 13736	Burt x Kf, 58-2025	102.9*	57.8	197	42.0	0.0	0.0	2.8	7.8	
ID 0015	Aberdeen Selection	95.5*	56.8	193	38.0	21.3	1.5	0.0	0.0	M
ID 0020	Aberdeen Selection	93.2*	58.0	192	38.0	20.0	0.5	0.0	0.0	M
ID 0016	Nainari 60 x2 Lemhi 53	91.5	58.5	190	42.3	27.5	2.8	3.5	13.8	H
ID 0019	Aberdeen Selection	90.0	54.0	191	35.8	12.5	0.5	0.0	0.0	H
UT 256006	Svn/4/Lee/3/N10/Bvr//Ut	85.1	58.3	188	36.3	18.8	2.0	0.0	0.0	M
CA 6902	Tobari 66	85.1	61.4	186	34.3	0.0	0.0	0.0	0.0	L
MT 6723	Nrn10/Bvr14//6*Cnt	85.1	58.8	191	36.0	57.3	3.0	5.8	60.0	
ID 0021	Aberdeen Selection	84.5	55.6	192	38.0	20.0	1.3	1.0	3.8	H
ID 0006	Aberdeen Selection	84.3	55.1	194	38.5	36.3	1.8	0.0	0.0	M
UT 256005	Svn/4/Lee/3/N10/Bvr//Ut	83.1	58.5	188	37.0	37.3	4.0	0.0	0.0	M
OR 672	Idaed x Burt, 19-1	82.0	60.0	189	36.3	63.5	3.8	0.0	0.0	H
CA 6903	Axteca F67	79.8	61.2	185	33.3	0.0	0.0	0.0	0.0	
MT 677	Nrn10/Bvr14//6*Cnt	78.8	60.3	190	36.8	51.3	3.0	4.3	56.3	
CA 6901	Inia 66	78.3	61.6	184	32.0	0.0	0.0	3.8	45.0	
CI 13631	Idaed 59 3/	78.2	57.6	187	43.3	99.0	7.3	1.3	0.3	M
WA 5387	1750 x Tst 2x Aiv, 14	77.8	58.2	193	47.3	62.0	5.3	5.8	72.5	
CI 13722	Adams	77.0	58.3	190	43.5	99.0	8.0	0.0	0.0	H
CI 13732	Federation 67	76.0	59.9	191	44.3	33.3	6.3	7.0	67.5	
ID 0028	Nrn10/Bvr//Tk/3/2*Cnt	72.6	58.3	187	41.0	89.8	4.5	6.5	91.3	
CI 10003	Thatcher	70.5	60.0	189	44.5	94.5	5.5	0.0	0.0	H
WA 5488	K337/A0//Koelz7941S66-9	69.0	53.8	192	44.3	99.0	8.8	0.0	0.0	VH
CI 11919	Marfed	67.3	56.8	196	43.3	89.5	6.8	5.0	20.0	H
CI 1697	Baart	62.1	58.0	192	50.8	96.8	8.3	9.0	99.0	
CI 11415	Lemhi	57.0	56.3	193	46.5	86.8	5.0	9.0	99.0	
CI 4734	Federation	55.2	52.8	198	47.3	81.8	6.8	9.0	85.3	

1/ Prev. = % involved; Sev. = Scale 0-9 , 0 = No lodging 9 = flat
2/ Type 0-9, Sev. % of plants involved
3/ Check variety
* Varieties yielding significantly more than the check
4/ VH = very heavy; H = heavy; M = medium; L = light.

Table 3 . continued

	Yield Bu/A	Test Wt. Lbs/Bu.	Days Jan.1 to Heading	Plant Height	Lodging[1/] % Prev.	Lodging[1/] Sev. 0-9	Stripe Rust[2/] Type 0-9	Stripe Rust[2/] % Sev.
$\bar{x}$	80.5	57.7	191	40.3	50.3	3.6	2.7	26.7
F - value for variety comparison	9.07**	0.0	62.84**	24.93**	9.24**	7.59**	19.51**	24.71**
S.E.$\bar{x}$	4.3	0.0	0.4	1.0	12.5	1.1	0.7	7.4
L.S.D.(P. = .05)	12.02	0.0	1.25	2.71	35.14	2.96	2.09	20.82
C.V.%	5.31	0.0	.23	2.39	24.86	29.51	27.28	27.70

Table 4. Summary of white spring wheat yields grown at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana from 1959-1969.

Number	Variety	1959	1960	1961	1962	1963	1964	1966	1967	1968	1969	Sta. Years	% Lemhi	% Idaed 59
1697	Baart	41.8	29.1	25.5	41.8	21.8	35.0	32.4	60.9	52.5	62.1	10	123	78 1/
4734	Federation	43.2	30.6	24.9	44.1	21.2	29.5	36.6	43.7	54.1	55.2	10	117	74 1/
10003	Thatcher	45.2	25.5	30.0	50.3	35.2	50.1	72.6	57.4	54.7	70.5	10	150	97 1/
11415	Lemhi	38.7	17.8	18.3	52.4	6.2	14.7	15.7	37.2	69.7	57.0	10	100	63 1/
13631	Idaed 59		31.8		52.1	29.1	55.7	66.7	59.6	54.8	78.2	8	158	100
13732	Federation 67					32.3	42.7	60.4	54.2	55.2	76.0	6	160	93
0006	Aberdeen Selection								77.7	66.3	84.3	3	139	119
256002	Svn/4/Lee/3/N10/Bvr//Ut								63.3	61.6	113.0	3	145	124
0015	Aberdeen Selection									71.9	95.5	2	132	126
13736	Burt x Kf, 58-2025									70.2	103.0	2	137	130
0016	Nainari 60 x 2 Lemhi 53									70.1	91.5	2	128	122
13722	Adams									61.0	77.0	2	109	104
5387	1750 x Tst2xAiv,14									57.0	77.8	2	106	101
11919	Marfed									53.0	67.3	2	95	90
0020	Aberdeen Selection										93.2	1	164	119
0019	Aberdeen Selection										90.0	1	158	115
256006	Svn/4/Lee/3/N10/Bvr//Ut										85.1	1	149	109
6902	Tobari 66										85.1	1	149	109
6723	Nrn10/Bvr14//16* Cnt										85.1	1	149	109
0021	Aberdeen Selection										84.5	1	148	108
256005	Svn/4/Lee/3/N10/Bvr//Ut										83.1	1	146	106
672	Idaed x Burt 19-1										82.0	1	144	105
6903	Azteca F 67										79.8	1	140	102
677	Nrn10/Bvr14//6* Cnt										78.8	1	138	101
6901	Inia 66										78.3	1	137	100
0028	Nrn10/Bvr//Tk/3/2* Cnt										72.6	1	127	93
5488	K337/AB//Koelz 7941S 66-9										69.0	1	121	88

1/ Eight years

Table 10. Agronomic data from pubescent glume yield nursery grown on the Northwestern Montana Branch Station in 1969, Field No. Y-6. Experimental design - random block, four replications.

Planting date: May 6, 1969 Harvest date: September 16, 1969 Size of plot: 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Days Jan.1 to Heading	Plant Height	Tiller[1] Count	Weight[2] 200 Kernel	Spikelets per Head
MC 1	PI 242500	83.9*	57.1a	188a	32.5a	515.3a	8.2*	17.1*
MC 5	PI 242500 x B52-91	83.9*	59.4	185a	42.3a	513.5a	8.8*	17.0*
MC 14	PI 242500 x B52-91	83.5*	58.9	186a	43.5a	520.3a	8.7*	17.2*
MC 2	PI 242500 x B52-91	81.6*	58.6	183a	43.3a	479.5a	8.6*	18.3*
MC 16	PI 242500 x B52-91	81.4	59.2	186a	41.5a	481.3a	8.7*	17.5*
MC 10	Pugsley x B52-91	80.0	60.4	189a	50.0	663.5	8.2*	16.2
MC 18	PI 242500 x B52-91	74.9	56.3a	189a	32.5a	494.8a	7.8*	17.6*
MC 13	Pugsley x B52-91	72.7	60.4	189a	50.5	576.8a	8.3*	16.0
MC 15	B52-91	72.4	61.3*	187a	47.3a	477.5a	8.4*	15.7
MC 4	Pugsley x B52-91	69.7	60.6	189	51.0	585.8	8.4*	15.9
CI 12974	Centana[3]	65.8	59.7	191	49.8	638.5	6.9	15.7
MC 7	PI 242500 x B52-91	64.6	57.2a	189a	32.5a	524.8a	7.7*	17.3*
MC 11	Pugsley x B52-91	60.6	59.9	189	52.3	623.0	7.4*	16.7
MC 3	PI 176217 x Cnt	54.8	58.7	189	46.0	674.3	6.4	18.2*
MC 12	Pugsley	54.8	57.4a	192*	48.8	701.7*	7.1	18.3*
MC 19	PI 176217 x Cnt	51.1	58.3a	188a	46.0	609.5	6.2a	18.3*
MC 9	PI 176217 x Cnt	51.1	58.9	189	49.5	688.0	6.4	18.5*
MC 17	PI 176217 x Cnt	50.8	58.4a	189a	48.0	617.5	6.3a	18.5*
MC 6	PI 176217	48.3	57.7a	189a	45.5a	609.0	5.8a	18.6*
$\bar{x}$		67.7	58.9	188	44.9	578.6	7.6	17.3
F - Value for variety comparison		7.22**	13.93*	23.23*	19.79**	12.31**	28.80**	6.65**
S.E.$\bar{x}$		4.8	0.4	0.4	1.4	21.6	0.2	0.4
L.S.D. (P. = .05)		13.67	1.03	1.20	4.00	61.32	.53	1.14
C.V.%		7.12	.62	.23	3.15	3.74	2.46	2.32

1/ 16 liner feet
2/ Grams
3/ Check variety
* Values yielding significantly more than the check (P. = .05)
a Values significantly less than the check

Table 6. Data from pubescent yield nursery giving measurement for certain agronomic characteristics as related to parental material.

MC No.	Parent or Cross	Yield Bu/A	Test Weight Lbs/Bu	Days Jan 1 to Heading	Plant Height Inches	1/ Tiller Count	200 Kernel Count	Spike-lets/ Head
1	PI 24500	83.9	57.1	188	32.5	515	8.2	17.1
5	PI 24500 x B 52-91	83.9	59.4	185	42.3	513	8.8	17.0
14	PI 24500 x B 52-91	83.5	58.9	186	43.5	520	8.7	17.2
2	PI 24500 x B 52-91	81.6	58.6	183	43.3	479	8.6	18.3
16	PI 24500 x B 52-91	81.4	59.2	186	41.5	481	8.7	17.5
18	PI 24500 x B 52-91	74.9	56.3	189	32.5	494	7.8	17.6
7	PI 24500 x B 52-91	64.6	57.2	189	32.5	524	7.7	17.3
15	B 52-91	72.4	61.3	187	47.0	477	8.4	15.7
	$\bar{x}$ of parents	78.2	59.2	188	39.8	496	8.3	16.4
	$\bar{x}$ of progeny	78.3	58.2	186	39.3	502	8.4	17.5
	Gain or loss	+ .1	- 1.0	+ 2	+ .5	+ 6	+ .1	+ 1.1
12	Pugsley	54.7	57.4	192	48.8	701	7.1	18.3
10	Pugsley x B 52-91	80.0	60.4	189	50.0	663	8.2	16.2
13	Pugsley x B 52-91	72.7	60.0	189	50.5	576	8.3	16.0
4	Pugsley x B 52-91	69.7	60.6	189	51.0	585	8.4	15.9
11	Pugsley x B 52-91	60.6	59.9	189	52.3	623	7.4	16.7
15	B 52-91	72.4	61.3	187	47.0	477	8.4	15.7
	$\bar{x}$ of parents	63.6	59.3	190	47.9	589	7.8	17.0
	$\bar{x}$ of progeny	70.7	60.2	189	50.9	612	8.1	16.2
	Gain or loss	+ 7.1	+ .9	+ 1	- 3.0	+ 23	+ .3	- .8
4	Centana	65.8	59.7	191	49.8	638	6.9	15.7
3	PI 176217 x Centana	54.8	58.7	189	46.0	674	6.4	18.2
19	PI 176217 x Centana	51.5	58.3	188	46.0	609	6.2	18.3
9	PI 176217 x Centana	51.1	58.9	189	49.5	688	6.4	18.5
17	PI 176217 x Centana	50.8	58.4	189	48.0	617	6.3	18.5
6	PI 176217	48.3	57.7	189	45.5	609	5.8	18.6
	$\bar{x}$ of parents	57.0	58.7	190	47.7	624	6.4	17.2
	$\bar{x}$ of progeny	52.1	58.6	189	47.4	647	6.3	18.4
	Gain or loss	- 4.9	- .1	+ 1	+ .3	+ 23	- .1	+ 1.2

1/ Count of 16 liner feet

Table 7. Agronomic data from isogenic height level nursery grown at Northwestern Montana Branch Station, Kalispell, Montana in 1969. Experimental design - random block, four replications.

Planting date: May 6, 1969 Harvest date: September 16, 1969 Size of plot: 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu.	Days Jan.1 to Heading	Plant Height	Sheaf Weight Grams	Lodging % Prev.	Lodging Sev. 0-9	Tiller Count	Spike-lets/ Head	Straw Tons per A
CI 13596	Fortuna	80.8	61.4	191	44.0	1883.8	78.8	2.5	621.3	15.2	3.2
MC 1	Medium	80.4	61.0	190	38.8	2038.5	3.8	0.8	744.3	15.8	3.7
CI 12974	Centana 1/	69.3	61.4	192	51.3	2023.5	50.0	2.0	652.5	16.5	4.0
MC 2	Tall	66.9	61.2	191	48.8	1931.3	16.3	1.3	607.5	16.6	3.8
MC 3	Short	55.4	57.5	193	25.0	1273.0	0.0	0.0	654.8	15.5	2.2
$\bar{x}$		70.5	60.5	191	41.5	1830.0	29.8	1.3	656.0	15.9	3.4
F - Value for variety comparison		7.43*	0.0	12.08*	38.69**	5.15*	26.89**	13.46**	1.30	1.60	5.05*
S.E.$\bar{x}$		3.9	0.0	0.4	1.7	140.2	6.5	0.3	46.7	.5	.3
L.S.D. (P. = .05)		11.67	0.0	1.09	5.04	422.40	19.61	.81	N.S.	N.S.	.99
C.V.%		5.49	0.0	.19	4.03	7.66	21.87	20.77	7.12	2.97	9.70

1/ Check variety

Table 8. Agronomic data from isogenic height level nursery grown on the M.C. Roberts farm, Flathead County, Kalispell, Montana in 1969. Experimental design - random block, four replications.

Planting date: May 1, 1969 Harvest date: September 10, 1969 Size of plot: 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height	Sheaf Weight Grams	Lodging % Prev.	Lodging Sev. 0-9	Tiller Count	Spike-lets/ Head	Straw tons per A
MC 1	Medium	35.6	58.0	31.5	914.3	0.0	0.0	505.3	13.9	1.7
CI 13596	Fortuna	34.8	58.3	36.3	937.0	17.5	3.0	503.8	12.8	1.8
CI 12974	Centana 1/	31.3	59.0	42.3	929.0	6.3	1.0	501.0	14.1	1.9
MC 3	Short	30.3	58.5	21.8	731.3	0.0	0.0	500.0	13.4	1.3
MC 2	Tall	28.8	59.2	39.8	862.5	0.0	0.0	462.0	14.1	1.7
$\bar{x}$		32.2	58.6	34.3	874.8	4.8	0.8	494.4	13.6	1.7
F - value for variety comparison		2.39	0.0	227.92*	3.29*	23.36**	29.14**	1.14	1.62	6.22**
S.E.$\bar{x}$		1.9	0.0	.5	47.1	1.5	.2	17.1	0.4	0.1
L.S.D. (P.= .05)		N.S.	0.0	1.62	141.80	4.56	.73	N.S.	N.S.	.26
C.V.%		5.88	0.0	1.56	5.38	37.87	30.19	3.45	3.29	5.25

1/ Check variety

Table 9. Agronomic data from isogenic height level nursery grown in Lake Co. on the James Fleming farm, Pablo, Montana in 1969. Experimental design - random block, four replications.

Planting date: April 9, 1969 Harvest date: August 28, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height
CI 12974	Centana	47.0	59.8	41.0
MC 2	Tall	43.6	60.4	40.0
MC 3	Short	42.2	58.0	21.8
MC 1	Medium	42.1	58.2	31.5
CI 13596	Fortuna	40.0	60.2	36.0
	$\bar{x}$	43.0	59.3	34.0
	F - Value for variety comparison	.55	0.0	138.85**
	S.E.$\bar{x}$	3.5	0.0	.7
	L.S.D. (P. = .05)	N.S.	0.0	2.00
	C.V.%	8.14	0.0	1.95

Table 10. Agronomic data from isogenic height level nursery grown in Missoula County on the A.D. Neilson farm, Missoula, Montana in 1969. Experimental design - random block, four replications.

Planting date: April 29, 1969 Harvest date: August 28, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height
CI 13596	Fortuna	33.0	59.5	37.5
MC 2	Tall	29.6	60.5	36.3
CI 12974	Centana	26.3	60.1	36.8
MC 1	Medium	25.6	59.9	27.3
MC 3	Short	23.6	58.5	19.5
	$\bar{x}$	27.6	59.7	31.4
	F - Value for variety comparison	7.30	0.0	31.38**
	S.E.$\bar{x}$	2.5	0.0	1.4
	L.S.D. (P. = .05)	N.S.	0.0	4.24
	C.V.%	8.92	0.0	4.47

Table 11. Summary of data from isogenic height level nursery.

Location	Fortuna	Centana Regular	Centana Tall	Centana Medium	Centana Short	$\bar{x}$	L.S.D.	C.V.%
			YIELD BUSHEL/ACRE					
N.W. Mont. Br. Sta.	80.8	69.3	66.9	80.4	55.4	70.5	11.7	5.49
Roberts(Flathead Co.)	34.8	31.3	28.8	35.6	30.3	32.2	N.S.	5.88
Neilson(Missoula Co.)	33.0	26.3	29.6	25.6	23.6	27.6	N.S.	8.92
Fleming (Lake Co.)	40.1	47.0	43.6	42.1	42.2	43.0	N.S.	8.14
$\bar{x}$	47.2	43.5	42.2	45.9	37.9			
			TEST WEIGHT POUNDS/BUSHEL					
N.W. Mont. Br. Sta.	61.4	61.4	61.2	61.0	57.5	60.5		
Roberts(Flathead Co.)	58.3	59.0	59.2	58.0	58.5	58.6		
Neilson(Missoula Co.)	59.5	60.1	60.5	59.9	58.5	59.7		
Fleming(Lake Co.)	60.2	59.8	60.4	58.2	58.0	59.3		
$\bar{x}$	59.9	60.1	60.3	59.3	58.1			
			PLANT HEIGHT in INCHES					
N.W. Mont. Br. Sta.	44.0	51.3	48.8	38.8	25.0	41.5	5.0	4.03
Roberts(Flathead Co.)	36.3	42.3	39.8	31.5	21.8	34.3	1.6	1.56
Neilson(Missoula Co.)	37.5	36.8	36.3	27.3	19.5	31.4	4.2	4.47
Fleming(Lake Co.)	36.0	41.0	40.0	31.5	21.8			
$\bar{x}$	38.5	42.9	41.2	32.3	22.0			
			DAYS JANUARY 1 to HEADING					
N.W. Mont. Br. Sta.	191	192	191	190	193	191	1.1	.19
			SHEAF WEIGHT in GRAMS					
N.W. Mont. Br. Sta.	1883.8	1931.3	2023.5	2038.5	1273.0	1830.0	422.4	7.66
Roberts(Flathead Co.)	937.0	929.0	862.0	914.3	731.0	874.8	141.8	5.38
$\bar{x}$	1410.4	1430.2	1442.8	1476.4	1002.0			
			LODGING SEVERITY 0-9					
N.W. Mont. Br. Sta.	2.5	2.0	1.3	0.8	0.0	1.3	.8	20.77
Roberts (Flathead Co.)	3.0	1.0	0.0	0.0	0.0	0.8	.7	30.19
$\bar{x}$	2.8	1.5	0.7	0.4	0.0			
			LODGING PERCENT					
N.W. Mont. Br. Sta.	78.8	50.0	16.3	3.8	0.0	29.8	19.6	21.87
Roberts(Flathead Co.)	17.5	6.3	0.0	0.0	0.0	4.8	4.6	37.87
$\bar{x}$	48.2	28.1	8.2	1.9	0.0			
			TILLER COUNTS 16 LINER FEET					
N.W. Mont. Br. Sta.	621	652	607	744	654	656	N.S.	7.12
Roberts(Flathead Co.)	503	501	462	505	500	494	N.S.	3.45
$\bar{x}$	562	577	535	625	577			

Table 11. (con't)

Location	Fortuna	Centana Regular	Centana Tall	Centana Medium	Centana Short	$\bar{x}$	L.S.D.	C.F.%
		SPIKELETS/HEAD						
N.W. Mont. Br. Sta.	15.2	16.5	16.6	15.8	15.5	15.9	N.S.	2.97
Roberts(Flathead Co.)	12.8	14.1	14.1	13.9	13.4	13.6	N.S.	3.29
$\bar{x}$	14.0	15.3	15.4	14.9	14.5			
		STRAW TONS/ACRE						
N.W. Mont. Br. Sta.	3.2	4.0	3.8	3.7	2.2	5.1	.99	9.70
Roberts(Flathead Co.)	1.8	1.9	1.7	1.7	1.3	1.7	.26	5.25
$\bar{x}$	2.5	3.0	2.8	2.7	1.8			

Table 12. Agronomic data from off station spring wheat grown in Flathead County on the M.C. Roberts farm, Kalispell, Montana in 1969. Experimental design - random blaock, four replications.

Planting date: May 1, 1969 Harvest date: September 10, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height	Lodging % Prev.	Lodging Sev. 0-9
ID 0016	Nainari 60 x2 Lemhi 53	54.1*	59.3	40.0	0.0	0.0
ID 0015	Aberdeen Selection	51.3*	57.2	34.3	0.0	0.0
ID 0006	Aberdeen Selection	48.8*	56.4	36.0	0.0	0.0
MT 6722	Nrnl0 x Bvrl4 2x6 Cnt	44.4*	60.1	32.3	0.0	0.0
13596	Fortuna	42.4*	61.0	39.5	47.5	2.8
MT 6723	Nrnl0 x Bvrl4 2x6 Cnt	41.1	61.3	32.0	2.5	1.8
MT 676	Nrnl0 x Bvrl4 2x6 Cnt	40.7	60.6	32.8	0.0	0.0
13333	Wells (durum)	40.0	61.2	41.5	0.0	0.0
13631	Idaed 59	39.7	60.4	36.5	15.0	2.0
10003	Thatcher	39.3	60.9	40.8	10.0	1.0
13775	Manitou	37.9	60.5	40.3	12.5	1.5
MT 677	Nrnl0 x Bvrl4 2x6 Cnt	35.9	60.4	32.3	0.0	0.0
12974	Centana	35.4	61.1	44.8	0.0	0.0
13586	Sheridan 1/	34.5	60.9	42.8	7.5	1.8
13773	Polk	28.7	60.5	39.5	5.0	0.3
13768	Leeds (durum)	28.7	61.3	38.5	0.0	0.0
	$\bar{x}$	40.2	60.2	37.7	6.3	0.7
	F - Value for variety comparison	9.28**	0.0	18.48**	7.54**	3.27
	S.E.$\bar{x}$	2.3	0.0	1.0	4.4	0.5
	L.S.D.(P.=.05)	6.66	0.0	2.71	12.56	N.S.
	C.V.%	5.82	0.0	2.52	70.55	76.18

1/ Check variety
* Varieties yielding significantly more than the check (P.=.05)

Table 13. Agronomic data from off station spring wheat grown in Missoula County on the A. D. Neilson farm, Missoula, Montana in 1969. Experimental design - random block, four replications.

Planting date: April 29, 1969 Harvest date: August 20, 1969
Size of Plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height
ID 0015	Aberdeen Selection	40.5*	58.5	29.0
ID 0006	Aberdeen Selection	35.3*	58.0	29.5
13333	Wells (durum)	33.3*	62.0	36.8
ID 0016	Nainari 60 x 2 Lemhi 53	32.2*	59.5	32.3
13596	Fortuna	30.8	60.3	36.5
MT 676	Nrnl0 x Bvrl4 2x6 Cnt	29.7	60.5	26.5
MT 6722	Nrnl0 x Bvrl4 2x6 Cnt	29.5	59.9	28.5
MT 677	Nrnl0 x Bvrl4 2x6 Cnt	28.5	61.5	29.0
13768	Leeds (durum)	27.4	61.5	38.3
MT 6723	Nrnl0 x Bvrl4 2x6 Cnt	27.3	61.0	29.0
10003	Thatcher	24.5	60.6	34.8
13586	Sheridan 1/	24.5	60.2	38.5
12974	Centana	24.4	61.1	36.0
13775	Manitou	23.3	59.1	35.0
13773	Polk	22.6	60.5	34.0
13631	Idaed 59	13.3	0.0	20.8

1/ Check Variety
* Varieties yielding significantly more than the check (P.=.05)

$\bar{x}$	27.9	56.5	32.1
F - Value for variety Comparison	6.08**	0.0	11.1**
S.E.$\bar{x}$	2.5	0.0	1.5
L.S.D.(P.=.05)	7.13	0.0	4.2
C.V.%	8.95	0.0	4.59

Table 14. Agronomic data from off station spring wheat grown in Lake County on the James Fleming farm, Pablo, Montana in 1969. Experimental design random block, four replications.

Planting date: April 29, 1969 Harvest date: August 28, 1969
Size of plot: 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height
ID 0015	Aberdeen Selection	51.3	56.3	30.5
ID 0016	Nainari 60 x2 Lemhi 53	44.6	60.0	31.8
13631	Idaed 59	44.5	59.9	29.0
MT 676	Nrnl0 x Bvrl4 2x6 Cnt	41.0	58.6	30.0
ID 0006	Aberdeen Selection	39.5	56.5	31.3
MT 6722	Nrnl0 x Bvrl4 2x6 Cnt	39.3	57.5	28.8
MT 6723	Nrnl0 x Bvrl4 2x6 Cnt	38.0	56.9	30.0
13775	Manitou	37.6	58.7	37.8
13596	Fortuna	37.3	60.0	35.0
10003	Thatcher	36.6	57.4	37.0
MT 677	Nrnl0 x Bvrl4 2x6 Cnt	36.3	57.9	29.0
12974	Centana	35.4	57.9	38.0
13586	Sheridan	34.7	58.0	41.0
13773	Polk	32.1	60.5	33.0
13333	Wells (durum)	30.9	50.6	33.8
13768	Leeds (durum)	22.9	60.5	32.8
	$\bar{x}$	37.6	58.0	33.1
	F - Value for variety comparison	5.74**	0.0	13.12**
	S.E.$\bar{x}$	2.7	0.0	1.0
	L.S.D. (P.=.05)	7.59	0.0	2.98
	C.V.%	7.08	0.0	3.16

Table 15. Summary of spring varieties grown in western Montana in 1969.

CI or St. No.	Variety	N.W. Br. Sta.	Flat-head Co.	Miss-oula Co.	Lake Co.	x̄	Rank	N.W. Br. Sta.	Flat-head Co.	Miss-oula Co.	Lake Co.	x̄
		YIELD BU/A						TEST WT. LB/Bu.				
13333	Wells	64.8	40.0	33.3	30.9	42.3	8	61.0	61.2	62.0	50.6	58.7
13768	Leeds	49.4	28.7	27.4	22.9	32.1	12	60.5	61.3	61.5	60.5	61.0
13596	Fortuna	88.9	42.4	30.8	37.3	49.9	1	61.5	61.0	60.3	60.0	60.7
13586	Sheridan	71.8	34.5	24.5	34.7	41.4	9	58.6	60.9	60.2	58.0	59.4
12974	Centana	62.0	35.4	24.4	35.4	39.3	10	59.8	61.1	61.1	57.9	60.0
13775	Manitou	70.7	37.9	23.3	37.6	42.4	7	59.9	60.5	59.1	58.6	59.5
MT 676	Nrnl0xBvrl4,2x6Cnt	81.7	40.7	29.7	41.0	48.3	3	60.2	60.6	60.5	58.6	60.0
MT 677	Nrnl0xBvrl4,2x6Cnt	75.6	35.9	28.5	36.3	44.1	5	60.0	60.4	61.5	57.9	60.0
MT 6723	Nrnl0xBvrl4,2x6Cnt	71.9	41.1	27.3	38.0	44.6	4	59.9	61.3	61.0	56.9	59.8
13773	Polk	64.3	28.7	22.6	32.1	36.9	11	60.6	60.5	60.5	60.5	60.5
10003	Thatcher	69.5	39.3	24.5	36.6	42.5	6	59.5	60.9	60.0	57.4	59.5
MT 6722	Nrnl0xBvrl4,2x6Cnt	82.6	44.4	29.5	39.3	49.0	2	60.0	60.1	59.9	57.5	59.4
13631	Idaed 59	78.2	39.7	13.3	44.5	43.9	4w	57.6	60.4	0.0	59.9	59.3
ID 0015	Aberdeen Sel.	95.5	51.3	40.4	51.3	59.6	1w	56.8	57.2	58.5	56.3	57.2
ID 0006	Aberdeen Sel.	85.1	48.8	35.3	39.5	52.2	3w	58.3	56.4	58.0	56.5	57.3
ID 0016	Nainari60x2Lemhi53	91.5	54.1	32.2	44.6	55.6	2w	58.5	59.3	59.5	60.0	59.3

w/ White wheats

x̄	40.2	27.9	37.6
L.S.D.(.05)	6.7	7.1	7.6
C.V.%	5.82	8.95	7.08

Table 16. Agronomic data from semidwarf observation nursery grown on the Northwestern Montana Branch Station, Route 4, Kalispell in Field Y-6, 1969.

Date Seeded: May 6, 1969 Date Harvested: September 16,1969
Size of Plot: 16 sq. ft.

Variety	Plant Height	Yield Bu/A	Test Weight Lbs/Bu.
Pk 176	30	76.1	0.0
Sonora 64	29	51.3	0.0
PI 290483	48	68.2	0.0
PI 295963	39	50.9	0.0
PI 303663 (pubescent)	28	61.7	0.0
PI 303665	34	73.5	0.0
PI 303670	31	68.5	0.0
VI-E-2-7c-2y-1c	23	55.8	0.0
Nainari 60	31	85.7	0.0
1T-3y-2c	33	80.5	0.0
Pi62/II-53-526//Sn64	34	77.7	0.0
Sn64/Klein Rendidores	34	91.2	60.1
Pi62/II-53-526//Sn64	31	80.8	0.0
Sn64A//Tzpp/Nai 60	34	94.7	60.0
Pitic/Chris//Sn64, S4014	32	84.4	0.0
Tzpp/Sn64	37	82.8	0.0
Sn64//Tzpp/YQ54	29	75.8	0.0
Sn64A//Tzpp/Nai 60	32	62.5	0.0
Tzpp*2/3*An, II-19025-4M	33	61.2	0.0
Tzpp/Sonora 64, II-1908-15M	39	90.0	58.5
Tzpp/Sonora 6414, II-19021-1M	40	89.7	59.5
Nrnl0/Bvrl4//6*cnt, MT676	35	76.3	0.0
Nrnl0/Bvrl4//6*cnt, MT677	36	73.4	0.0
Nrnl0/Bvrl4//6*cnt, MT6722	38	86.8	0.0
Nrnl0/Bvrl4//6*cnt, MT6723	36	89.7	58.9

Table 17. Reading from the male sterile ergot study grown on the Northwestern Montana Branch Station, Field Y-6 in 1969.

Seeding Date: May 6, 1969

Variety	Disease Reading 1/		
	I	II	III
Manitou	0	0	0
Justin	0	0	0
Pembina	0	0	0
Selkirk	0	1	0
Chris	0	1	0
Mexican Sterile 1	0	0	0
Mexican Sterile 2	0	0	0

1/ Number of heads with ergot 48 liner feet of row.

TITLE: Winter Wheat

PROJECT: Small Grains Investigations MS 756

YEAR: 1969

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. Burt x P.I. 178383 lines are highly resistant to dwarf smut and stripe rust.
2. Moro and Omar x P.I. 178383 are white wheats which have a high degree of resistance to stripe rust and dwarf smut.
3. Nugaines and Moro were the highest yielding varieties in all studies in western Montana. Wanser was the highest yielding hard red entry, but very susceptible to dwarf smut.

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-3; Western Regional Hard Red Winter Wheat Nursery grown on the L. B. Claridge farm, northwest of Kalispell in a dwarf bunt area; Uniform White Wheat Nursery grown at the Northwestern Montana Branch Station in Field E-3. The off station nurseries were located in Ravalli, Missoula, Lake, Sanders and Mineral Counties.

Herbicide applications were made for weed control in all winter wheat studies early in the spring. Bromoxynil was used at the rate of 3/8 lb ai/a.

Plots were harvested with a power harvester.

RESULTS AND DISCUSSIONS:

Intrastate Hard Red Winter Wheat Nursery

The yield data from this nursery were non-significant when analyzed statistically. The high coefficient of variability is due in part to bird damage, uneven soil conditions and variation of stripe rust between replications which is a direct relationship to the soil variation.

Dwarf smut readings wee high in the varieties of Lancer, McCall, Winalta, Westmont, Wanser, MT 6832, Rego, Cheyenne, MT 6830 and MT 6641. Some of the fore named varieties also had a high incidence of stripe rust. The Burt x P.I. 178383 lines were the top yielding entries, had excellent dwarf bunt resistance and generally good stripe rust resistance. Table 1, gives complete detail of this teat.

In table 2 a summary of data is given for varieties grown in the above named nursery. Two varieties, Cheyenne and Westmont have been grown for ten years. Using Westmont as a standard, Cheyenne is 20% higher in yield over the 10 years 1960-69. Of the named varieties, four year averages, Wanser (64.5 bu/a) is high in yield followed by Delmar (61.8 bu/a), McCall (56.4), and Crest 55.6 bu/a). McCall and Wanser both have a high susceptibility to dwarf smut in this location.

Western Regional Hard Red Winter Nursery

A seeding date of October 1, 1969 resulted in loss of stand and low tillering in this nursery. Only three of the four replications was harvested because of almost total loss of the fourth replication. To obtain optimum stand in this area, seeding should be completed by not later than September 20, with September 15 being the best seeding date for highest yields.

Yields were non-significant, however UT 646001 was the highest yielding entry. This variety also had the highest stand count at harvest time. The mean for the nursery was 41.3 bu/a.

Dwarf smut was very light this season on the Claridge farm. This in in contrast to what we usually expect in this area with a late date of planting. (Oct. 1, 1969) Readings were not obtained for all entries because of an error in recording at the time the notes were taken. Table 4.

Unifrom White Wheat Nursery

Soil and moisture conditions were the same for this nursery as discribed above for the Intrastate hard red winter wheat nursery. Yield data were non-significant. Significant differences were found in stripe rust and dwarf bunt levels in the nursery. Nugaines, the check variety, had a high level of both stripe rust and dwarf bunt. Moro and a sister selection showed good resistance to both diseases in this nursery. Table 5 gives complete tabulation of all data obtained in 1969.

A summary of the Uniform White Wheat Nursery is given in Table 6. This shows five varieties being greater in yield than Gaines which is used as a standard. Some of the comparisons are for only one year thus one should not make a firm judgement on this limited amount of data. WA 4966 and WA 4995 have good yield level, but the dwarf smut level is too high to be acceptable as a commercial variety in this area.

Results and Discussion (con't)

Missoula County

The yield range of this nursery was 37.8 bu/a for MT 6641 to 65.1 bu/a for Nugaines. This range was found to be statistically non-significant when analyzed. One replication had to be dropped from the study because of herbicide residule. Table 7.

Lake County

Yields were low in this area in 1969. There was no grouping of the hard reds or soft whites as to yielding ability. The two highest yielding entries were MT 6641 (hard red) and WA 4877 (soft white). These two entries were significantly higher in yield than Crest which was used as a check. Table 8.

Ravalli County

Moro was highest yielding entry in this nursery, however yield differences were not found to be statistically significant. Delmar was the lowest yielding entry. Table 9.

Mineral County

The white wheat entries were the higher yielding entries at this location. Three white entries (WA 4877, Moro and WA 4984) were significantly higher in yield than Crest. Table 10.

Sanders County

The study located on the D. L. Ross farm was abandoned because of a severe perennial and annual weed infestation. Wheat stands were poor because of uneven emergence in the fall.

In table 11 are summarized data from 16 entries grown at five locations in Western Montana in 1969. The white entries and hard red entries are ranked seperately. Nugaines ranks number one in the white group and Wanser number one in the hard red group. Wanser and McCall do have high yield potential, but are very susceptible to race D-3 of dwarf smut. Therefore one has to give careful qualification to any variety being evaluated and many other characteristics must be considered along with yield.

Table 1. Agronomic data from the intrastate winter wheat nursery grown on the Northwestern Montana Branch Station, in 1969. Field No. E-3. Experimental design - random block, three replications.

Planting date: September 25, 1969 Harvest date: August 20, 1969 Size of plot: 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Days Jan. 1 to Heading	Plant Height	Stripe Rust Type	Stripe Rust Prev. %	Dwarf Smut
MT 6829	Burt/PI 178383 101-1200	77.1	62.6	156	36.0	0.5	0.5	0.0
MT 6646	Burt x 83 C63-11	68.3	56.8	169	37.0	3.0	4.3	0.0
MT 6828	Burt/PI 178383 13-1201	67.7	61.4	157	35.3	0.0	0.0	0.0
MT 6826	Burt/PI 178383 4-1192	61.4	61.7	157	36.0	0.0	2.5	0.0
MT 6827	Burt/PI 178383 14-1202	61.3	60.2	156	35.7	0.3	1.3	0.0
MT 6729	Wmt/PI 178383 14-11-3	59.6	61.5	157	40.0	2.8	1.8	2.0
CI 13442	Delmar	59.3	61.0	162	41.0	6.8	47.5	6.7
MT 6833	Wmt/178383 21-1-6	59.0	61.8	156	35.0	0.3	1.3	0.0
MT 6641	PI 178383 x2 Wmt, 16-1-8	58.0	61.2	159	41.3	0.0	0.0	20.0
MT 6830	Uniform Mildew 48	57.1	62.5	158	38.0	2.8	2.8	21.7
CI 8885	Cheyenne	57.0	61.6	158	43.3	5.0	60.0	16.7
MT 6732	Wmt/PI 178383 8-8-1	56.4	62.5	157	35.3	3.8	6.3	0.0
CI 13844	Wanser	56.0	62.0	157	35.7	7.5	72.5	18.3
MT 6831	Wmt/178383 20-3-14	54.1	62.9	156	34.7	3.0	7.5	1.7
MT 6634	Wmt-2 x 83 7-14-4	51.8	62.0	155	35.3	2.0	16.3	0.0
MT 6721	Wmt/PI 178383 7-10-3	51.5	61.6	156	37.3	3.0	2.3	0.0
CI 13181	Rego	51.3	59.0	158	43.0	4.3	15.0	13.3
MT 6726	Wmt/PI 178383 8-10-6	50.3	61.1	156	35.0	2.3	5.0	0.0
MT 6832	Wmt/178383 11-4-5	49.1	61.0	155	35.0	0.8	0.3	16.7
MT 6734	Wmt/PI 178383 12-6-3	46.8	60.7	157	37.0	4.0	22.8	0.0
CI 12930	Westmont	46.7	61.0	156	36.0	9.0	95.5	33.3
CI 13670	Winalta	45.7	60.9	157	39.3	7.0	38.8	23.3
CI 13880	Crest	43.8	62.4	156	36.7	0.0	0.0	0.0
CI 13842	McCall	40.5	61.1	158	32.3	7.8	71.3	30.0
CI 13547	Lancer	38.3	60.9	156	36.7	4.8	28.8	31.7
$\bar{x}$		54.7	61.3	157.3	37.1	3.2	20.1	9.4
F - Value for variety comparison		1.47	0.0	101.9**	3.79**	10.35**	13.27**	6.8**
S.E.$\bar{x}$		7.4	0.0	.3	1.4	.9	7.7	4.5
L.S.D. (P. = .05)		N.S.	0.0	.77	3.98	2.42	21.65	12.72
C.V.%		13.46	0.0	.17	3.79	26.68	37.98	47.77

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Table 2. Summary of winter wheat data from the intrastate yield nurseries grown at the Northwestern Montana Branch Station, Kalispell, Montana from 1960-1969.

Variety	Number	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	Station Yrs.	% Westmont	$\bar{x}$	2 Yrs.	3 Yrs.	4 Yrs.	10 Yrs.
															Average bu/acre			
Cheyenne	8885	41.4	49.5	55.5	61.9	57.5	48.7	59.3	46.4	57.2	57.0	10	120	53.4	57.1	53.5	55.0	53.4
Westmont	12930	34.3	51.1	57.2	45.6	41.5	42.4	30.2	50.4	46.9	46.7	10	100	44.6	46.8	48.0	43.5	44.6
Rego	13181	35.5	46.7	60.6	60.2	49.9	42.5	62.4	43.6		51.3	9	113	50.3				
Delmar	13442			55.3	71.8	51.4	47.3	64.2	55.9	68.0	59.3	8	131	59.2	63.6	61.1	61.8	
Winalta	13670					54.4	31.4	67.4	44.9	55.8	45.7	6	116	49.9	50.7	48.8	54.3	
Burtx83C63-11	6646						50.1	81.8	58.4	64.4	68.3	5	149	64.6	66.4	63.7	68.2	
Crest	13880						40.8	73.4	53.5	51.5	43.8	5	121	52.6	47.6	49.6	55.6	
McCall	13842							56.4	51.9	76.8	40.5	4	130	56.4	58.7	42.3	56.4	
Lancer	13547							57.0	41.7	44.0	38.3	4	104	45.3	41.1	41.3	45.3	
Wanser	13844							73.9	51.7	76.5	56.0	4	148	64.5	66.2	61.4	64.5	
PI 178383 x 2 Wmt 16	6641								54.8	48.8	58.0	3	112	53.9	53.4	53.9		
Wmt-2x83 7-14-4	6634								45.8	36.1	51.8	3	93	44.6	44.0	44.6		
2 Wmt/PI 178383 14-11-3	6729									60.0	59.6	2	128	59.8	59.8			
2 Wmt/PI 178383 8-10-6	6726									54.7	50.3	2	112	52.5	52.5			
2 Wmt/PI 178383 12-6-3	6734									52.2	46.8	2	106	49.5	49.5			
2 Wmt/PI 178383 8-8-1	6732									52.1	56.4	2	116	54.3	54.3			
2 Wmt/PI 178383 7-10-3	6721									41.9	51.5	2	98	46.7	46.7			
Burt/PI 178383 101-1	6829										77.1	1	173	77.1				
" " 13-1201	6828										67.7	1	152	67.7				
" " 4-1192	6826										61.4	1	138	61.4				
" " 14-1202	6827										61.3	1	137	61.3				
3Wmt/178383 21-1-6	6833										59.0	1	132	59.0				
Uniform Mildew	6830										57.1	1	128	57.1				
3Wmt/178383 20-3-14	6831										54.1	1	121	54.1				
" " 11-4-5	6832										49.1	1	110	49.1				

Table 3. Agronomic data from the western regional hard red winter wheat nursery grown on the L. B. Claridge farm, Kalispell, Montana in 1969. Experimental design - random block, three replications.

Planting date: October 1, 1968 Harvest Date: September 6, 1969 Size of plot: 16 square feet

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	% Stand
UT 646001	Delmar/Columbia	51.1	62.6	168	35.7	96.0	6.0	94.7
MT 6319	Sel Bulk 2-77	49.5	59.1	171	37.7	86.0	6.3	83.3
CI 8885	Cheyenne	49.0	59.8	169	37.0	68.3	7.0	76.7
WA 4836	Bezosztaja 2/ Sel.B	47.0	60.0	167	32.0	2.0	6.0	80.0
CI 1442	Kharkof	47.0	60.0	168	43.3	99.0	7.0	91.7
ID 0001	At150(Rio-Rex//2Cnn)/4Tk	45.2	59.6	169	35.3	23.3	7.0	75.0
CI 13426	Tendoy	45.1	59.4	170	37.3	60.0	8.0	88.3
ID 5001	(Rex-Rio x6 Cmn)XA.F. Tk	43.8	59.8	168	39.0	59.7	4.7	83.0
MT 6531	Rego x Cnn 37-3-6	43.8	59.4	168	41.7	73.0	7.0	91.3
UT 522001	Utah 175A-53/Delmar	43.3	60.8	170	40.0	94.3	6.7	91.3
ID 5006	Nrn10/Staring //2 Cnn	42.4	62.0	172	25.7	0.0	0.0	83.3
ID 0007	Cheyenne/Utah 175A-53	41.4	58.6	170	34.7	50.0	8.3	85.0
CI 13842	McCall	40.8	61.0	171	35.7	16.7	8.7	84.7
ID 0002	Orfed/Wsc//Burt	40.7	60.5	169	34.0	46.7	8.0	81.7
ID 0010	Cnn x Utah 175A-53	40.7	0.0	170	38.0	69.7	4.0	88.0
CI 13846	Itana 65	40.5	61.5	170	35.3	70.0	7.3	81.7
ID 0009	Cheyenne/Utah 175A-53	39.7	59.3	169	36.0	38.3	5.3	88.3
CI 13844	Wanser	38.4	59.0	169	36.0	8.3	9.0	66.7
ID 0008	Cheyenne/Utah 175A-53	36.9	60.6	171	39.7	73.3	6.7	76.7
MT 6641	PI 178383 x2 Wmt, 16-1-8	35.0	60.5	170	34.3	61.7	6.7	81.3
CI 10061	Rio	34.0	56.6	170	33.3	73.0	8.3	73.3
CI 13442	Delmar 1/	32.9	59.0	172	39.0	16.7	7.7	68.3
CI 13880	Crest	32.3	60.9	170	22.0	61.3	5.3	73.3
CI 12933	Itana	31.3	60.4	170	36.3	13.3	7.3	73.3
$\bar{x}$		41.3	60.0	170	35.8	52.5	6.6	81.7
F - Value for variety comparison		1.00	0.0	1.09	3.07*	5.22*	3.43*	.78
$SE\bar{x}$		5.5	0.0	11.4	2.6	13.5	1.0	8.6
L.S.D.		N.S.	0.0	N.S.	7.43	38.49	2.89	24.56
C.V.%		13.28	0.0	6.83	7.26	25.64	15.35	10.52

1/ Delmar is the check variety

Table 4. Disease readings from western regional hard red winter nursery grown on the L. B. Claridge farm, Kalispell, Montana in 1969.

CI or State No.	Variety	Stripe Rust Type[1]	Stripe Rust Prev. %	Dwarf Smut %
UT 646001	Delmar/Columbia	3	2.0	1.0
MT 6319	Sel. Bulk	1	2.0	0.0
CI 8885	Cheyenne	2	5.0	4.0
WA 4836	Bezosztaja 2/Sel. B			
CI 1442	Kharkof			
ID 0001	Atl 50 (Rio-Rex//2 Cnn)/4TK	1	1.0	1.0
CI 13426	Tendoy	0	1.0	4.0
ID 5001	(Rex-Rio x 6Cmn)XA.F.TK	0	0.0	1.0
MT 6531	Rego x Cnn 37-3-6	1	1.0	0.0
UT 522001	Utah 175A-53/Delmar	2	3.0	0.0
ID 5006	Nrn 10/Staring// 2 Cnn	0	1.0	5.0
ID 0007	Cheyenne/Utah 175A-53	1	1.3	.7
CI 13842	McCall	1	1.0	1.0
ID 0002	Orfed/WSC//Burt	1	4.0	.7
ID 0010	Cnn x Utah 175A-53	1	2.0	.1
CI 13846	Itana 65	0	1.0	.0
ID 0009	Cheyenne/Utah 175A-53	1	0.0	.0
CI 13844	Wanser	1	1.0	2.0
ID 0008	Cheyenne/Utah 175A-53	0	.3	.3
MT 6641	PI 178383x2Wmt, 16-1-8	0	0.0	.2
CI 10061	Rio	0	0.0	9.0
CI 13442	Delmar			
CI 13880	Crest	0	0.0	0.0
CI 12933	Itana	0	0.0	0.0

1/ Scale 0-4 stripe rust type.

Table 5. Agronomic data from uniform white winter wheat grown at Northwestern Montana Branch Station in 1969. Field No. E-3. Experimental design - random block, four replications.

Planting date: Setpember 26, 1968 Harvest date: August 20, 1969 Size of plot: 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Days Jan.1 to Heading	Plant Height	Stripe Rust Type 0-9	Stripe Rust % Sev.	Dwarf Smut %
OR 6688	PI 178383/3 Omar	77.5	61.0	159	42.7	0.0	0.0	0.0
OR 63130	Nord Desprey x2 Sel. 1	73.7	60.1	159	29.0	4.0	16.3	6.7
CI 13448	Gaines	71.7	61.4	159	29.3	7.3	71.3	18.3
CI 13072	Omar	71.0	62.2	160	39.3	9.0	99.0	10.0
WA 4995	N10/B11/P14//14/53-101	70.7	61.6	158	32.7	4.8	9.0	16.7
OR 611227	HeinesVII/Redmond	69.6	58.2	162	32.0	3.8	2.5	15.0
CI 12385	Brevor	68.4	60.2	158	35.0	5.3	80.0	3.3
CI 10063	Golden	67.2	60.5	160	44.0	9.0	94.5	18.3
CI 12696	Burt	66.0	60.0	158	36.3	7.5	88.5	11.7
CI 13740	Moro	65.7	60.3	158	39.3	0.0	0.0	0.0
WA 4966	Suwon 92/4 Omar	65.4	60.5	158	33.0	0.0	0.0	11.7
OR 6739	178383/2 Omar 2/13438	63.3	60.5	156	31.0	1.5	4.0	0.0
CI 13968	Nugaines	63.2	62.2	158	29.3	6.8	46.3	16.7
OR 63112	Nord Desprey/2 Sel. 10	62.7	61.3	159	27.3	4.0	6.3	13.3
CI 1442	Kharkof	58.9	60.4	160	42.3	4.3	38.0	28.3
CI 5408	Triplet	57.2	62.4	158	39.3	9.0	93.0	21.7
WA 4984	Suwon 92/4 Burt	55.4	62.0	157	28.7	2.8	2.8	8.3
WA 4877	(14/53/Odin)/CI 13431	53.3	60.0	160	28.7	0.8	1.5	10.0
CI 11755	Elgin	51.2	60.6	160	34.3	8.8	99.0	21.7
WA 5379	Omar Mutant 642084-808	50.7	58.1	164	26.0	7.5	66.3	3.3
WA 5435	Burt Mutant 937	48.0	57.3	161	26.0	6.0	68.8	13.3
$\bar{x}$		63.4	60.5	159	38.3	4.8	42.2	11.8
F - Value for variety comparison		1.15	0.0	11.05**	1.19	13.26**	34.89**	4.16*
S.E.$\bar{x}$		7.7	0.0	0.5	21.9	.9	6.8	3.8
L.S.D. (P. = .05)		N.S.	0.0	1.48	N.S.	2.44	19.20	10.84
C.V.%		12.13	0.0	.33	57.05	17.83	16.08	32.41

Table 6. Summary of uniform white winter wheat nursery grown at the Northwestern Montana Branch Station, Kalispell, Montana from 1962 - 1969.

Variety	Number	1962	1963	1964	1966	1967	1968	1969	Station Years	% Gaines
Omar	13072	60.2	36.0	51.2	58.7	51.4	73.9	71.0	7	82
Brevor	12385	68.5	61.7	67.7	71.0	60.0	87.9	68.4	7	93
Golden	10063	50.6	43.5	42.3	55.0	46.3	70.4	67.2	7	76
Burt	12696	60.0	58.7	54.6	62.2	46.0	86.5	66.0	7	88
Kharkof	1442	48.8	50.1	49.2	52.1	47.4	58.5	58.9	7	74
Triplet	5408	50.2	49.8	51.1	59.5	47.4	71.3	57.2	7	78
Elgin	11755	59.3	41.6	57.3	52.3	49.6	80.5	51.2	7	79
Gaines	13448	56.3	74.6	78.0	68.4	60.3	84.4	71.7	7	100
Moro	13740			50.1	85.9	57.2	86.3	65.7	5	95
Nugaines	13968				79.7	58.7	85.8	63.2	4	101
N10/B11/P14//14/53-101	4995						98.8	70.7	2	109
Suwon 92/4 Omar	4966						98.1	65.4	2	105
Nord Desprey/2Sel. 101	63112						90.1	62.7	2	98
Suwon 92/4 Burt	4984						84.5	55.4	2	90
(14/53/Odin)/ CI 13431	4877						86.7	53.3	2	90
PI 178383/3 Omar	6688							77.5	1	108
Nord Desprey x 2 Sel. 1	63130							73.7	1	103
Heines VII/Redmond	611227							69.6	1	97
178383/2 Omar2/13438	6739							63.3	1	88
Omar Mutant 642084-808	5379							50.7	1	71
Burt Mutant 937	5435							48.0	1	67

Table 7. Agronomic data from off station winter wheat nursery grown in Missoula County on the Al Goodan farm, Missoula, Montana in 1969. Experimental design - random block, three replications.

Planting date: September 16, 1968 Harvest date: July 31, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height
CI 13968	Nugaines	65.1	61.3	24.0
WA 4877	(14/53/Odin)/CI 13431	55.1	59.7	24.7
CI 13880	Crest 1/	54.9	62.5	28.3
CI 13844	Wanser	51.1	61.5	29.7
CI 13842	McCall	48.9	61.9	28.3
CI 13442	Delmar	48.5	58.8	33.3
WA 4984	Suwon 92/4 Burt	47.3	62.6	22.7
CI 13072	Omar	47.3	57.9	22.7
CI 13740	Moro	47.2	58.1	28.0
CI 13181	Rego	47.0	60.7	36.0
CI 13670	Winalta	46.6	62.5	31.7
CI 8885	Cheyenne	44.6	60.6	31.0
UT 646001	Delmar/Columbia	43.6	63.0	31.0
CI 13547	Lancer	43.3	62.5	30.7
CI 12930	Westmont	41.6	61.8	30.0
MT 6641	PI 178383 x2 Wmt, 16-1-8	37.8	59.7	33.7
	$\bar{x}$	48.1	60.9	29.4
	F - Value for variety comparison	1.37	0.0	15.93**
	S.E.$\bar{x}$	5.4	0.0	0.9
	L.S.D. (P.= .05)	N.S.	0.0	2.63
	C.V.%	11.28	0.0	3.10

1/ Check variety

Table 8. Agronomic data from off station winter wheat nursery grown in Lake County on the Walt Mangles farm, Polson, Montana in 1969. Experimental design - random block, four replications.

Planting date: September 26, 1968 Harvest date: August 11,1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height
MT 6641	PI 178383 x2 Wmt, 16-1-8	39.6*	61.9	33.0
WA 4877	(14/53/Odin)/CI 13431	39.4*	60.4	26.0
CI 13842	McCall	38.5	62.0	30.0
CI 13844	Wanser	36.4	62.9	28.8
CI 13740	Moro	35.8	60.3	25.3
CI 13968	Nugaines	35.3	62.6	24.3
CI 13181	Rego	32.8	59.6	32.3
CI 12930	Westmont	32.3	62.6	25.0
CI 8885	Cheyenne	32.2	62.6	31.3
CI 13880	Crest 1/	32.1	62.2	24.3
WA 4984	Suwon 92/4 Burt	31.8	63.5	24.3
UT 646001	Delmar/Columbia	31.6	63.1	29.0
CI 13072	Omar	31.5	59.4	25.8
CI 13670	Winalta	30.5	62.5	31.0
CI 13442	Delmar	24.9	59.8	32.3
CI 13547	Lancer	24.7	61.6	27.0
	$\bar{x}$	33.1	61.7	28.1
	F - Value for variety comparison	3.38**	0.0	4.97**
	S.E.$\bar{x}$	2.4	0.0	1.4
	L.S.D.	6.80	0.0	4.12
	C.V.%	7.20	0.0	5.14

1/ Check variety
* Varieties yielding significantly more than the check (P. = .05)

Table 9. Agronomic data from off station winter wheat nursery grown in Ravalli County on the L. B. McFadgen farm, Stevensville, Montana. Experimental design - random block, four replications.

Planting date: September 26, 1968 Harvest date: August 13, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height
CI 13740	Moro	36.0	59.1	21.3
MT 6641	PI 178383 x2 Wmt, 16-1-8	35.9	61.0	26.3
CI 13844	Wanser	35.7	61.5	22.8
CI 13072	Omar	33.2	60.0	21.3
CI 13181	Rego	32.4	60.5	30.0
CI 13670	Winalta	32.4	62.2	25.3
CI 8885	Cheyenne	32.3	61.2	23.8
WA 4877	(14/53/Odin)/CI 13431	31.7	59.5	19.5
CI 13880	Crest 1/	31.7	61.5	21.3
CI 13842	McCall	31.3	60.8	22.3
CI 13968	Nugaines	30.8	62.5	18.3
WA 4984	Suwon 92/4 Burt	30.3	60.6	18.0
CI 13547	Lancer	29.2	61.9	24.0
UT 646001	Delmar/Columbia	21.1	62.6	26.3
CI 12930	Westmont	28.6	60.8	21.3
CI 13442	Delmar	25.5	61.2	25.0

1/ Check variety

$\bar{x}$	31.6	61.1	22.9
F - Value for variety comparison	1.23	0.0	6.15**
S.E.$\bar{x}$	2.6	0.0	1.3
L.S.D. (P. = .05)	N.S.	0.0	3.68
C.V.%	8.10	0.0	5.63

Table 10. Agronomic data from off station winter wheat nursery grown in Mineral County on the Johnson farm, Lozeau, Montana in 1969. Experimental design - random block, four replications.

Planting date: September 27, 1968 Harvest date: August 12, 1969
Size of plot : 16 square feet

CI or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Plant Height
WA 4877	(14/53 Odin)/CI 13431	66.8*	62.1	24.0
CI 13740	Moro	66.6*	62.1	30.5
CI 13842	McCall	62.9*	62.4	31.8
WA 4984	Suwon 92/4 Burt	62.7*	63.3	23.0
CI 13442	Delmar	60.9	62.5	34.8
CI 13072	Omar	59.1	63.1	28.5
CI 13968	Nugaines	56.9	59.9	22.8
CI 13844	Wanser	54.2	62.8	32.8
CI 13880	Crest 1/	53.2	63.3	28.0
CI 12930	Westmont	52.0	62.4	30.0
MT 6641	PI 178383 x2 Wmt, 16-1-8	50.9	62.5	32.8
CI 13181	Rego	50.3	61.1	36.5
UT 646001	Delmar/Columbia	49.7	62.8	31.0
CI 13670	Winalta	49.0	59.8	33.3
CI 8885	Cheyenne	48.6	62.9	31.8
CI 13547	Lancer	46.3	62.6	32.0

1/ Check variety
* Varieties yielding significantly more than the check (P.=.05)

$\bar{x}$	55.6	62.2	30.2
F - Value for variety comparison	4.56**	0.0	21.91**
S.E.$\bar{x}$	6.3	0.0	1.7
L.S.D. (P. = .05)	8.98	0.0	2.47
C.V.%	5.65	0.0	2.86

Table 11. Yield summary of winter wheat varieties grown in western Montana, 1968-69.

CI or State No.	Variety	Yield Bu/A Location by Counties: Flathead	Missoula	Lake	Ravalli	Mineral	$\bar{x}$	Rank
CI 13880	Crest	43.8	54.9	32.1	31.7	53.2	43.1	4
CI 13844	Wanser	56.0 1/	51.1	36.4	35.7	54.2	46.7	1
CI 13842	McCall	40.5 1/	48.9	38.5	31.3	62.9	44.4	2
CI 13442	Delmar	59.3	48.5	24.9	25.5	60.9	43.8	3
CI 13181	Rego	51.3	47.0	32.8	32.4	50.3	42.8	6
CI 13670	Winalta	45.7	46.6	30.5	32.4	49.0	40.8	7
CI 8885	Cheyenne	57.0	44.6	32.2	32.3	48.6	42.9	5
UT 646001	Delmar/Columbia	50.1	43.6	31.6	29.1	49.7	40.8	7
CI 13547	Lancer	38.3	43.3	24.7	29.2	46.3	36.4	9
CI 12930	Westmont	46.7	41.6	32.3	28.6	52.0	40.2	8
MT 6441	PI 178383 x Westmont 16-1-8	58.0	37.8	39.6	35.9	50.9	44.4	2
CI 13968	Nugaines	63.2	65.1	35.3	30.8	56.9	50.3	1w 2/
WA 4877	14/53/Odin/CI 13431	53.3	55.1	39.4	31.7	66.8	49.3	2w
WA 4984	Suwon 92/4 Burt	55.4	47.3	31.8	30.3	62.7	45.5	4w
CI 13072	Omar	71.0	47.3	31.5	33.2	59.1	48.4	3w
CI 13740	Moro	65.7	47.2	35.8	36.0	66.6	50.3	1w
	$\bar{x}$		48.1	33.1	31.6	55.6		
	F. - Value for variety comparison		1.37	3.38**	1.23	4.56**		
	S.E.$\bar{x}$		5.4	2.4	2.6	6.3		
	L.S.D. (.05)		N.S.	6.8	N.S.	8.98		
	C.V.%		11.28	7.20	8.10	5.65		

1/ 20% or higher dwarf smut infection.
2/ w - white wheat ranking

January 20, 1970

Mr. Billie S. Morgan
Research and Development
UNIROYAL Chemical
403 Anza Ave.
Davis, California 95616

Dear Mr. Morgan:

Following are the results from the product VITAVAX used on the seed you supplied us.

Variety	Treatment	Yield Bu/A
Cheyenne	Ceresan	26.7
"	" + VITAVAX	20.6
Winalta	Ceresan	22.1
"	" + VITAVAX	20.6

You will note the reduction in yield where we used VITAVAX with Ceresan.

I refer you to Crop Science Vol. 9, #5 page 586, an article by Stoker and Dewey. They conclude the yield loss is due to a reduction in tiller numbers.

Thank you for your cooperation in our research program.

Sincerely,

Vern R. Stewart
Associate Agronomist
VRS/jc
cc: Don Mathre