GENERAL ADMINISTRATION 750

Included in the 750 budget is one month of salary for the Superintendent, the station travel allowance, office supplies and expenses and employer contributions to employee benefits.

Jeanette Calbick continued as the entire office work force during the year and managed this remarkable feat in three days per week. Plans are forming to extend her work week to five days.

Nothing is wrong with the hand operated mineograph that was secured in Helena as a surplus item for $15.00 several years ago that a new electric machine couldn't fix. The amount of paper used in reports of all kinds calls rather insistantly for mechanization of this phase of the office proceedure.

Attention is called to the length of service record for those at Northwestern Branch. The superintendent's service dates to 1948, the Agronomists to 1952, the Foremans to 1955 and the Clerks to 1963.

The Work-Study program has proven to be of great assistance to the Northwestern Branch Station, making it possible to have really adequate common help. Perhaps common help is a mis-nomer and manual labor better, for young men enrolled at Montana State University are less common than most.

The 1966-67 budget for the project is $5304.00.

PHYSICAL PLANT 751

The budget includes one month of the Superintendent's time, labor for maintenance of buildings and roads, materials and supplies for building and road maintenance, the lease fee for the Robert's 80, fuel, light and power.

The one maintenance item of some size during the period was carpet replacement in the Superintendent's residence.

Serious consideration should be given to the purchase of the Robert's lease while the present owner, now near 80, is available for negotiations. Heirs might not be as reasonable to deal with.

It is possible that an irrigation well would provide the best source of water and also a practical one because of saving pumping up hill from a creek a half mile or more away.

The 1966-67 budget for this project is $4055.00.

One month of the Superintendent's time, most of the time of the farm foreman, some seasonal help, plus the lease fee for machines, gas, oil, repairs, baler twine and like items comprise the major portion of this budget.

Farming so as to maintain and improve conditions for research is the goal of general farm operations. Incidental revenue from farming amounts to an estimated $5500.00 per year.

Purchase of farm machines that are needed but that have long life is scheduled to the extent that this is possible and desirable. Tractors and high wear items will be leased for as long as reasonable lease agreements can be made.

Fifteen ton capacity truck scales have been ordered and will be in operation in time to weigh 1967 crops. This item has been needed for as long as we have done without.

Two large equipment items are still very much needed. One is a properly engineered sprinkler irrigation system. Another is a forage harvesting and storage system that works, and by this I mean one that permits forage harvest at the time of highest forage value and saves a high percentage of that value at a reasonable cost. Two systems are known to work. One is forced hot air drying. The other is storage in very expensive glass lined facilities. The station should, with the help of engineers and the results of research done in areas as unfavorable for field curing as our own, to initiate a practical system.

The 1966-67 budget for this fiscal project is $10,875.00.

ACTIVITIES

In 1966 the staff assisted with and attended the list of activities that follow.

Date 1966	Activity	Staff	Place
Jan. 12	Sugar Beet Research Conference	Stewart	Billings
Jan. 14	Conference on Crop Recommendations	Roath	Kalispell
Jan. 17-18	T. V. School KGVO	Roath Stewart	Missoula
Jan. 26	S.C.D. Meet	Roath	Eureka
Jan. 27	Lecture to High School Biology Class	Stewart	Kalispell
Feb. 8	Ag. Council	Roath	Kalispell
Feb. 10	Advisory Committee Meeting	Roath Stewart	Polson
Feb. 15 & 22	Rural Area Development	Roath	Kalispell
Feb. 23	Sta. Report to Vo-Ag. Enrollees - Ag Council Meeting	Roath Stewart	Kalispell
Feb. 28 to Mar. 4	Planning Conference, Research Planning	Roath Stewart	Bozeman
Mar. 5	Western Mont. Seed Growers Assoc.	Stewart	Charlo
Mar. 8	T. V. School	Stewart	Missoula
Mar. 8	Ag. Council	Roath Stewart	Kalispell
Mar. 16-18	Weed Meetings	Stewart	Reno, Nev.
Mar. 24	Weed Meetings	Stewart	Missoula
Mar. 26	Stockgrowers Meeting	Roath	Plains
Mar. 29	T. V. Program (Hay & Pasture)	Roath	Missoula
Apr. 15	M.A.S. Meeting	Stewart	Missoula
Apr. 20	Tour for 20 men from Bigfork	Roath	Station
Apr. 26	Demonstration of County Gopher Control Machine	Roath	Station
May 28	Furnished two lambs to 4-H Members	Roath	Station
June 13-17	Sainfoin Inspection tours	Roath	Several Counties
June 19-21	Summer Staff Conference	Roath Stewart	Havre
June 27-30	Western Crop Science Meetings	Stewart	Pullman, Wn.
June 29	Talk to Garden Section of Century Club	Roath	Kalispell
July 5	T. V. Show	Stewart	Missoula
July 14	Field Day	Roath Stewart	Station
Aug. 11	Judged at Junior Fair	Roath	Ronan
Aug. 24	Judged Field Crops at Missoula Co. Fair	Roath	Missoula
Sept. 2	Judged Field Crops at Sanders Co. Fair	Roath Stewart	Lewistown
Oct. 30-Nov. 2	Weed Conference	Roath	Bozeman
Nov. 28-Dec. 2	Agricultural Division Conference	Stewart Roath	Missoula
Dec. 27	T. V. Program		

VISITORS

The following individuals visited the station in 1966:

DATE	NAME	REPRESENTING	ADDRESS
Jan. 14	Phil Donnelly	Cominco Products	Missoula
Jan. 28	Don Graham	Western Mont. Branch Sta.	Corvallis
Jan. 28	Don Merkley	" " " "	"
Jan. 29	Allen Yenne	Farmer	Bigfork
Mar. 10	Ben Gordon	Farmer	Kalispell
Apr. 2	Herb Sorenson		
Apr. 2	R. B. Glendenning	Painter	Kalispell
Apr. 14	Luther Lalum	F.F.A. Teacher	Kalispell
Apr. 21	Charles Smith	Extension Service	Bozeman
Apr. 21	Allen Nelson	Extension Agent	Kalispell
Apr. 21	Don Bosely	Mont. Farmers Stockman	Great Falls
Apr. 21	Rock Baker	KGVO - TV	Missoula
May 12	Carl Holm	Chipman Chemical	Billings
May 12	Hugh Springstun	" "	Portland, Ore.
May 12	Phil Donnelly	Cominco Products	Missoula
May 12	Don Graham	Western Mont. Branch Sta.	Corvallis
June 6	Jack Fisher	Dow Chemical	Seattle, Wn.
June 6	Jim Gowell	Dow Chemical	
June 7	Burton Isch	Farmer	Rt. 4, Kalispell
June 7	Ben Gordon	Farmer	Rt. 4, Kalispell
June 8	Homer Turner	Simplot	Dillon
June 8	Phil Donnelly	Cominco Products	Missoula
June 14	Larry Baker	Montana State University	Bozeman
July 8	Peter McMullen	Fission Company	Alberta, Canada
July 8	Gregg Clarke	Fission Company	England
July 8	Chris Crion	Fission Company	England
July 8	R. F. Pfieffer	Fission Company	England
July 8	Don Graham	Western Mont. Branch Sta.	Corvallis
July 8	Jack Ismel	Farmer	Lake County
July 8	Bob Morris	"	" "
July 12	Gene Sharp	Montana State University	Bozeman
July 14	Doug Warren	MSU - AES	Bozeman
July 14	Joe Asleson	Montana State University	Bozeman
July 14	Charles Bowman	" " "	"
July 14	Scott Cooper	" " "	"
July 26	Jim Welsh	" " "	"
Aug. 8	Dave Lindel	University of Nebraska	Lincoln
Aug. 8	Mr. Lindel	Farmer	Kansas
Aug. 8	Rev. & Mrs. Fred Paxton		Kalispell
Aug. 9	Jim Byrd		Hungry Horse
Aug. 9	Gregg Wieck		Enterprise Ore.
Aug. 18	Bob Eslick	Montana State University	Bozeman
Aug. 19	Charles Prongia	Farmer	Hot Springs
Aug. 19	Carl Holm	Chipman Chemical	Billings
Aug. 19	John Boss	Farmer	Rt. 4, Kalispell
Aug. 19	Tony Rollin	Western Mont. Nat'l. Bank	Missoula

DATE	NAME	REPRESENTING	ADDRESS
Aug. 25	Les Sounder	Montana State University	Bozeman
Aug. 25	Glen Roth	Farmer	Rt. 4, Kalispell
Aug. 30	John Boss	"	" " "
Aug. 30	Elmer Beeman	"	" " "
Aug. 30	Glen Roth	"	" " "
Sept. 29	Carl Holm	Chipman Chemical	Billings
Sept. 29	Terry Howard	Chipman Chemical	Burlingame, Calif.
Oct. 17	Don Schnaidt	Investors Diversified Ser.	Kalispell
Oct. 25	Terry Howard	Chipman Chemical	Burlingame, Calif.
Oct. 25	Everett Smyth	Chipman Chemical	
Oct. 27	Lark Carter	Montana State University	Bozeman
Nov. 4	Phil Donnely	Cominco Products	Missoula
Nov. 4	William O'Malley	Cominco Products	Spokane, Wn.
Nov. 22	Jim Hoffman	Washington State University	Pullman, Wn.

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Weather Data

The crop year of 1965-66 began with a fair moisture situation with 1.72 inches of moisture falling during the month of September, enabled us to establish excellent stands of winter grains in the fall of 1965. This precipitation amount is about average for the period of 1949-1965. Precipitation during the months of October, December, February, March, April and May were considerably below the average of 1949-1965. Percipitation in June and July was considerably above normal with 6.57 inches falling in June and 2.49 inches falling in the month of July. Rainfall in August was approximately average. The total for the growing season was 19.05 inches compared with an average of 19.24.

Temperature variations throughout the year were not great with the mean for the crop year for 1965-66 being almost the same as the long time average.

A complete summary of data by crop year is found in Table 1, and a summary of the temperature and percipitation for 1965-66 and the years 1950-1966 on a calendar basis are found in Table 2.

The average frost free period is 108 days over the long term period however, there were 135 frost free days during 1966. Summer temperatures were not excessive with 91° F. being the high on August 2nd and August 25, 1966. The coldest temperature was recorded -7° below zero on March 4, 1966.

Table __/___. Summary of climatic data by months for the 1965-1966 crop year (September to August) and averages for the period 1949-1966 at the Agricultural Experiment Station, Route 4, Kalispell, Montana.

	Month												Total or Ave.
	Sept. 1965	Oct. 1965	Nov. 1965	Dec. 1965	Jan. 1966	Feb. 1966	Mar. 1966	Apr. 1966	May 1966	June 1966	July 1966	Aug. 1966	Growing Season
Precipitation (inches)													
Current year	1.72	.21	1.31	.55	1.42	.67	.53	.76	1.18	6.57	2.49	1.64	19.05
Ave. 1949 to 1965-66	1.42	1.47	1.51	1.63	1.61	1.18	1.01	1.32	2.05	2.96	1.37	1.71	19.24
Mean temperature (°F)	46.4	47.7	35.0	28.6	26.3	27.7	34.5	42.9	54.2	55.9	64.4	62.0	43.8
Current year													
Ave. 1949 to 1965-66	53.6	44.2	33.0	26.7	22.0	27.6	32.1	43.3	51.8	58.3	64.3	64.3	43.4

Last killing frost in spring*

1966 - May 18 (26°F)

Ave. 1949-1966 - - - - - - - - - - - - - - - - - - - May 28

First killing frost in fall*

1966 - September 30 (28°)

Ave. 1949-1966 - - - - - - - - - - - - - - - - - - - September 13

Frost free period

1966 - 135 days

Ave. 1949-1966 - - - - - - - - - - - - - - - - - - - 108 days

Maximum summer temperature - - - - - - - - - - - - - - - 91°F on August 2, 25, 1966

Minimum winter temperature - - - - - - - - - - - - - - - 7°F below zero on March 4, 1966

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

Table 2. Comparisons of monthly average of weather data for 1965-66 and 1950-65 for the Northwestern Montana Branch Station, Route 4, Kalispell, Montana.

Month	Air Temperatures (Fahrenheit) Average 1965 Mean	Max.	Min.	Average 1966 Mean	Max.	Min.	Average 1950-1966 Mean	Max.	Min.	Precipitation 1965	1966	1950-65
January	30.2	35.1	25.3	26.3	31.8	20.8	22.0	29.2	14.7	2.25	1.42	1.61
February	28.7	36.9	20.4	27.7	35.3	27.7	27.6	35.9	19.1	.64	.67	1.18
March	28.6	41.0	16.2	34.5	45.4	23.6	32.1	42.0	22.1	.24	.53	1.01
April	45.2	57.6	32.7	42.9	54.8	30.9	43.3	55.1	31.3	2.55	.76	1.32
May	50.6	64.3	36.9	54.3	69.8	38.7	51.8	65.6	38.1	.81	1.18	2.05
June	57.6	71.4	43.8	56.0	69.1	42.8	58.3	72.1	44.5	2.30	6.57	2.96
July	64.6	80.8	48.4	64.5	81.2	47.7	64.3	81.2	47.4	1.15	2.49	1.37
August	63.6	77.1	50.0	61.7	78.4	45.0	64.3	78.9	46.2	4.74	1.64	1.71
September	46.4	57.5	35.2	59.3	74.9	43.6	50.4	68.9	38.6	1.72	.79	1.40
October	47.6	61.1	34.0	43.4	55.1	31.7	41.8	56.2	32.9	.21	1.34	1.41
November	35.0	42.6	27.4	33.4	41.1	25.6	30.7	39.9	25.0	1.31	3.33	1.41
December	28.5	35.4	21.7	30.4	36.1	24.6	25.1	33.2	20.7	.55	1.68	1.58
Total	526.6	660.8	392.0	534.4	673.0	402.7	511.7	658.2	380.8	18.47	22.40	19.01
Mean	43.9	55.1	32.7	44.5	56.1	33.6	42.6	54.8	31.7			

Frost-free Period

1965	1966	1950-1966
91 days	135 days	108 days

PART I

1966

Annual Research Report

Northwestern Montana Branch

of the

Montana Agricultrual Experiment Station

Kalispell, Montana

by

C. W. Roath

Superintendent

Ks
C/R
1

TITLE: Fertilizers for Irrigated Pastures

PROJECT: M.S. 753 Fertilizer Investigations

PERSONNEL: C. W. Roath, Don R. Graham and Soils Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Ten Years

OBJECTIVES:

To determine the effect of the annual use of nine fertilizer treatments on the yield of three pasture mixtures, and compare three legumes in association with grass.

RESULTS AND DISCUSSION:

Attached.

PLANS:

Continue and determine relative legume percentages of the three legume species.

SIGNIFICANT FINDINGS:

Use of both N and P on an annual basis has resulted in highest yield of all mixtures.

1. Fertilizers for Irrigated Pastures

RESULTS AND DISCUSSION:

A. Orchardgrass - Trefoil

Nine annual fertilizer treatments have been applied to plots seeded to orchardgrass and birdsfoot trefoil each year beginning in 1962 on plots seeded in 1960. The trefoil is making less contribution to yields than was expected when compared to Ladino. Producing the most forage in 1966 and for a five year average is the treatment with the highest rate of both N and P. However there is so little more for the period than from use of less of both that the lesser amounts are likely the more practical. Table 1. Five year mean 3.18 T/A.

B. Orchardgrass - Ladino

The same annual rates of fertilizer have been applied to this as to the other mixtures in the study. Highest producing treatments this year and for the five year average are 100-40-0 and 100-80-0 but 50-80-0 is not far behind. The five year average yield for 50-80-0 is 161 percent of the 50-0-0 treatment and 219 percent of the untreated check. Table 2. Five year mean 3.10 T/A.

C. Orchardgrass - Alfalfa

As is the case for other mixtures the highest yield for this year and for the five year average is from 100-80-0 on an annual basis. Other good treatments producing not greatly less are 50-40, 100-40 and 50-80. Table 3. Five year mean 3.33 T/A.

CONCLUSIONS:

Over a five year period the better of three mixtures without the use of fertilizer has been Orchardgrass-Trefoil. The better mixture if phosphorus alone was used was Orchard-Alfalfa. Orchard-Alfalfa also produced the greatest five year average when 100-80-0 was used. Differences were not great however and Orchard-Ladino produces the highest yield in 1966 from 100-80-0. With all mixtures use of both N and P on an annual basis seemed necessary for good uniform yield. With 50-40-0 a yield of $3\frac{1}{2}$ tons per acre at 12% moisture basis seems possible, with 100-80-0 nearer four tons, under conditions of this trial. Four harvests spaced about thirty days apart were obtained by grazing quickly with sheep then removing the animals. Yields were determined by clipping part of each plot ahead of each grazing.

Table 1. Fertilizer for Irrigated Pasture, Orchard - Trefoil, in 1966. Seasons yield in tons per acre. 12% moisture.

Treatment N	Treatment P	Cutting	Replications 1	2	3	4	Total	Total Average	5 Year Average
50	40	1	.93	1.78	1.31	1.44			
		2	1.19	1.69	1.52	1.36			
		3	.51	.68	.85	.76			
		Total	2.63	4.15	3.68	3.56	14.02	3.51	3.37
100	40	1	1.91	1.95	1.74	1.65			
		2	1.10	1.69	1.52	1.36			
		3	.51	1.44	.93	.51			
		Total	3.52	5.08	4.19	3.52	16.31	4.08	3.52
0	40	1	.89	1.19	.89	1.10			
		2	1.19	.93	1.36	1.36			
		3	.51	.76	.59	.34			
		Total	2.59	2.88	2.84	2.80	11.11	2.78	2.85
100	0	1	1.78	1.57	1.36	1.44			
		2	1.19	1.78	1.44	1.02			
		3	.76	.68	1.10	.34			
		Total	3.73	4.03	3.90	2.80	14.46	3.62	3.53
0	80	1	1.02	.89	1.14	.85			
		2	1.27	1.44	1.19	.76			
		3	.85	.42	.85	.34			
		Total	3.14	2.75	3.18	1.95	11.02	2.76	2.86
100	80	1	1.70	2.03	2.12	1.52			
		2	1.44	1.95	1.27	1.36			
		3	.93	.93	.85	.68			
		Total	4.07	4.91	4.24	3.56	16.78	4.20	3.64
50	80	1	1.61	1.52	1.23	1.86			
		2	1.44	1.52	1.19	1.44			
		3	.68	.42	.59	.93			
		Total	3.73	3.46	3.01	4.23	14.43	3.61	3.50
50	0	1	1.36	1.10	1.48	1.40			
		2	.85	1.36	1.44	1.36			
		3	.51	.51	.68	.34			
		Total	2.72	2.97	3.60	3.10	12.39	3.10	3.05

Table 1 . (con't)

Treatment N	Treatment P	Cutting	Replications 1	2	3	4	Total	Total Average	5 Year Average
0	0	1	.38	1.10	.93	.97			
		2	.85	.85	.85	.76			
		3	.51	.51	.64	.25			
		Total	1.74	2.46	2.42	1.98	8.60	2.15	2.33

$\bar{x}$..... 3.30888
S.E.$\bar{x}$..... .23267
C.V.%..... 7.03

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.70196	3.24
Varieties	8	1.78708	8.25
Error	24	.21655	
Total	35		

Table 2. Fertilizers for Irrigated Pastures, Orchard - Ladino, in 1966. Seasons yield in tons per acre. 12% moisture.

Treatment N	Treatment P	Cutting	Replications 1	2	3	4	Total	Total Average	5 Year Average
50	40	1	1.23	2.20	1.74	1.61			
		2	1.27	1.27	1.36	1.86			
		3	.93	.93	.76	.59			
		Total	3.43	4.40	3.86	4.06	15.75	3.94	3.43
100	40	1	1.52	1.86	2.03	2.25			
		2	1.78	1.86	1.44	1.52			
		3	1.19	1.19	1.19	.76			
		Total	4.49	4.91	4.66	4.53	18.59	4.65	3.94
0	40	1	.93	1.02	1.36	1.14			
		2	1.61	1.10	1.10	.93			
		3	1.06	.85	.55	.34			
		Total	3.60	2.97	3.01	2.41	11.99	3.00	2.76
100	0	1	1.36	1.44	2.03	1.06			
		2	1.44	1.44	1.36	1.02			
		3	.76	1.27	1.19	.34			
		Total	3.56	4.15	4.58	2.42	14.71	3.68	3.00
0	80	1	1.02	1.65	1.44	1.23			
		2	1.02	1.19	.81	.81			
		3	.85	1.02	1.10	1.02			
		Total	2.89	3.86	3.35**	3.06*	13.16	3.29	3.08
100	80	1	1.86	2.12	2.37	1.65			
		2	1.95	1.44	1.52	1.44			
		3	1.10	1.44	1.10	.76			
		Total	4.91	5.00	4.99	3.85*	18.75	4.68	3.94
50	80	1	1.95	1.95	2.12	1.86			
		2	1.61	2.12	1.02	1.36			
		3	1.19	.85	1.23	.68			
		Total	4.75	4.92	4.37	3.90	17.94	4.49	3.77
50	0	1	.89	1.78	1.44	.76			
		2	.76	1.78	.93	.76			
		3	.42	1.10	.59	.08			
		Total	2.07	4.66	2.96	1.60	11.29	2.82	2.34
0	0	1	.38	.76	.80	.76			
		2	.85	1.10	.68	.51			
		3	.25	.42	.17	.17			
		Total	1.48	2.28	1.65	1.44	6.85	1.71	1.72

*Calculated missing plots for second harvest only use 1 less degree of freedo
**The July 15 harvest weights missing.

Table 2. (con't)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	1.90175	7.01**
Varieties	8	3.90353	14.38**
Error	23	.27143	
Total	34		

$\bar{x}$..... 3.58416
S.E.$\bar{x}$..... .26049
L.S.D..... .76257
C.V.%..... 7.27

Table 3. Fertilizers for Irrigated Pastures, Orchard - Alfalfa in 1966. Seasons yield in tons per acre. 12% moisture.

Treatment N	Treatment P	Cutting	Replications 1	2	3	4	Total	Total Average	5 Year Average
50	40	1	1.40	1.44	1.69	1.61			
		2	1.44	1.19	1.44	1.44			
		3	.76	.59	.85	.76			
		Total	3.60	3.22	3.98	3.81	14.61	3.65	3.77
100	40	1	2.08	1.86	1.95	1.95			
		2	1.52	1.36	1.52	1.44			
		3	.93	.76	.85	.51			
		Total	4.53	3.98	4.32	3.90	16.73	4.18	3.90
0	40	1	1.02	.85	.76	1.27			
		2	1.36	1.19	.93	1.36			
		3	.85	.51	.34	1.02			
		Total	3.23	2.55	2.03	3.65	11.46	2.87	2.95
100	0	1	1.52	1.44	1.61	.51			
		2	1.19	1.19	1.69	.59			
		3	.76	.51	.68	.17			
		Total	3.47	3.14	3.98	1.27	11.86	2.97	2.96
0	80	1	.93	1.19	1.44	1.02			
		2	1.44	1.19	1.02	1.02			
		3	.76	.76	.34	.59			
		Total	3.13	3.14	2.80	2.63	11.70	2.93	3.27
100	80	1	2.03	1.95	2.12	1.91			
		2	1.52	1.69	1.44	1.52			
		3	.85	.76	.93	1.10			
		Total	4.40	4.40	4.49	4.53	17.82	4.46	4.15

Table 3 . (con't)

Treatment N	Treatment P	Cutting	Replications 1	2	3	4	Total	Total Average	5 Year Average
50	80	1	1.86	1.95	2.20	1.86			
		2	1.52	1.69	1.61	1.10			
		3	.76	.85	.59	.76			
		Total	4.14	4.49	4.40	3.72	16.75	4.19	3.84
50	0	1	.85	1.61	1.52	.68			
		2	1.02	1.61	1.02	.76			
		3	.17	.85	.85	.17			
		Total	2.04	4.07	3.39	1.61	11.11	2.78	2.95
0	0	1	.68	1.02	.68	.76			
		2	.85	1.19	.68	.68			
		3	.17	.76	.08	.17			
		Total	1.70	2.97	1.44	1.61	7.72	1.93	2.21

Anaylsis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.56542	1.28
Varieties	8	2.80516	6.34
Error	24	.44215	
Total	35		

$\bar{x}$..... 3.33
S.E.$\bar{x}$..... .33247
L.S.D..... .96857
C.V.%..... 9.99

TITLE: Fertilizer for Alfalfa and Sainfoin Compared

PROJECT: M. S. 753 Fertilizer Investigations

PERSONNEL: C. W. Roath, Don R. Graham and Soils Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Five Years

OBJECTIVES:

Compare response of sainfoin to that of alfalfa when both receive identical treatments of P and other minerals.

RESULTS AND DISCUSSION:

Attached

SIGNIFICANT FINDINGS:

Sainfoin would appear to be a more efficient plant than alfalfa in plant nutrient utilization since more yield is obtained at lower rates of fertilizer use.

2. Fertilizer for Alfalfa and Sainfoin.

Plots treated with phosphorus and other fertilizer and seeded in 1965 were harvested in 1966. Don Graham of Western Branch is cooperating with this work and has received the yield information. Two very good cuttings were secured even though no irrigation was provided. Sainfoin yields were above five tons per acre on the check plots and for all treatments. Alfalfa varied from a low of 4.2 tons for the check to a high of 5.7 where phosphorus and potash were used together and appears to have responded to up to fifty pounds of phosphorus. Table 4.

Table 4. Fertilizers for Alfalfa and Sainfoin in 1966.
Seasons yield in T/A. 12% moisture.

Treatment	Crop	Cutting	Replications 1	2	3	4	Total	Average
Potash + Phosphorus	Sainfoin	1	4.07	4.08	3.90	3.66		
		2	1.59	1.27	1.29	1.20		
		Total	5.66	5.35	5.19	4.86	21.06	5.26
Potash + Phosphorus	Alfalfa	1	2.87	2.48	3.80	3.50		
		2	2.83	2.82	2.27	2.19		
		Total	5.70	5.30	6.07	5.69	22.76	5.69
Sulfur	Sainfoin	1	4.80	4.42	4.47	4.23		
		2	1.49	1.30	1.40	1.48		
		Total	6.29	5.72	5.87	5.71	23.59	5.90
Sulfur	Alfalfa	1	2.45	2.72	3.29	2.47		
		2	2.67	2.40	2.45	2.29		
		Total	5.12	5.12	5.74	4.76	20.74	5.19
Check	Sainfoin	1	4.50	4.57	4.11	3.63		
		2	1.59	1.12	1.45	1.17		
		Total	6.09	5.69	5.56	4.80	22.14	5.53
Check	Alfalfa	1	1.99	2.55	2.65	2.21		
		2	1.75	2.00	2.29	1.40		
		Total	3.74	4.55	4.94	3.61	16.84	4.21
25P annual	Sainfoin	1	4.35	4.27	4.78	4.09		
		2	1.42	1.44	1.29	1.47		
		Total	5.77	5.71	6.07	5.56	23.11	5.78
25P annual	Alfalfa	1	2.18	2.76	2.70	2.83		
		2	1.81	2.68	1.93	2.08		
		Total	3.99	5.44	4.63	4.91	18.97	4.74
50P	Sainfoin	1	3.68	4.37	4.22	3.63		
		2	1.40	1.21	1.31	1.60		
		Total	5.08	5.58	5.53	5.23	21.42	5.36
50P	Alfalfa	1	2.48	2.78	3.06	2.85		
		2	1.88	1.98	2.61	2.24		
		Total	4.36	4.76	5.67	5.09	19.88	4.97

Table 4. (con't)

Treatment	Crop	Cutting	Replications 1	2	3	4	Total	Average
100P	Sainfoin	1	4.61	3.98	4.04	4.64		
		2	1.40	1.21	1.29	1.60		
		Total	6.01	5.19	5.33	6.24	22.77	5.69
100P	Alfalfa	1	1.87	2.20	2.31	2.04		
		2	2.39	2.50	2.84	2.95		
		Total	4.26	4.70	5.15	4.99	19.10	4.78
150P	Sainfoin	1	3.63	4.14	4.38	3.89		
		2	1.37	1.74	1.52	1.09		
		Total	5.00	5.88	5.90	4.98	21.76	5.44
150P	Alfalfa	1	2.85	2.07	2.31	3.18		
		2	2.13	1.91	2.03	2.18		
		Total	4.98	3.98	4.34	5.36	18.66	4.67

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	.27027	1.24
Varieties	13	.98421	4.52
Error	39	.21751	
Total	55		

$\bar{x}$..... 5.23
S.E.$\bar{x}$.... .22954
C.V.%.... 4.39

TITLE: Irrigated White Clover Varieties

PROJECT: M. S. 755 Forage Investigations

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: 1963 through 1966

OBJECTIVES:

Compare winter hardiness and other important characters of selected varieties in areas of use.

RESULTS AND DISCUSSION:

Attached

PLANS:

Discontinue and summarize.

SIGNIFICANT FINDINGS:

Commercial white less winter hardy and less productive than other entries.

White Clover Results and Discussion:

The Montana Intrastate Irrigated test of white clover varieties seeded in 1963 was harvested again in 1966. Stands had improved somewhat compared to early 1965*, except in the case of Common White Clover. Yields from plots seeded to this entry were largely volunteer bluegrass.

Table 1, presents the yield data for 1966 plus a column for a three year average when plots were clipped frequently as pasture. This year Holland White produced more than Commercial White, and each year the three Ladino types produce more than Commercial White when calculated at the five percent statistical level by analysis of variance.

If the results at this location agree with those from other locations it would seem to support a recommendation for Holland White over commercial. So far as the Ladino types are concerned their performance is too similar to be decisive. Each is above Commercial White in yield and has maintained stands better than Commercial White.

* Winter injury was evident in the spring of 1965 and plots were slow to recover.

Table 1. Irrigated White Clover Varieties in 1966.
Seasons yield in tons per acre. 12% Moisture.

Variety	Cutting	Replications 1	2	3	4	5	Total	Average	3 Year Average
Pilgrim	1	.33	.42	.46	.55	.58			
	2	.92	.96	.18	1.24	1.59			
	3	.71	1.01	.89	.94	.65			
	Total	1.96	2.39	2.53	2.73	2.82	12.43	2.49*	3.23
Merit	1	.32	.38	.57	.60	.65			
	2	1.00	.98	1.13	1.10	1.56			
	3	.67	.85	.94	.86	.81			
	Total	1.99	2.21	2.64	2.56	3.02	12.42	2.48*	3.42
Com. Ladino	1	.32	.56	.50	.53	.37			
	2	1.02	1.02	1.22	1.34	1.23			
	3	.60	.79	1.07	.76	.71			
	Total	1.94	2.37	2.79	2.63	2.31	12.04	2.41*	3.32
Com. White	1	.56	.65	.57	.55	.62			
	2	1.02	.87	.70	.94	.99			
	3	.27	.49	.60	.33	.34			
	Total	1.85	2.01	1.87	1.82	1.95	9.50	1.90	2.56
Holland	1	.47	.64	.58	.66	.66			
	2	.89	.96	1.25	1.13	1.14			
	3	.46	.67	.96	.87	.51			
	Total	1.82	2.27	2.79	2.66	2.31	11.85	2.37*	2.79

* Greater yield than Com. White @ 5%

Analysis of Variance

Source	D.S.	Mean Square	F.
Replications	4	.33045	6.61*
Varieties	4	.30079	6.02**
Error	16	.04999	
Total	24		

$\bar{x}$..... 2.3296
S.E.$\bar{x}$..... .03161
L.S.D..... .0947
C. V.%..... 1.36

Ks
CWR
2

TITLE: Date of Last Cutting Alfalfa

PROJECT: M. S. 755 Forage Investigations

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Through 1967 or 1968

OBJECTIVES:

Determine effect of fall harvest dates on stands and yield.

RESULTS AND DISCUSSION:

Attached

PLANS: Continue as revised one or two additional years.

SIGNIFICANT FINDINGS:

Plots subjected to early fall harvest show greater tendency to deminish in yield through time.

Date of Last Cutting Alfalfas, Results and Discussion.

The standard two variety, five replications, alfalfa nursery for determining the effect of dates of last harvest upon survival and yield was harvested again in 1966 at this location. However because of little effect due to treatment in previous years it was decided to remove two cuttings and then subject the plots to differential fall harvest treatment. And to continue the study one additional year to permit the revised treatment schedule to become effective.

As may be seen in Table 2, Flandria continued to exceed Vernal in yield nearly one ton per acre for the season except for that harvested the first week of September. And obvious also is the fact that this season the later harvest dates, those from near the middle of September on, result in additional seasonal yield. This additional yield is partially but not entirely due to additional third cutting yield, for in the case of the Vernal Alfalfa the yield is .69 tons per acre greater for the last than for the first harvest date from the first two cuttings.

Table 3, which lists total seasons production for three years by cutting and variety and three year averages offers little proof of necessity for any particular fall cutting dates. It points to additional yield from Flandria over Vernal. A trend that may become of considerable importance if stands remain seem to be developing however. Early cutting dates appear to be producing successively lower yields each year while later cutting dates either maintain or improve yields over time.

Table 2. Date of Last Cutting by Variety and Cutting in 1966. Three cuttings with date of third varied. In previous years the date of the second varied. Seasons yield in tons per acre, 12% Moisture.

Date	Variety	Cutting	Replications 1	2	3	4	5	Total	Average
1	Vernal	1	1.30	2.34	2.72	2.31	2.13		
		2	1.27	1.53	1.54	1.03	1.45		
8/30		3	.22	.35	.27	.34	.22		
		Total	2.79	4.22	4.53	3.68	3.80	19.02	3.80
1	Flandria	1	2.06	2.78	2.72	2.13	2.88		
		2	1.73	1.84	2.10	1.61	2.08		
8/30		3	.37	.51	.58	.34	.36		
		Total	4.16	5.13	5.40	4.08	5.32	24.09	4.82
2	Vernal	1	2.16	2.26	2.37	2.36	1.86		
		2	1.66	1.61	1.59	1.54	1.61		
9/6		3	.42	.45	.55	.45	.45		
		Total	4.24	4.32	4.51	4.35	3.92	21.34	4.27
2	Flandria	1	2.30	1.77	2.08	2.46	2.33		
		2	1.93	1.91	1.59	1.77	1.65		
9/6		3	.68	.53	.61	.65	.65		
		Total	4.91	4.21	4.28	4.88	4.63	22.91	4.58
3	Vernal	1	2.24	2.46	2.51	1.82	2.17		
		2	1.75	1.46	1.50	1.66	1.84		
9/13		3	.56	.75	.63	.45	.54		
		Total	4.55	4.67	4.64	3.93	4.55	22.34	4.47*
3	Flandria	1	2.49	2.95	2.52	2.33	2.23		
		2	1.77	2.06	2.26	1.75	1.70		
9/13		3	.84	1.10	.98	.76	.97		
		Total	5.10	6.11	5.76	4.84	4.90	26.71	5.34
4	Vernal	1	2.47	3.23	1.96	2.48	2.63		
		2	1.38	1.68	1.56	1.26	1.56		
9/21		3	.71	.73	.62	.73	.55		
		Total	4.56	5.64	4.14	4.47	4.74	23.55	4.71*
4	Flandria	1	2.71	2.61	2.91	2.40	2.87		
		2	2.13	2.37	2.33	2.07	2.47		
9/21		3	1.22	1.07	.94	.95	.72		
		Total	6.06	6.05	6.18	5.42	6.06	29.77	5.95*

Table 2. (con't)

Date	Variety	Cutting	Replications 1	2	3	4	5	Total	Average
5	Vernal	1	2.22	2.39	2.84	2.59	2.44		
		2	1.57	2.07	1.82	1.45	1.67		
9/30		3	.89	.95	.76	.67	.54		
		Total	4.68	5.41	5.42	4.71	4.65	24.87	4.97*
5	Flandria	1	3.53	2.95	2.69	2.45	2.45		
		2	2.61	2.30	2.09	1.86	1.78		
9/30		3	1.10	1.17	1.27	.79	.65		
		Total	7.24	6.42	6.05	5.10	4.88	29.69	5.94*

NOTE: The yields of August 30 are check in this study.

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	4	.72744	2.97*
Varieties	9	2.39910	9.80**
Error	36	.24477	
Total	49		

$\bar{x}$.....	4.89
S.E.$\bar{x}$.....	.22125
L.D.S.....	.63517
C.V.%.....	4.53

Table 3. Three year average by date and variety.

	Variety	1964	1965	1966	Total	3 Year Average
1	Vernal	4.58	4.78	3.80	13.16	4.39
1	Flandria	5.28	5.81	4.82	15.91	5.30
2	Vernal	5.04	4.64	4.27	13.95	4.65
2	Flandria	5.34	5.38	4.58	15.30	5.10
3	Vernal	4.07	4.70	4.47	13.24	4.41
3	Flandria	4.61	5.52	5.34	15.47	5.16
4	Vernal	4.42	4.57	4.71	13.70	4.57
4	Flandria	5.62	5.68	5.95	17.25	5.75
5	Vernal	3.66	4.66	4.97	13.29	4.43
5	Flandria	4.66	5.84	5.94	16.44	5.48

Vernal Average: 4.49
Flandria Average: 5.36

TITLE: One Cutting Hay Mixtures

PROJECT: M. S. 755 Forage Investigations

PERSONNEL: C. W. Roath, R. F. Eslick, C. S. Cooper

LOCATION: Three in Northwestern Montana

DURATION: Through 1966

OBJECTIVES:

Compare late cut grass-legume mixtures with two cuttings of alfalfa at selected locations.

RESULTS AND DISCUSSION:

Attached

PLANS:

Discontinue present nurseries and incorporate the study into the Species-Care-Harvest Study.

SIGNIFICANT FINDINGS:

When given credit for regrowth for fall grazing some one cut mixtures compare favorably with two cut alfalfa.

One Cutting Hay Results and Discussion:

One cutting hay nurseries made up largely of late maturing grass-legume mixtures, designed to determine which are best suited to Western Montana conditions, were harvested for the third harvest year in 1966 in three locations. Accidental harvest of alfalfa plots intended as two cutting check on the yield of the one-cut mixtures in the Ravalli County location this season is regretable.

A. One cutting nursery at Northwestern Branch Station.

In this the third year of harvest of this nursery on the station the yield of Sainfoin and four mixtures harvested in one late cutting was practically equal to that of two cuttings of alfalfa. Table 4. Add to this the aftermath for fall grazing of .77 tons per acre on a 12% moisture basis and seasons yield would favor Sainfoin and some late mixtures. Protein and other nutrient comparisons would perhaps be less favorable unless weather was more favorable for field curing in July than in June and August. The three year average production (Table 5) shows the three year yields to be from 3.3 tons to 3.9 tons for the one-cut mixtures compared to 4.4 tons for two cuttings of alfalfa. If to the hay yield is added the regrowth for fall grazing as shown in Table 6 of in excess of one ton per acre the one cutting mixtures look very good.

B. One cutting nursery at Western Branch Station.

Timothy with Altasweede Red Clover with 4.6 tons per acre came the nearest to the 4.7 ton alfalfa yield at this location in 1966. Others varied from 2.9 to 4.1 tons. Table 7. In three year average production (Table 5) Timothy and Altasweede and Intermediate with commercial Mammoth Clover each produced 4.2 tons per acre in one late cutting for the three year period average, which with the regrowth for fall graze would equal two cutting alfalfa production.

C. One cutting nursery at Libby.

There was little difference this year between yields of alfalfa and several of the late grass-clover mixtures when all were harvested July 6, at which time alfalfa was considerably past the best harvest stage in maturity. Table 8. The three year production, all in one cutting harvest for all entries since moisture was inadequate for second growth, is shown in Table 5. Timothy with Altasweede Red Clover and Intermediate wheatgrass with Altasweede both produced slightly in excess of three tons per acre compared to 2.55 tons for alfalfa.

D. Protein and Phosphorus Analysis of one cutting hays.

Chemical analysis of samples from three replications of the Northwestern Branch one cut hays are lower than expected in many cases and lacking in agreement in certain instances. It is hard to imagine Timothy-Clover hay having as little as 5.7% protein or Sainfoin having as little as .13% phos. Perhaps they indicate need for different sampling technique.

Table 4. One cutting hay mixtures grown on station in 1966.
Seasons yield in tons per acre at 12% moisture.

Mixture		Replications 1	2	3	4	Total	Average
Vernal Alfalfa	1st	2.09	1.71	2.29	2.45	8.54	2.14
	2nd	1.34	1.70	1.53	1.32	5.89	1.47
	Total	3.43	3.41	3.82	3.77	14.43	3.61
Brome & Altasweede		3.51	2.75	3.59	2.89	12.74	3.19
Brome & Mammoth		3.19	2.92	4.02	3.90	14.03	3.51
Tall(1) & Altasweede		2.87	2.85	2.73	2.98	11.43	2.86
Tall(1) & Mammoth		2.24	2.74	3.35	3.44	11.77	2.94
Tall (2) & Altasweede		2.65	2.85	2.50	2.44	10.44	2.61
Tall (2) & Mammoth		2.26	2.63	2.87	2.54	10.30	2.58
Sainfoin		2.99	3.57	4.20	2.87	13.63	3.41
Timothy & Altasweede		3.97	3.75	4.09	3.74	15.55	3.89
Timothy & Mammoth		3.87	3.35	4.31	4.02	15.55	3.89
Interm. & Altasweede		2.97	3.15	4.15	3.22	13.49	3.37
Interm. & Mammoth		2.90	3.41	2.75	3.76	12.82	3.21

Table 5. Three year seasons yield of hay for one cutting nurseries. Seasons yield in tons per acre at 12% moisture.

Species & Mixtures	Northwestern Branch Station 1964	1965	1966	Average
Vernal Alfalfa	5.40	4.21	3.61	4.41
Brome & Altasweede	3.96	3.66	3.19	3.60
Brome & Mammoth	3.65	3.53	3.51	3.56
Tall (1) & Altasweede	4.05	3.19	2.86	3.37
Tall (1) & Mammoth	3.97	2.99	2.94	3.30
Tall (2) & Altasweede	3.80	3.44	2.61	3.28
Tall (2) & Mammoth	3.87	3.45	2.58	3.30
Sainfoin	3.11	3.61	3.41	3.38
Timothy & Altasweede	4.12	3.48	3.89	3.83
Timothy & Mammoth	4.10	3.80	3.89	3.93
Interm. & Altasweede	3.63	3.39	3.37	3.46
Interm. & Mammoth	4.01	3.62	3.21	3.61

NOTE: Two cuttings for alfalfa and one for all others except that sainfoin was harvested in two cuttings in 1964. (Irrigated)

Species & Mixtures	Western Branch Station 1964	1965	1966	Average
Vernal Alfalfa	5.97	3.47	4.74	4.73
Brome & Altasweede	4.42	3.70	3.20	3.77
Brome & Mammoth	4.09	3.40	4.08	3.86
Tall (1) & Altasweede	4.71	2.70	3.27	3.56
Tall (1) & Mammoth	4.12	2.80	3.36	3.43
Tall (2) & Altasweede	4.03	2.97	3.18	3.39
Tall (2) & Mammoth	4.24	2.49	2.90	3.21
Sainfoin	4.17	2.49	3.36	3.34
Timothy & Altasweede	4.16	3.93	4.60	4.23
Timothy & Mammoth	4.24	3.13	3.27	3.55
Interm. & Altasweede	4.21	3.17	3.84	3.74
Interm. & Mammoth	5.45	3.56	3.74	4.25

NOTE: Two or more cuttings from alfalfa each year except only one in 1966. One cutting for other entries each year ecept two for sainfoin in 1964. (Irrigated)

Table 5. (con't)

Species & Mixtures	Libby 1964	Libby 1965	Libby 1966	Average
Vernal Alfalfa	1.28	2.84	3.55	2.56
Brome & Altasweede	2.12	3.11	3.11	2.78
Brome & Mammoth	2.17	2.62	3.13	2.64
Tall (1) & Altasweede	1.84	2.66	2.97	2.49
Tall (1) & Mammoth	1.33	2.94	3.39	2.55
Tall (2) & Altasweede	1.57	3.03	3.16	2.57
Tall (2) & Mammoth	1.46	2.83	3.11	2.47
Sainfoin	.32	1.07	1.24	.88
Timothy & Altasweede	2.09	3.48	3.51	3.03
Timothy & Mammoth	2.04	3.24	3.32	2.87
Interm. & Altasweede	2.32	3.59	3.52	3.14
Interm. & Mammoth	2.01	3.47	3.30	2.93

NOTE: One cutting only for all entries. (Dryland)

Table 6. Regrowth of one cutting hay mixtures. Seasons yield in tons per acre at 12% moisture.

Species & Mixtures	Northwestern Branch 1964	Northwestern Branch 1965	Northwestern Branch 1966	Northwestern Branch Average	Western Branch 1964
Brome & Altasweede	1.43	1.38	1.00	1.27	1.27
Brome & Mammoth	1.25	1.36	.81	1.14	1.05
Tall (1) & Altasweede	1.23	1.31	.66	1.07	1.14
Tall (1) & Mammoth	1.24	1.12	.71	1.02	1.14
Tall (2) & Altasweede	1.25	1.20	.64	1.03	1.13
Tall (2) & Mammoth	1.29	1.11	.68	1.03	.82
Sainfoin	1.06	1.60	1.37	1.34	
Timothy & Altasweede	1.41	1.40	.97	1.26	1.45
Timothy & Mammoth	1.39	1.34	.88	1.20	1.10
Interm. & Altasweede	1.37	1.28	.77	1.14	.98
Interm. & Mammoth	1.26	1.18	.80	1.08	1.08

NOTE: Determined by harvest about October 1.

Table 7. One cutting hay mixtures at Western Montana Branch Station at Corvallis. Seasons yield in tons per acre at 12% moisture.

Mixture	Replications 1	2	3	4	Total	Average
Vernal Alfalfa	4.68	4.73	4.56	5.00	18.97	4.74
Brome & Altasweede	4.26	3.14	2.76	2.65	12.81	3.20
Brome & Mammoth	4.83	3.70	3.39	4.39	16.31	4.08
Tall (1) & Altasweede	3.11	3.67	3.60	2.70	13.08	3.27
Tall (1) & Mammoth	4.79	2.98	3.07	2.61	13.45	3.36
Tall (2) & Altasweede	3.19	3.01	4.19	2.32	12.71	3.18
Tall (2) & Mammoth	3.01	2.95	2.57	3.05	11.58	2.90
Sainfoin	3.41	3.80	3.11	3.14	13.46	3.36
Timothy & Altasweede	4.02	5.15	5.87	3.35	18.39	4.60
Timothy & Mammoth	3.05	2.90	4.00	3.14	13.09	3.27
Interm. & Altasweede	4.36	4.53	3.58	2.87	15.34	3.84
Interm. & Mammoth	4.14	4.14	3.74	2.92	14.94	3.74

Table 8. One cutting hay mixtures at Libby in 1966. Seasons yield in tons per acre at 12% moisture.

Mixtures	Replications 1	2	3	4	Total	Average
Vernal Alfalfa	3.71	3.39	3.77	3.33	14.20	3.55
Brome & Altasweede	3.01	3.07	2.39	3.99	12.46	3.11
Brome & Mammoth	3.24	2.56	2.97	3.75	12.52	3.13
Tall (1) & Altasweede	3.33	3.02	2.84	2.69	11.88	2.97
Tall (1) & Mammoth	4.46	3.62	2.97	2.53	13.58	3.39
Tall (2) & Altasweede	3.61	3.10	3.20	2.74	12.65	3.16
Tall (2) & Mammoth	3.29	2.92	3.28	2.97	12.46	3.11
Sainfoin	1.43	1.12	1.29	1.12	4.96	1.24
Timothy & Altasweede	3.07	2.99	4.28	3.70	14.04	3.51
Timothy & Mammoth	2.72	3.74	3.07	3.77	13.30	3.32
Interm. & Altasweede	3.20	3.87	4.17	2.85	14.09	3.52
Interm. & Mammoth	3.61	3.31	3.31	2.97	13.20	3.30

Averages:		
	Altasweede	3.46
	Mammoth	3.24
	Tall (1)	3.19
	Tall (2)	3.11

TITLE: Sainfoin Production and Evaluation

PROJECT: M. S. 755 Forage Investigations

PERSONNEL: C. W. Roath, Don Graham and Forage Committee

LOCATION: Northwestern and Western Montana

DURATION: Five years

OBJECTIVES:

To determine adaptation to numerous soil and moisture conditions. To produce and distribute seed.

RESULTS AND DISCUSSION:

Attached

PLANS:

Continue to evaluate and produce seed.

SIGNIFICANT FINDINGS:

Adaptation seems to be limited to areas of adaptation of the innoculum. No nodules on roots equals poor growth.

Sainfoin Evaluation, Results and Discussion:

A. Sainfoin-Alfalfa-Vetch

(a) Irrigated Nursery : This Montana Standard nursery seeded in 1964 was harvested in two cuttings in 1966. The location, where a high water table delays early spring growth, is not conducive to best growth of either species but seems no more favorable or unfavorable for one than the others. 1966 yield in Table 9 shows Eski Sainfoin to be nearer alfalfa in two cutting yield than Hall Sainfoin or Cicer Milkvetch

(b) Dryland Nursery (first cutting) : This nursery was plowed immediately after harvest because of its proximity to a Sainfoin seed field. The location even without irrigation was more favorable for Sainfoin than the irrigated one above for Eski produced 3.1 tons per acre in the first cutting compared to 2.35 in the irrigated location. (Table 10) Eski ranked first in yield in this nursery followed by the Bridger Sainfoin, Ladak Alfalfa and Cicer Milkvetch in that order.

B. Off-station Sainfoin Adaptation

During the week of June 13 a tour of Sainfoin plantings in Northwestern and Western Montana was made with Extension Agents as guides and with Al Carleton of Montana State University an active and interested associate. In several instances Northrup King seed source fields were adjacent to plots seeded to Eski. In all cases the Eski was larger and later blooming than the Northrup King fields.

Eski Sainfoin looked both good and poor. Where it was poor its growth usually equaled that of other plants in the same situation. However, it appeared not to be a strong competitor in stands of grass or other legumes. And not to be vigorous under conditions of acidity not favoring growth of the innoculum. Six inch tall plants in one place where the p.h. on the spot test read 6.4, had no nodules on the roots. Response to crowding is indicated by comparative weights of growth above roots at three locations, each with fewer plants per square foot than the other. Gram weights per plant were 12.0 grams 29.4 grams and 40.0 grams for the three locations. Observers were impressed by apparent adaptability of Eski to tight alkaline soils in the Hot Springs-Perma area and to gravelly knolls.

C. Sainfoin Seed Production

Northwestern Branch cooperated in a seed production study that has been written up and published for the benefit of seed growers. The Kalispell location differed from the others in the study in many respects. Notably in having a much higher moisture content at any given percentage of brown seeds than at other locations. Delay of two weeks in harvesting at the Northwestern Branch Station, according to the study, would have increased production per acre in pounds 135 percent and improved the germination. As harvested 1578 pounds of cleaned seed was obtained from field R-8, 405 pounds from E-4, and 1125 pounds from X-1. Field X-2 was seeded for harvest in 1967.

Results and Discussion (con't)

D. 1966 Sainfoin Seed Source Nursery

The Intra-state Sainfoin Variety Nursery of six entries and four replications became quickly established after seeding May 27, 1966, and was harvested August 12, to measure the very obvious difference in seedling-year growth and vigor. Table 12, shows the greater yield of 2.1 tons per acre at 12% moisture from Northrup King seed from Czechoslovakia sources, 1.79 from Eski and lesser amounts from the other entries down to .63 for the Hall source. Border plots on this nursery seeded with Sanguisorba from New Mexico also established quickly and produced at the rate of 1.43 tons per acre.

E. Sainfoin Plant Selections

One of the criticisms of Sainfoin for hay production in Northwestern Montana is its extreme earliness and a selection that blooms nearer July 1st when dryer weather is expected than is generally experienced in June would appear to be more desirable. With this goal in mind sixty plants were selected from the registered seed field E-4 at Northwestern Branch Station. These were dug and reset in an isolated location at the south end of R-3. Water was hauled to provide each plant a gallon or more every second day for a considerable period of time. In fact, those that showed signs of living were watered all summer. On September 30, 1966, fourteen plants were alive and all others appeared to be dead. Seed from these,if any is secured,will be used to establish seed rows for regueing for the desired characters.

Table 9. Sainfoin-Alfalfa-Vetch Nursery grown in 1966. Irrigated Seasons yield in tons per acre at 12% moisture.

Variety	Cutting	Replications 1	2	3	4	Total	Average
Eski	1	1.99	2.21	2.57	2.62		
	2	1.07	1.20	1.37	1.40		
	Total	3.06	3.41	3.94	4.02	14.43	3.61
Hall	1	2.85	3.00	1.14	1.90		
	2	1.24	1.12	1.04	1.07		
	Total	4.09	4.12	2.18	2.97	13.36	3.34
Cicer	1	1.79	1.53	1.52	1.59		
	2	1.36	1.65	1.40	1.24		
	Total	3.15	3.18	2.92	2.83	12.08	3.02
Ladak	1	1.99	1.96	2.26	2.03		
	2	1.57	2.09	2.20	2.23		
	Total	3.56	4.05	4.46	4.26	16.33	4.08

Analysis of Variance

Source	D.F.	Mean Square	F.
Replicatinns	3	.0703	
Varieties	3	.80831	2.02
Error	9	.39985	
Total	15		

$\bar{x}$..... 3.51
S.E.$\bar{x}$..... .31617
L.D.S..... N.S.
C.V.%..... 9.0

Table 10. Sainfoin-Alfalfa-Vetch grown in 1966. Dryland Seasons yield in tons per acre at 12% moisture.

Variety	Replications 1	2	3	4	Total	Average
Eski	2.42	3.64	2.64	3.77	12.47	3.12
Bridger	1.47	3.05	3.16	2.96	10.64	2.66
Cicer	.39	.47	.88	1.49	3.23	.81
Ladak	1.52	1.96	1.07	2.51	7.06	1.77

NOTE: Plowed immediately after harvest because of proximity to seed field.

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	1.09331	5.08*
Varieties	3	4.17475	19.4*
Error	9	.21521	
Total	15		

$\bar{x}$..... 2.09
S.E.$\bar{x}$..... .23195
L.D.S..... .74135
C.V.%..... 11.11

Table 11. Sainfoin Seed from Plot Study in 1966. Grams from thirty square feet.

Date	Replications 1	2	3	Total	Average
7/26	110	75	125	310	103
8/ 2	135	240	200	575	192
8/ 9	220	250	255	725	242
8/16	245	225	170	640	213
8/23	125	255	210	590	197

Table 12. Intrastate Sainfoin Varieties grown in 1966. Seasons yield in tons per acre at 12% moisture.

Variety	Replications 1	2	3	4	Total	Average
Hall	.62	.73	.85	.33	2.53	.63
Eski	1.50	1.75	1.91	1.99	7.15	1.79
N. K. Czeck.	2.18	1.72	2.38	2.11	8.39	2.10
Lethbridge	1.56	1.35	1.99	1.66	6.56	1.64
N. K. Poland	.70	.51	.97	.57	2.75	.69
Onar	1.29	1.49	1.34	1.59	5.71	1.43

$\bar{x}$ 1.65
S.E.$\bar{x}$..... .10456
C.V.%..... 6.32

Analysis of Variance

Source	D. F.	Mean Square	F.
Replications	3	.11467	2.62
Varieties	5	1.43121	32.73**
Error	15	.04373	
Total	23		

TITLE: Species-Care-Harvest Nurseries

PROJECT: M.S. 755 Forage Investigations

PERSONNEL: C. W. Roath and Don R. Graham

LOCATION: Northwestern and Western Montana

DURATION: Five or more years

OBJECTIVES:

Three main objectives are combined in this study since all help determine results. The complex objective is to determine what species, treated with what fertilizer program, and harvested which way, will produce the most value in forage.

PROCEEDURE:

Single randomized blocks of the study are seeded at several locations, locations are to be considered as replications for analysis.

RESULTS AND DISCUSSION:

Attached

PLANS:

Seed yet other nurseries in 1967 and harvest those already established.

Species-Care-Harvest Nursery, Results and Discussion.

In cooperation with Don Graham, Soil Scientist from Western Branch, a study was intitated to measure effect on hay production in several locations if adapted species and varieties were properly cared for (care being primarily fertilizer treatment) and properly harvested. Recommended varieties of six species were used, three fertilizer treatments used, and three harvest methods scheduled. In 1966 nurseries were seeded in four locations and perhaps three more are planned. Each location is considered to be a replication. Acceptable stands and growth was obtained in all locations.

Only one location--the Northwestern Station-- was harvested in the seeding year. Here growth differed considerably by species so it was considered desirable to measure this seeding year growth. The plots intended for three harvest treatments in subsequent years provided three replications. Pennlate Orchardgrass produced from three to nearly five times the forage of Intermediate and Tall wheatgrass. Ladak alfalfa and Eski Sainfoin were close in yield with Mammoth Red Clover (no altasweede avaiable at the time) somewhat less. Table 13.

Table 13. Seeding year yield of six forage species grown in 1966 in the Species-Care-Harvest Nursery at Northwestern Montana Branch Station. Seasons yield in tons per acre at 12% moisture.

Species	Replications 1	2	3	Total	Average
Ladak Alfalfa	1.53	1.38	1.48	4.39	1.46
Altasweede	.88	.92	1.07	2.87	.96
Pennlate	1.85	1.93	2.03	5.81	1.93
Oahe Int.	.65	.58	.74	1.97	.66
Alkar Tall	.38	.53	.36	1.27	.42
Eski Sainfoin	1.02	1.30	1.73	4.05	1.35

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	.05301	2.33
Varieties	5	.93820	41.2
Error	10	.02277	
Total	17		

$\bar{x}$..... 1.13
S.E.$\bar{x}$..... .08711
L.D.S..... 2.23
C.V.%..... 7.70

TITLE: Intrastate Legume (Crownvetch) Nursery

PROJECT: M. S. 755 Forage Investigations

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Five Years

OBJECTIVES:

Determine adaptation and value as forage compared to alfalfa and sainfoin.

RESULTS AND DISCUSSION:

Attached

PLANS:

Continue to permit time for expression of potential.

Intrastate Legume (Crownvetch) Nursery, Results and Discussion.

This nursery containing four crownvetches, Cicer milkvetch, Ladak alfalfa and Eski Sainfoin was seeded in 1965. None of the vetches produced evidence of stands in 1965 although both alfalfa and sainfoin came up quickly to good stands. Plots were left without disturbance in 1966 to permit the crops to become established and by the close of the season there was evidence of fair stands even though growth did not favor harvest. Yields of alfalfa and sainfoin were obtained (Table 14) and the yields of 4.6 tons for alfalfa and 6.4 tons for sainfoin seem to say that if vetches fail to produce in the nursery site it is scarcely the fault of the location.

Table 14. Intrastate Legume (Crownvetch) Nursery grown in 1966 at the Northwestern Montana Branch Station. Comparative Alfalfa - Sainfoin Yield in tons per acre.

Variety	Cutting	Replications 1	2	3	4	Total	Average
Ladak	1	2.13	2.65	2.55	2.31		
	2	2.16	1.93	2.55	2.27		
	Season	4.29	4.58	5.10	4.58	18.55	4.64
Eski	1	4.63	5.67	3.64	4.49		
	2	1.87	1.81	1.57	1.88		
	Season	6.50	7.48	5.21	6.37	25.56	6.39

Table 15. Protein and Phosphorus Analysis of One Cutting Hays in 1966.

Variety	Protein % Replications 1	2	3	Average	Phosphorus % Replications 1	2	3	Average
Vernal Alfalfa	16.0	12.8	16.6	15.1	.12	.10	.18	.133
Brome & Altasweede	9.1	7.7	6.3	7.7	.08	.11	.11	.100
Brome & Mammoth	11.3	8.5	9.0	9.6	.09	.12	.10	.103
Tall (1) & Altasweede	9.8	10.2	11.1	10.4	.07	.13	.14	.113
Tall (1) & Mammoth	9.9	11.9	10.0	10.6	.11	.11	.12	.113
Tall (2) & Altasweede	10.1	10.6	11.3	10.7	.09	.10	.16	.117
Tall (2) & Mammoth	13.4	10.4	8.9	10.9	.17	.12	.13	.140
Sainfoin	9.9	9.0	6.5	8.5	.14	.14	.12	.133
Timothy & Altasweede	5.7	5.9	.75	6.4	.07	.10	.14	.103
Timothy & Mammoth	6.3	7.9	6.4	6.8	.07	.08	.09	.08
Interm. & Altasweede	9.5	10.5	8.9	9.6	.09	.10	.12	.103
Interm. & Mammoth	9.0	8.4	9.0	8.8	.10	.10	.12	.107

TITLE: Evaluation of Potato Varieties, Selections and Breeding Material in 1966

PROJECT: Potato Production 5027

LOCATION: Northwestern Montana Branch Station

PERSONNEL: C. W. Roath and Horticultural Research Committee

DURATION: Indefinite

OBJECTIVES:

1. Compare varieties and advance selections of breeding material from Montana and other stations in replicated studies designed to determine their relative value for production of commercial and home garden potatoes.

2. Make initial evaluation of lines and selections not in sufficient supply for replicated trials to determine characteristics, particularly resistance to common scab.

PROCEEDURE:

Potato research occupied a prominent place in the program of work at Northwestern Montana Branch Station in 1966. Evaluation of Montana selections was perhaps the major phase of the work, and in other phases selections from other stations and named varieties were grown in replicated trials. A Standard Montana Yield Nursery was grown, also forty-five seedlings from Dr. Hoyman crosses were grown and a few hills selected for further study. In addition, Mr. Stewart evaluated certain chemicals for weed control in potatoes.

Because of the numbers of entries involved and because of variation in the quanity of seed available seven plans were developed involving limited numbers with comparable quanities and sources of seed. Information on production according to each plan follows.

RESULTS AND DISCUSSION:

Table 1 Presents data for selections from other stations. Four of eleven exceeded Netted Gems in yield slightly in this years trial, none of which were rated as mature as gems on August 29, 1966.

Table 2 In a named variety trial of ten entries Kennebec closely approached Netted Gem in yield while others fell far short. High susceptability to blight or incidence of rhizoc, fusarium, blackleg and scab above that for Gem. Kennebec was less mature than Gems, August 29, 1966.

Table 3 Contains data regarding seven Montana numbered selections for which seed permitted a three replication comparison. All but one of these (M 5908-1) and possibly (M 5959-3) should be discarded for blight susceptability, other diseases or lack of productivity.

Table 4 Montana Potato Yield Nursery presents data for selections grown at four Montana locations in 1966. Gem yield was exceeded by that

of Bounty and approached by Blanca and Norland, however the Bounty tubers were excessively large and often hollow and Norland vines very susceptable to blight and other vine diseases. One beautiful red skinned potato appeared almost ideal for size type, maturity and freedom from disease but cooked to mush. It will be interesting to see the gravity rating on this one (M 5922). The least productive and most susceptable to disease of these should be discarded.

Table 5 Reports on Montana Selections grown in single row plots because of limited seed. These data suggest elimination of several of these selections because of disease susceptability and low productiveity.

Table 6 Lists the information secured from planting twenty-four Montana selections in duplicate plots. Low blight coupled with absence of other diseases and good production and maturity is a rarity in this group. Gravity and scab readings will be required to determine whether even these few are worthy of further study.

Generous quanities of Hayman seedlings from thirty-six families and lesser amounts from ten others were grown in 1966. Single rows one hundred feet long were seeded to those having sufficient seed and shorter rows to those with limited seed. The entire block was cultivated and irrigated as a commercial field. A few hills were rogued, however the general health and vigor of the patch was excellent.

All Hayman rows were dug by hand and each hill observed for yield, type, maturity and scab. Initially two or more hills per row were selected for observation and increase in 1967. This number was considerably reduced later when all of a type and color could be placed side by side for more carefull scrutiny and only the more desirable kept. Scab was the reason for discarding many otherwise very attractive and productive prospects, and lack of maturity eliminated yet others.

PLANS:

Hills selected are to be planted for evaluation in 1967. Hayman numbers indicating the breeding of each hill selected are being carefully preserved. Also it is presumed that a Montana Potato Nursery will be grown and that some additional Montana selections will be evaluated for scab resistance.

KEY TO ABREVIATIONS ON TABLES:

Type: Obl - oblong, F - flat, R - round
Vine Size: S - small, M - medium, L - large, VL - very large
Blight: L - low, M - medium or moderate, H - high or heavy
Maturity: G - good, F - fair, P - poor
Disease: Rhizoc - rhizoctonia

Table 1. Yield Data and Characteristics for Other Station Selections in 1966. Field Run Tubers in Cwt per Acre (Plot Lbs. x 4.36)

Selection	Replications 1	2	3	Total	Average	Set	Size Ounce	Color	Type	Vine Size	Disease Blight	Phizoe	Other	(1)	Tuber Defects
A 483-6	313.9	324.8	364.1	1002.8	334.3	6.9	11.5	Russet	obl	M	L	0	0	F	Rough
A 483-13	252.9	351.0	379.3	983.2	327.7	6.7	11.8	Russet	obl	M	L	0	0	F	
A 589-65	268.1	279.0	353.2	900.3	300.1	13.1	5.9	Russet	obl f	L	VL	0	0	F	
Netted Gem	296.5	292.1	340.1	928.7	309.6	9.7	8.4	Russet	obl f.	M	L	0	0	G	
A 595-15	213.6	165.7	235.4	614.7	204.9	6.2	8.4	Russet	obl	M	H	x	0	G	Soft rot
A 610-19	183.1	135.2	187.5	505.8	168.6	5.2	8.9	Russet	obl	M	L-M	0	0	G	Rough
B 1639	152.6	281.2	183.1	616.9	205.6	9.5	5.5	Red	round	SM	H	0	0	F	
Neb 16.55-1	327.0	431.6	266.0	1024.6	341.9	9.4	8.5	White	rf	M-L	L	0	0	F	
Neb 93.55-15	311.7	257.2	322.6	891.5	297.2	9.5	7.8	White	rf	M	H	0	0	G	
N.D.4524-4R	157.0	122.1	87.2	366.3	122.1	4.6	11.7	Red	round	M-S	L-M	x	0	F-G	Scab
N.D.5778-2R	416.6	351.0	313.9	1083.5	361.2	10.8	7.1	Red	r	M-L	M	0	0	F	
N.D.6125-4R	283.4	268.1	287.8	839.3	279.8	12.0	6.1	Red	r	M	M	0	0	F	Small-Scab

(1) Maturity based on observation of tubers from one hill dug, August 29, 1966.

Ks CWR 42

Table 2 . Yield and Characteristics of Named Varieties in 1966. Field Run in CWT per Acre (Plot Lbs. x 4.36)

Variety	Replications 1	2	3	Total	Ave.	Set	Size Oz.	Color	Type	Vine Size	Disease Blight	Phizoe	Other	(1)	Tuber Defects
Catoosa	161.3	139.5	305.2	606.0	202.0	5.6	15.2	Red	obl	M-L	Low	0	0	G	rough-scab
Fruhperle	157.0	235.4	279.0	671.4	223.8	7.2	8.5	White	obl	M-L	Low	x	0	F	scab
Hi Plains	222.4	218.0	200.6	641.0	213.7	7.3	9.2	White	obl	M	Med		fusarium	F-P	
Kennebec	335.7	412.0	283.4	1031.1	343.7	7.9	9.2	White	obl	L	Low	0	0	P	
Merrimac	300.8	318.3	296.5	915.6	305.2	6.0	14.3	White	obl	M	Low	0	0	P	rough
Netted Gem	355.3	340.1	381.5	1076.9	358.9	8.1	10.3	White	obl-f	M-L	Low	0	0	G	
Norland	213.6	305.2	165.7	684.5	228.2	10.0	6.9	Red	round	S-M	Heavy	0	0	F	
Red Bake	287.8	287.8	257.2	832.8	277.6	9.8	9.2	Red	obl-f	M-L	L-M	0	0	F	scab
Rode Ersting	117.7	218.0	183.1	518.8	172.9	6.1	8.2	Red	obl	S-M	Heavy		blackleg	F-G	
Norgold	231.1	143.9	218.0	593.0	197.7	7.2	13.1	Russet	obl	M	L-M	x		G	hollow

(1) Maturity

Table 3. Yield and Character of Montana Numbered Selections in 1966. Field run in cwt per acre (Plot Lbs. x 4.36)

Number	Replications 1	2	3	Total	Ave.	Set	Size Oz.	Color	Type	Vine Size	Disease Blight	Phizoe	Other	(1)	Tuber Defects
M26016-6	82.8	91.6	91.6	266.0	88.7	5.4	4.6	Russet	round	S	H	0	0	G	
M6102-8	113.4	139.5	259.4	512.3	170.8	10.0	5.6	White	obl	M	M	0	0	F	scab
M5908-1	285.6	200.6	296.5	782.7	260.9	10.4	6.3	White	obl	M-L	M	0	0	F-G	
M6083	196.2	139.5	187.5	523.2	174.4	6.3	7.8	White	obl	M-S	M	x	0	F-G	rough
M5959-3	143.9	200.6	122.1	466.6	155.5	7.1	8.0	White	oval	M	M	0	0	F	
M6024	43.6	39.2	65.4	148.2	49.4	3.6	3.6	Russet	round	S	M-L	x	0	G	v small
M6191-18	122.1	187.5	174.4	484.0	161.3	4.9	9.1	Russet	obl	S-M	M-L	x	(2)	G	

(1) Maturity
(2) Leaf roll suspected

Table 4. Yield and Character of Montana Yield Nursery Varieties grown in 1966. Field run cwt per acre. (Plot Lbs. x 4.36)

Variety	Replications 1	2	3	4	Total	Ave.	Set	Size Oz.	Color	Type	Vine Size	Disease Blight	Phizoe	Other	(1)	Tuber Defects
M5979-1	65.4	48.0	39.2	117.7	270.3	67.6	3.1	3.4	Russet	Round	S	H			G	V. small
Bounty	470.9	396.8	422.9	379.3	1669.9	417.5	10.5	10.6	Red	Round	VL	L	x	O	F	Hollow
M6083	226.7	248.5	329.2	303.0	1107.4	276.9	6.8	6.8	White	Round	M	M-H			F-G	
M5978-3	113.4	91.6	78.5	48.0	331.5	82.9	3.7	3.2	Russet	Round	S	VH			VG	
M5943-1	104.6	117.7	56.7	122.1	401.1	100.3	3.0	5.2	Russet	Round	S	VH			VG	
M5903-4	100.3	187.5	187.5	218.0	693.3	173.3	6.1	5.7	Red	Round	S-M	H			F	
Blanca	279.0	226.7	342.3	407.3	1255.3	313.8	10.0	5.2	White	R-Flat	M	VL			P	
M6130-4	152.6	61.0	187.5	165.7	566.8	141.7	4.0	6.6	Russet	Obl	M-S	L			G	
M5959-3	209.3	200.6	191.8	157.0	758.7	189.7	4.4	8.4	White	R-Flat	M	H			G	
M5922	370.6	318.3	327.0	183.1	1199.0	299.8	8.4	6.0	Red	R-Flat	L	VL			F	Cook to mush
Gem	348.8	270.3	340.1	348.8	1308.0	327.0	7.5	6.7	Russet	Obl	M-L	L	x	Leaf Roll	F	
M6031	174.4	157.0	117.7	87.2	536.3	134.1	5.8	4.4	Russet	Round	M	M-H			G	Small
Norland	305.2	313.9	300.8	357.5	1277.4	319.4	8.8	6.6	Red	Round	M	VH			G	

(1) Maturity

Table 5. Montana Single Row Selections grown in 1966.

Selection	Cwt/A	Discription	Set	Size Oz.	Vine Size	Blight	(1)	Notes
M45906A-38	13.1	Round-Red	2.6	3.7	S	H	P	Lacks vigor
Blanca	213.6	Obl-White	9.6	6.8	M-L	L	P	
M45906A-22	383.7	Small-Obl	17.6	5.7	L	H	VG	Prostrate vines
M4506A-43	311.7	Round-Red	3.8	25.4	M-L	L	G	Very large tuber
M45936-2	161.3	Obl-Red	6.4	13.2	M	L	G	Leaf roll suspected
M36024-6	30.5	Round-White			S	L	G	Low vigor
M45906A-41	213.6	Obl-Red	11.2	7.0	L	VL	P	Vigorous
M45912-1	226.7	Obl-White	9.5	8.0	L	H	F	Curly leaf,rough
M45938-16	191.8	Round-White	8.5	13.8	M	L	F	
M45936	218.0	Obl-Red	9.8	7.4	M-L	M-H	F	Scab
M45906-20	270.3	Obl-Red	11.5	6.6	VL	L	F	Scab
M45924-8	95.9	Obl-White	6.6	6.0	L	M	F	Rolled leaves, rough & checks
M45907-2	74.1	Obl-White	7.0	7.8	M	M-H	F	Rough rosetting
M45938-12	161.3	Obl-White	6.5	7.6	M	M-H	F	Rhizoc & fus. wilt, rough
M4538-7	117.7	Obl-White	5.6	8.6	M-S	VH	F	Scab
M45924-10	74.1	Obl-White	6.6	8.2	M	M-H	G	
M36053-4	161.3	Obl-White	3.7	11.8	M	H	G	Curled leaf,rough
M45938-4	218.0	Obl-White	6.3	11.0	L	M	G	Rhizoc, scab
M45938-10	43.6	White	2.0	12.3	S	L	F	Large, rough
M45933	222.4	Round-White	5.4	11.7	L	O	P	Large, late, rhizoc
M45906A-32	361.9	Round-Red	15.6	6.1	VL	L	F-G	Scab
M45907-1	414.2		12.8	7.9	L	L	P	Late
M45936-3	13.1	Obl-Red	10.0	4.8	M		P	Scab,sickly vine
M36053-6	4.4	Red	5.0	3.2	S		G	Two sickly vines
M45906A-27	161.3	Obl-Red	8.6	6.2	M	H	F	
M36053-18	152.6	Oval-Red	10.1	5.5	M-S	VH	F-G	
M45912	226.7	Obl-White	10.7	7.8	VL	L	P	
M45933-3	231.1	R,Flat-White	9.4	6.9	M	M	F	Checks,rugose leaf
M5978-3	30.5	Obl-Russet	3.6	3.5	VS	H	P	Small
M45944-2	318.3	Obl-White	11.7	8.3	L	VL	F-G	Rhizoc,soft rot
M5903-4	361.9	Round-Red	8.5	13.3	M-S	VH	P	Scab
M45936-1	348.8	Obl-White	11.1	8.8	M-L	L	P	Rhizoc, scab
M5922	191.8	Obl-Red	9.0	8.7	L	L	G	
M36053-14	139.5	Obl-Red	6.3	8.1	M	M-H	F	
M45906A-35	191.8	Round-White	10.0	5.8	M	H	F-G	Rhizoc, scab
M36024-9	50.0	Round-White	6.7	2.9	M	VH	P	Very small

(1) Maturity

Table 6 . Yield of Montana Potato Selections in Duplicate Plots grown in 1966 in cwt per Acre. (Plots Lbs. x 4.36)

Selection	Replications 1	2	Ave.	Set	Size Oz.	Description	Vine Size	Blight	(1)	Notes
M36053-9	117.7	161.3	139.5	5.9	7.5	Obl-Red	S-M	VH	F	Rhizoc
M45938-5	139.5	196.2	167.9	7.0	8.1	Obl-White	M	M-H	F	Rhizoc, rough
M36053-12	161.3	143.9	152.6	12.3	4.3	Obl-Red	M-S	H	F-G	Rhizoc
M4526-4	239.8	157.0	198.4	7.2	8.8	White	M-L	L-M	F	Rhizoc, rough
M36024-10	135.2	69.8	102.5	9.2	4.8	R.Flat-White	M-S	H	F	
M36024-4	74.1	48.0	61.1	5.4	5.5	R.Flat-White	M	M	G	Rhizoc
M35939-7	146.1	226.7	186.4	7.9	6.5	Round-Red	M-L	M-H	F	Rhizoc
M36075-10	261.6	313.9	287.8	12.3	6.9	Round-Red	L	H	F-G	Rhizoc, black leg
M35939-5	165.7	143.9	154.8	10.0	5.4	Obl-Red	M-L	M-L	F-G	Rhizoc
M45938-6	30.5	56.7	43.6	4.0	5.5	Round-Net	S-M	M	F-G	Rough, scab
M45926-1	261.6	305.0	283.3	10.8	7.1	Obl-White	L	M	F-P	Large, rhizoc, soft rot
M36075-8	113.4	117.7	115.6	7.8	4.9	R.Flat-White	S	H	F	Rhizoc, checks
M5943-1	91.6	56.7	74.2	3.7	5.9	Round-Russet	S	H	VG	Rhizoc, small
M45906A-29	239.8	174.4	207.1	14.9	4.3	Oval-Red	L	L	F-P	
M45940-1	52.3	95.9	74.1	8.8	3.9	Obl-Red	M	M-H	F	Suspected leaf roll, hay wire
M45938	78.5	30.5	54.5	4.0	5.0	Round-White	M-S	M-H	VG	Suspected leaf roll, rhizoc, scab
M36053-5	226.7	224.5	225.6	11.0	7.9	Obl Flat-Red	L	L	F-G	
M35939-9	100.3	95.9	98.1	10.4	4.6	Round-Red	M-S	H	G	Rhizoc, scab
M35904A-15	95.9	126.4	111.2	8.2	4.3	Round-White	M-L	M-H	F-G	Rhizoc
M35904A-17	316.1	244.2	230.2	13.4	6.1	Obl.R-Red	M-L	M-H	G	
M45907	209.3	313.9	261.6	13.9	8.1	White	L	VL	F	Rough, soft rot, rhizoc
M45940-3	157.0	213.6	185.3	13.6	6.6	Round-White	L	L-M	G	
M5979-1	139.5	122.1	130.8	7.4	7.2	Round-Net	M	VL	F-G	Rosetting, rhizoc, scab
M6192-27	39.2	139.5	89.4	4.5	6.3	Obl-Russet	M	M	G	

(1) Maturity

TITLE: Farm Flock Investigations for 1966

PROJECT: Farm Flock 5029

LOCATION: Northwestern Montana Branch Station

PERSONNEL: C. W. Roath cooperating with Animal Science and Range and with the Montana Wool Laboratory

OBJECTIVES:

1. Improve flock by breeding and selection.
2. Compare Columbia with cross-bred ewes and lambs.
3. Compare high moisture barley with a dry grain self-fed ration.

RESULTS:

Favorable price and quite satisfactory production combined to make the current year one of the better ones since the station flock was established in 1951, from the standpoint of overall management and return.

Forty-six ewes over one year were in the flock January 1, 1966, plus ten ewe lambs. Seventy-five live lambs were born, seventy-two weaned. Of the seventy-two lambs, four were sold as 4-H lambs in May, fifty-two sold through the Flathead Wool Pool and sixteen were kept for replacements or for sale at a later date.

Twenty cross-bred ewes no longer needed for research were sold in one sale of mature ewes and two Registered Columbia ewes went to 4-H members for projects. Culling and sale has reduced the number of ewes over one year in the flock as of January 1, 1967 to thirty-two plus ten replacement ewe lambs. However, the flock is now essentially a Registered Flock as all but ten are either registered or subject to registration upon inspection.

Receipts for the calendar year include $40.80 for 4-H lambs, $106.13 for wool payments, $336.45 for the 1966 wool clip and $941.38 for lambs sold through the Pool, $430.00 for breeding stock, for a total of $1854.76 in cash receipts. This may be increased by some $35.00 by sale of culls.

This amount is an average of $40.32 per mature ewe and $33.12 per ewe of all ages in the flock, January 1, 1966.

The flock has been used for grazing experimental pastures, in a continuing attempt to improve the flock thru breeding and selection based on individual production records, for study of the relative merits of purebred and crossbred lambs, and this year for a feeding trial using high moisture barley. Pasture research results will appear in the forage report.

Flock improvement is slow and difficult to prove. However, with twenty-five ewes in the flock with three or more generations of female parents having an average wool equivalent index of thirty or above, it would seem that progress was being made. As we rapidly approach the time when all members of the flock will have this kind of high production history the probability of getting high production from all flock decendents should improve.

Purebred-Crossbred Comparisons.

Direct comparisons of projeny of ewes of different breeding become meaningless unless the sires used have equal merit and feed, care, age and other factors are very similar. The fleece characteristics would be less subject to environmental factors. With these things in mind similar numbers of ewes of three breed differences that are similar in age and fed and cared for similarly have been selected for a production comparison of lambs and wool. These leave something to be desired since different rams were used, but does seem to say that one might expect somewhat less wool from use of meat breed crosses on all purpose sheep. See Table 1.

How the crossbred lambs behave in a feed lot after weaning is also important. For five years some feeding has been done involving lambs of different breeding. Table 2, lists feed lot gains of lambs of different breeding and seems to say that one-half Dorcets might gain one-tenth pound per day more than straight breed Columbia lambs. Lambs from one-half Dorcet ewes bred back to Columbia rams seem not to continue this advantage. This however, is subject to questions, since different sires are envolved and their one-half Dorcet mothers are smaller than the Columbia mothers of Columbia and one-half Dorcet lambs.

Feeding of high moisture barley to lambs was attempted this year for the first time at this station. In one regard this initial use of this feed was very successful, ie no losses occured and no lambs appeared to have digestive disorders. This was also true of mature rams when provided access to generous amounts of the material. In another regard results were not so gratifying. Gains were less and less uniform than those from a grain mixture consisting of one-third each of dry pulp,whole oats and whole barley by weight. This quite probably was due to the crude and rather ineffective methods used for barley storage. While not spoiled much was white with mold when or soon after being removed from storage. More effective barley storage in larger facilities should greatly improve acceptance and gains.

Twelve wether lambs similar in size, age and breeding were fed each ration for forty-three days. Lambs were provided limited long alfalfa hay plus salt water and shade. Weights at beginning and end were full weights less 4% shrink. The high moisture barley was determined to contain 41% moisture when cut and stored in plastic lined barrels or small composition containers, and was allowed to ferment for two weeks prior to starting the feeding program. Table 3, lists results of this feeding trial.

PLANS:

Need for sheep to graze pastures will continue, as will need for lambs for feed evaluation. Progress in registered flock improvement will probably proceed at a more rapid rate if work with crossbreds is discontinued until all flock members are desirable individuals and all have three or more generations of dams having high production records.

Table 1. Wool and Lamb Production of Ewes of Different Breeding.

COLUMBIA

Flock Number	1st Year Wool	1st Year Lamb	2nd Year Wool	2nd Year Lamb	3rd Year Wool	3rd Year Lamb	4th Year Wool	4th Year Lamb
3-58	7.00		11.00	1-100	10.50	1-119		
3- 2	7.75	1-76	10.00	1- 97	9.75	1-106		
2-37	8.50	1-52	9.50	1- 85	9.50	2-156	9.00	2-164
2-23	9.50	1-40	12.50	2-104	12.00	1- 92	12.00	1- 58*
2-17	8.00	1-39	11.25		14.00	1- 91	11.25	1- 81
2-10	9.50	1-63	11.00	2-155	11.00	2-164	11.25	2-156
2-79	7.00	1-53	14.00	2-128	11.50	2-149	11.00	2-117
445	9.00	2-99	14.00		12.00	2-124	12.00	2-160
472	9.00	2-108	12.50	2-157	11.25	1- 96	12.00	2-165
348	7.00	1-60	12.00	1- 54	12.00	2-148	12.75	
Total	82.25	11-590	117.75	12-880	113.50	15-1245	91.25	12-901

Average yearling fleece - 8.2
Average mature fleece - 11.5
% lamb crop from yearling ewes - 110 Average Weight - 53.6
% lamb crop mature ewes - 139.3 Average Weight - 77.6
Pounds lamb per mature ewe - 108.1
* May sale as 4-H lamb

½ DORSET

Flock Number	1st. Year Wool	1st. Year Lamb	2nd. Year Wool	2nd. Year Lamb	3rd. Year Wool	3rd. Year Lamb
3- 4	8.00	1- 69	9	1- 90	8.75	1-104.0
3- 8	8.00	1- 74	9	2-136	10.00	2-134.5
3-15	9.25		11	1- 73	8.00	3-173.6
3-16	8.00	1- 69	10	1- 92	8.25	1- 95.0
3-29	8.50	1- 70	9	1- 91	8.25	2-132.8
3-30	8.25		10	2-156	9.00	1- 67.2
3-49	8.50		10		12.00	1- 92.0
3-67	8.75	2-106	12	1- 82	11.50	2-149.1
Total	67.25	6-388	80	9-720	75.75	13-949.2

Average yearling fleece - 8.4
Average mature fleece - 9.7
% lamb crop from yearling ewes - 75.0 Average weight - 64.75
% lamb crop mature ewes - 137.5 Average weight - 75.90
Pounds lamb per mature ewe - 104.3

Table 1,(con't)

Flock Number	½ SUFFOLK 1st Year	2nd Year Wool	2nd Year Lamb	3rd Year Wool	3rd Year Lamb	4th Year Wool	4th Year Lamb
2-101	Purchased	9.75	1- 92	9.0	1- 78	9.0	2-161.3
2-102	fall of	9.50	2-158	11.0		11.0	1- 84.5
2-103	yearling	8.25	2-145	8.0	2-174	9.5	2-164.5
2-104	year	12.50	1- 89	12.5	1- 53	13.0	
2-105		10.50	1- 68	10.0	1- 72	9.0	2-105.6
2-106		9.00		12.0	2-180	9.5	2-152.0
Total		59.50	7-552	62.5	7-557	61.0	9-667.9

Average mature fleece - 10.17
% lamb crop mature ewes - 127.8 Average Weight - 77.3
Pounds lamb per mature ewe - 98.7

Table 2. Tabulation of Lamb Gains from 1962 - 1966.

Year	COLUMBIA No.	Lamb Days	Lbs. Gain	Daily Gain Lbs.	Year	½ POLED DORCET No.	Lamb Days	Lbs. Gain	Daily Gain Lbs.
1962	22	660	354.0	.536	1962	21	630	378.0	.600
1963	10	710	345.3	.486	1963	7	497	269.7	.543
1963	6	336	224.2	.667	1963	5	280	221.2	.790
1964	5	170	103.0	.606	1964	7	238	139.0	.584
1965	11	396	159.6	.403	1965	2	72	29.8	.414
1966	9	387	144.9	.374					
Total	63	2659	1331.0	.500		42	1717	1037.7	.604

Year	¼ DORCET No.	Lamb Days	Lbs. Gain	Daily Gain Lbs.	Year	CCS & CDCS No.	Lamb Days	Lbs. Gain	Daily Gain Lbs.
1963	1	71	33.0	.465					
1963	3	168	109.7	.653					
1964	3	102	52.0	.510					
1965	10	360	167.3	.465	1965	2	72	28.9	.401
1966	8	344	132.4	.385	1966	4	172	76.3	.444
Total	25	1045	494.4	.473		6	244	105.2	.431

Table 3. Self-Feeding of Lambs in 1966.

LOT 1 - Fed High Moisture Barley

Lambs - 12 In - 796.9 Out - 934.5 Gain - 137.6

Lamb Days - 12 x 43 or 516 Daily Gain - .267

Feed Consumed:	Pounds	Cost	Value
High Moisture Barley	1423	1¼¢	$17.79
Alfalfa	196	1¢ Lb.	1.96
Salt	5	3¢ Lb.	.15
Total	1624		$29.90

Pounds feed per head per day - 3.15
Cost per pound of gain - $ .217

LOT 2 - Pulp Grain Mixture

Lambs - 12 In - 779.1 Out - 1025.7 Gain - 246.6

Lamb Days - 12 x 43 or 516 Daily Gain - .478

Feed Consumed:	Pounds	Cost	Value
Grain Mixture	1415	2½¢	$35.38
Alfalfa	129	1¢	1.29
Salt	5	3¢	.15
Total	1549		$36.82

Cost per pound of gain - $.149
Pounds feed per head per day - 3.0

PART II

1966

Annual Research Report

Northwestern Montana Branch

of the

Montana Agricultural Experiment Station

Kalispell, Montana

by

Vern R. Stewart

Associate Agronomist

TITLE: Fertilizer Investigations (753)

LOCATION: Northwestern Montana Branch Station and the Tutvedt Brothers farm, Northwest of Kalispell, Montana.

PERSONNEL: Leader - Vern R. Stewart
Don R. Graham

DURATION: Indefinite

OBJECTIVES:

1. To determine the effect of nitrogen and phosphorus on the yield of small grains and other winter annuals.

2. To determine the optimum fertilizer levels for the production of Ingrid barley under irrigated conditions.

EXPERIMENTAL DESIGN AND PROCEDURES:

Two type of studies were conducted in 1966. 1. The field type study which was continued on the lease in rotation R for the past several years. In the field study field machinery is used in all operations. Yields were obtained with the combine. Yields were calculated on the basis of weight from the entire field area. 2. The detailed research study is laid out in a triple lattice design. This study was conducted using nursery type equipment. The fertilizer was applied with a Gandy Spreader which had been calibrated for rates of application. Barley was seeded with the four row belt seeder. The plots were harvested with a Jerri Power-Harvester. Bundles were weighed to obtain total plant weight. Two harvest dates were made. First when the grain was at a high moisture (35%) level. This harvest also included the total plant. Thus grain yield and total plant yield were secured. The second harvest was made when the grain was ripe, at approximately eleven to twelve percent moisture.

RESULTS AND DISCUSSION:

Attached

FUTURE PLANS:

It is planned to continue the fertilizer studies on winter wheat, which have already been established in Ravalli County. The study in R rotation will be continued. Several barley fertilizer studies located throughout Western Montana will be established in the spring of 1967.

SUMMARY:

No conclusive results can be drawn from these data obtained from the detailed fertility study.

RESULTS AND DISCUSSION:

Yields were good in the field study this year. The highest yield was obtained in plot R-3c where forty-six pounds of nitrogen and seventeen pounds of phosphorus were applied in the fall and topped dressed with 24.4 pounds of nitrogen in the spring. Yield in this plot was 59.9 bushels per acre, protein 14.2 percent, this is as it pertains to hard red wheats. Gaines yielded 70.9 bushels per acre with the application of 46.6 of nitrogen and 17.1 of phosphorus plus 24.4 nitrogen in the spring. There are no real big differences between fertilizer applications and non-fertilizer applications in this years study, however we note the protein level is higher where fertilizers have been used, by 1.9 percent.

The variety Westmont in R-7b was severely infected with stripe rust which tended to reduce the yield, but did not reduce the test weight in this particular study. Table 1, gives the complete report of yields.

Results of the barley fertilizer study conducted on the Tutvedt farm in 1965 are tabulated in Tables 2 and 3. In Table 4, are the results of the soil fertility test. Soil tests were conducted by both the soils laboratory in Bozeman and the soils laboratory in the Flathead County Extension Office. There were some discrepancies noted in the test by the two labs. The pH of a 6.8 organic matter was listed as high, phosphorus was excellent 520, which is a high reading and available potassium 120, which is high. The experiment was located after the soil test was conducted. This was done to find a soil fertility situation which would be better than average, because the study was designed to determine the maxiumum fertility levels which the variety Ingrid could tolerate without severe lodging. Unfortunately this did not occur too extensively except for the higher nitrogen rates when a slight tendancy of the plant to lean was noted. The grain yield at high moisture harvest was just slightly lower than the yield of the mature barley harvest. The mean for the high moisture harvest was 65.8 bushels per acre and the mean for the mature barley was 69.0 bushels per acre. Statistical analysis indicated that there were no significant difference in grain yields in either of the high moisture harvest or the mature harvest. The highest yield was obtained from 80 pounds of nitrogen, 46 pounds of P_2O_5 and 61 pounds of K_2O. The mature harvest date where the highest yielding treatment was 80-46-61. There was also noted in this study a little higher protein, phosphorus and potassium level in the 35% moisture harvest state than in the 12% moisture harvest state or the mature state. As far as the total plant harvest was concerned, the highest in pounds per acre was obtained with the treatment of 120 pounds of nitrogen, no phosphorus, with the 61 pounds of K_2O. The data are presented for your information only and no conclusive results can be drawn from this test.

Observations during the growing season, which were made the 29th of Aug. indicate that 120 pounds of nitrogen regardless of the phosphorus rates tended to lodge slightly; wereas 120 pounds of nitrogen alone there was no lodging. There was some visual response to the potassium and phosphorus with the 80 pounds of nitrogen; this was an obvious nitrogen response. There was no less lodging tendency in 80 pounds nitrogen plus potassium than the 80 pounds nitrogen without the potassium. An observation made the same day indicates that the 80 pounds of nitrogen and the 40 pounds of P_2O_5 plus 61 pounds of K_2O looked better than the 80-46-0 which is seen in the yield data.

Table 1. Yield of field crops in Rotation R.

Field Number	Number Acres	Fertilizer Type	Fertilizer Rate per acre #/acre	N	P	K	Crop	Variety	Yield Bushels per Acre	Bushel Weight in Lbs.	Protein %
R-1b	2.82	16 -20- 0	192	30.7	16.9	0	Wheat	Delmar	53.4	57.5	14.9
R-2b	2.18	0	0	0	0	0	Wheat	Delmar	55.9	58.9	13.0
R-3c	3.3	24 -20- 0 33.5- 0- 0	194 72.7*	46.6 24.4	17.1	0	Wheat	Delmar	59.9	58.9	14.2
R-4c	3.3	24 -20- 0 33.5- 0- 0	194 72.7*	46.6 24.4	17.1	0	Wheat	Gaines	70.9	60.0	
R-5c	3.3	24 -20- 0	194	46.6	17.1	0	Barley	Alpine	77.2	44.0	
R-6c	3.3	19 -19-19	242	46.0	20.2	38.2	Barley	Olympia	63.0		
R-7b	3.3	24 -20- 0	181	43.4	15.9	0	Wheat	Westmont	56.6	61.5	13.0
R-8c	3.3	24 -20- 0	175	42.0	15.4	0	Wheat	Delmar	57.8	60.0	

* Spring Application

Table 2. Yield data from fertilizer study conducted on the Tutvedt brothers farm, Kalispell, Montana in 1966. Harvest at high moisture level correct to 12% moisture yields.

Date Seeded: May 20, 1966 Date Harvested: September 2, 1966
Plot Size: 32 square feet

Treatment			Yield Grams per Plot Replications					Yield			
N	P	K	I	II	III	IV	Total	Lbs/A	Protein	P	K
0	0	0	531	1016	995	1231	3773	2830.7			.43
0	0	K	836	469	780	841	2926	2195.2	10.1	.37	.59
40	0	K	996	1110	1176	1219	4501	3376.8	9.7	.37	
80	0	K	971	1392	1210	1354	4927	3696.4	9.8		.50
120	0	K	633	1334	615	1541	4123	3093.2	10.8		
40	23	K	1099	1080	804	1294	4277	3208.8		.35	
80	23	K	774	800	1182	1705	4461	3346.8			
120	23	K	865	925	1025	1579	4394	3296.6			
40	46	K	980	758	838	1183	3759	2820.2	9.5	.35	
80	46	K	807	1461	1431	1140	4839	3630.4	10.0		.50
120	46	K	1018	1026	1481	792	4317	3238.8	11.1		
80	0	0	995	1233	1066	1547	4841	3631.9			
80	23	0	812	519	1138	1185	3654	2741.4			.50
80	46	0	1045	887	673	648	3253	2440.5			.48

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	295955.1166	4.599
Treatment	13	90840.9769	1.411
Error	39	64351.6910	
Total	55		

$\bar{x}$.....	3310.0
S.E.$\bar{x}$.....	380.6
L.S.D.....	N.S.
C.V.%.....	12.23

Table 3. Yield data from fertilizer study conducted on the Tutvedt brothers farm, Kalispell, Montana in 1966. Harvested at 12% moisture.

Date Seeded: May 20, 1966 Date Harvested: September 9, 1966
Plot Size: 32 Square feet

Treatment			Yield Grams per Plot Replications					Yield			
N	P	K	I	II	III	IV	Total	Lbs/A	Protein	P	K
0	0	0	546	950	1320	1292	4108	3082.0			.45
0	0	K	846	857	795	900	3398	2549.3	8.9	.34	.45
40	0	K	865	816	1330	1348	4359	3270.3	9.4	.32	
80	0	K	976	1355	1130	1320	4781	3586.9	9.2		.50
120	0	K	1010	1429	650	1685	4774	3581.6	10.0		
40	23	K	1015	1054	757	1240	4066	3050.5		.36	
80	23	K	655	894	1210	1798	4557	3418.8			
120	23	K	1055	1040	887	1660	4642	3482.6			
40	46	K	770	856	1027	1549	4202	3152.5	9.4	.35	
80	46	K	954	1166*	1410	1525	5055	3792.5	9.4		.53
120	46	K	875	1053	1445	1400	4773	3580.9	10.1		
80	0	0	1150	1282	1220	1495	5147	3861.5			
80	23	0	712	645	1255	1124	3736	2802.9			.60
80	46	0	1116	685	1345	1057	4203	3153.3			.45

* Calculated missing plot

$\bar{x}$.....	3311.6
S.E.$\bar{x}$.....	349.9
L.S.D.....	N.S.
C.V.%.....	10.57

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	618268.080	11.36
Treatment	13	61787.330	1.14 N.S.
Error	38	54387.001	
Total	54		

Table 4. Results of soil analysis by the soil laboratories at Bozeman and Kalispell.

Lab. Number	Sample Number[1]	pH	Organic Matter	Avail.P Lbs/ A	Avail.K Lbs/ A
2483 Bozeman	1	6.8	6.2%	520	120
5243 Kalispell	1	6.5	3.7%	132	465
5270 Kalispell	1	6.4	7.0%	25	996
5270 Kalispell Rerun	1	6.4	4.8%	20	797

[1] All analysis were made from the same sample of soil.

YEAR: 1966

TITLE: Weed Investigation 754

LOCATION: Northwestern Montana Branch Station, Field No's. R-8, X-3 and Y-5; Charles Stipe farm, Moiese, Montana; Homer Bailey farm, Corvallis, Montana; George Hubbard farm, Route 4, Kalispell, Montana and the Western Montana Branch Station, Corvallis.

PERSONNEL: Leader - Vern R. Stewart
Members of the Weed Research Committee and several Commercial Chemical Companies

DURATION: Indefinite

OBJECTIVES:

1. To find a herbicide that will effectively and economically control field gromwell (Lithospernium arvense) in winter wheat with little or no deleterious effect on wheat yields.
2. To determine what herbicides will effectively control weeds in sugar beets and further measure the effect of these herbicides on sugar beets.
3. To determine the effectiveness of certain products for the control of weeds in potatoes.
4. To determine the economical rate of picloram (Tordon) for the control of field bindweed.
5. To determine the selectivity of herbicides in horticultural crops and their effect on certain weed species.
6. To determine what herbicides will give effective control of broad leaves and/or control wild oats in pea production.

EXPERIMENTAL DESIGN AND PROCEDURES:

Eight herbicides were used alone and some in combination to find an effective means of controlling broad leaved weeds and grasses in a new legume seeding (sainfoin). Three herbicides were applied per plant and incorporated, the remainder of the products were applied post emergence when the sainfoin was in the three to five leaf stage. The plots were 10 by 20 feet. Applications were made with a research sprayer, fifty-four gallons of water per acre were used in all applications. Weed counts were made July 1, 1966. Six counts were made in each plot in a quadrant, three inches by forty-eight inches, or one square foot. Weed species found in this study were: fanweed (Thlaspi arvense (L)), shepherds purse (Capsella-Bursa pastoris (L)), other weeds; wild buckwheat (Polygonum convelvulus (L)), lambsquarter (Chenopodium album (L)), root pigweed (Amaranthus retroflexus (L)), night flowering catchfly (Silene notriflora), grasses; barnyard grass (Echinochloa crus-galli (L)), quackgrass (Agropyron repens (L)), green foxtail (Seteria viridis (L)).

The data was analyzed using the variance of anaylsis technique. Significance was determined in both weed and beet population by Duncan's Multiple Range Test.

The sugar beet studies were designed to have three replications with the replications to be in three different locations. Only two of the replications were established. One was established on the Charles Stipe farm near Moiese, the second replication was established on the Homer Bailey farm, near Corvallis, Montana. Plot size was 10 x 60 or 600 square feet. All material was applied in 54.4 gallons of water per acre. The materials were applied overall with a research sprayer, and then incorporated. The one at Stipe's was incorporated with a power incorporater and planted at the same time. The material at Corvallis was incorporated with a combination duck-foot roller-disk type of machine. Weed species found in these studies were; red root pigweed (Amaranthus retroflexus (L)), lambsquarter (Chenopodium album (L)), nightshade(Solanum nigrum (L)) and others. No division was made of the "others" in this particular study. Counts of each of these weeds were made as were counts of beets. These counts were made with a quadrant, three by forty-eight inches. Eight counts were made per plot in the two replications. Plant counts were made June 10, 1966.

A weed population indentified as red spurry (Spergularia rubra) was found on the Art Weaver farm, Kalispell, Montana. A study was designed with the purpose of controlling this weed. The four products used are found in table 6. Plots were 10 x 20, 200 square feet. These plots were placed on an established stand of winter wheat seeded by Mr. Weaver. Size of plot harvest was 18.6 square feet.

The control of field gromwell (Lithospernium arvense) was continued in 1966 with spring and fall applications of herbicides. The fall applications were made October 26, 1965, spring applications, April 13, 1966. Plot size was 12 x 20 feet, with 12 rows per plot. The two center rows were harvested for yield. The volume was 54.4 gallons of water per acre. The materials used in this study are found in Table 7. Yield data was analyzed using the analysis of variance technique. No weed counts were made, but a weed score was obtained (0-10).

A study to control weeds in horticultural crops was established at the Western Montana Branch Station with eight herbicides. Plots were laid out 10 x 60 feet, and the horticultural crops were planted at right angles across each of the treatments. There were fourteen different horticultural crops used in this study. All the materials were applied pre plant incorporated except dacthal and prometryne which were post plant application. Seeding was done with a garden type seeder where usable, otherwise all the other horticultural crops were seeded by hand. An evaluation of weed species were made approximately one month after emergence of plants. Prevalent weed species in this study were; storks-bill(Erodium cicutarium), lambsquarter (Chenopodium album), mustard (Brassica sp.), shepherds purse (Capsella-Bursa pastoris).

Two herbicides from Geigy Chemical Company were used in potato study at three different rates. The purpose of this study was to control broad leafed weeds in potatoes. Yields per hundred weight of potatoes were obtained, an estimated quality figure secured and the amount of injury to the potatoes was

recorded. The main weeds found in this study were; fanweed (Thaspi arvense(L)), and red root pigweed (Amaranthus rectoflexus (L)).

A study to measure the effectiveness of certain herbicides in control of weeds in peas was established. Seeding was done quite late and no stand of weeds were obtained. Therefore, a copy of the plan of this study is made a record of this report and will be found listed with the tables. Residual information was obtained from OSC 21799.

Three herbicides were used in 1964 to establish a field bindweed study on the George Hubbard farm. These herbicides were put out August 4, 1964. The purpose was to determine how to obtain economical and effective control with picloram. Observations were made in 1965 and in 1966.

RESULTS AND DISCUSSION:

Sainfoin

In Table 1, is shown a complete tabulation of the data obtained from the herbicide study for the control of weeds in sainfoin.

In Table 2, is a summary of the complete data for overall weed control and the effect of herbicides on sainfoin stand. When analyzed statistically it was found that there was no effect on stand and that the difference that exists in stand is due to chance and chance alone. In overall weed control significant differences were found. Those products giving control of 75 percent or better were; ACP 63-57 at 16 ounces per acre, ACP 63-57 at 32 ounces per acre, bromoxynil at 6 ounces and the combination of ACP 63-57 + bromoxynil at eight ounces and two ounces respectively. ACP 63-57 + bromoxynil at eight ounces and four ounces respectively was the most effective for the control of all weeds present in the study. One thing was noted that after controlling the weeds that had emerged, considerable chickweed emerged. This weed was not controlled by bromoxynil or the 2,4-DB ester or amine. Benefin and trifluralin did give some control of chickweed. In Table 3 is shown the effects of herbicides on individual weeds. ACP 63-57 was the most effective of the products in the control of sherpherds purse and also the combination ACP 63-57 + bromoxynil which gave almost one-hundred percent control of shepherds purse. These products were also very effective for the control of fan weed, but were less effective for the control of some of the other weeds which were listed earlier, under experimental design, mainly the night flowering catchfly and lambsquarter. The compounds most effective in controlling the grasses were, eptam, trifluralin and benefin. Benefin at sixteen ounces being very good and eptam at thirty-two ounces giving one-hundred percent control of the grasses. Data presented here for 1966 fairly closely correlates the data obtained in 1965, when ACP 63-57 gave effective control of most of the weed species in sainfoin. Complete data of this study are found in Tables 1, 2 and 3.

Sugar Beets

The study located at the Stipe farm in Lake County at Moiese did not have a very large population of weeds, therefore only beet counts and stands were obtained.

Results of the weed counts and beet counts from the study at Bailey's where weed counts were made are found in Table 4.

The herbicide R 2063 gave the most weed control of any of the products used. It was very effective on lambsquarter, good on nightshade and fair on pigweed. Pyramin was weak on the control of weeds as contrasted to previous years when it has given us very good control of nightshade. Part of it can probably be explained due to the lack of moisture during the early part of the growing season. Beets were planted in early April. This was followed by a long, cold dry period in the Bitterroot Valley. Pyramin + R 2063 was effective in the control of pigweed, but less effective in control of lambsquarter and nightshade.

In Table 5, are found the beet population data from the two locations. The analysis indicates there were no significant differences at the five percent level due to the herbicide. However, it is noted that the beet counts for tilam are somewhat less than the check. Pyramin + TD 282 has the lowest count in the study.

Winter Wheat Trial 1

The red spurry study in winter wheat located on the Weaver farm indicated early in the season that bromoxynil was going to be very effective in the control of this weed. The total plant was burned with four to eight ounces of bromoxynil four days after application of the herbicide. Three weeks after the application, the red spurry had completely recovered from the bromoxynil treatment. Late in the season evaluation indicated that the best control was obtained from one ounce of picloram and sixteen ounces of 2,4-D. One-half ounce of picloram and eight ounces of 2,4-D was somewhat effective. The data indicates that at five percent level there was no significance in yield due to the treatments, however a close examination of the data will show that bromoxynil at four ounces is the highest yielding treatment and the check in this particular case was the lowest treatment, followed very closely by 17.2 bushels for the treatment with picloram + 2,4-D at one ounce and sixteen ounces. No conclusions can be drawn from this data as this is the first year.

Winter Wheat Trial 2

The study for control of field gromwell (Lithospernium arvense) in winter wheat has continued now for several years. This year spring and fall applications were used in the study. The fall application of 2,4-D delayed maturity considerably, caused lodging and distortion of heads. Some distortion of heads was also noted with the spring application, but this could be due to the date of application of 2,4-D which was April 13, 1966, much earlier than most 2,4-D applications have been made in the past years. Some discoloration with the use of bromoxynil at one pound in the spring, both ester and the potassium salt formulations, occurred in the wheat early in the growing season; however this did not affect yields. Table 7 shows the complete data obtained from this study. Table 8, is a summary of the data secured from the study. A yield range of 50.4 to 69.0 bushels per acre is recorded between the check and the fall treatment of ioxynil ester which is listed as Amchem 65-16 in the table. The check yield was 50.4 and the ioxynil treatment 69.1. The small difference in the check and the hand weeded check can be explained. The hand weeded check was not weeded in the fall, but was weeded in the spring with some of the weeding delayed until June. So it appears from these data that yield loss was from the delay in not removing the weed population from the wheat population. There is very little difference between fall and spring applications.

However, with the several ioxynil treatments there is a two bushel increase from the fall application. With the 2,4-D applications and the combinations of 2,4-D a slight reduction in yield from fall application is noted.

Horticultural Crops

Weed control on horticultural crops and the data therein are found in Tables 9 and 10. The primary weeds of concern in this study are stork's-bill followed by lambsquarter, pigweed and shepherds purse. Products that controlled stork's-bill quite effectively were dacthal, pyramin, eptam and prometryne, products controlling lambsquarter were dacthal, amiben, eptam, pyramin and prometryne. Pigweed was controlled by all products except dalapon. Shepherds purse was controlled with amiben, eptam, pyramin and prometryne. The effectiveness of the herbicides on crops is found in Table 10. Some of the products have a fairly wide range, benefin and trifuluralin have about the same spectrum as far as effect on crops is concerned. Dacthal has a wide range, amiben injured all crops except bush beans, peas, spinach, head lettece and leaf lettece. Eptam had a narrower range than trifluralin or benefin. Pyramin and prometryne have a limited area as far as injury to crops was concerned, pyramin injured all crops except beets, spinach, swiss chard, radishes and cabbage, whereas prometryne injured all crops except bush beans, pole beans, peas and radishes. This study was a survey study and more detail may be used again another year to study the rates of different herbicides which show the most promise for use in horticultural crops.

Potatoes

Netted gem potatoes were used in the study for weed control in potatoes. Observation made on date of harvest, October 4 and 5, tubers had reduced netting compared to those in adjacant fields where no herbicides had been applied. There was no significant difference in yield when analyzed statistically. There was no great difference in the total number one potatoes because of treatment. The check had 56.7 percent number ones and the treatments vary from 70 to 46 percent number ones. It is difficult to make an evaluation of this study however excellent weed control was obtained with all the products used at the rates given.

Peas

The study on field peas yielded no information because of the lack of weed population. Slight injury with bromoxynil following application was noted but this could not be seen later in the growing season. There was some injury from OSC 21799, but these plants also recovered. A copy of the work plan is made a part of this report.

Field Bindweed

An observation of the field bindweed study established on the Hubbard farm in 1964 was made on August 25, 1966. To date no bindweed has been found in the area that was sprayed with picloram. No opportunity has been given us to made a study of or count of bindweed in this plot because of the tillage done by the farmer. There was some stunting of growth in the barley and evidence of picloram damage. There was delayed maturity in the whole area which had been the test sight.

FUTURE PLANS:

Plans at this writing are indefinite, but we will continue to pursue the work on winter wheat for the control of field gromwell. The work on field bindweed is continuing. The new legume seeding work will no doubt be continued in 1967. There is a question yet about the work on sugar beets at this writing.

SUMMARY:

1. The use of ACP 63-57 at sixteen and thirty-two ounces and the combination of this product and bromoxynil were quite effective for the control of most broad leafed weeds that were found in the sainfoin.

2. Sugar beet study results were less spectacular than in previous years, however we did find the R 2063 was the most effective for weed control. At the study at Bailey's there was no reduction of weed stand due to herbicides used on sugar beets.

3. No significant results could be drawn from the study on red spurry the first year. Bromoxynil did injure the plant in the beginning, but it recovered during the growing season. There was some evidence of control with the combination of picloram and 2,4-D.

4. Bromoxynil was quite effective for the control of field gromwell in the winter wheat plots at eight ounces and also at four ounces. There was a slight increase in yield over fall spraying with the bromoxynil and ioxynil treatments. Ioxynil ester, Amchem 65-15 was the treatment from which the highest yields were obtained.

5. Several compounds show promise for the control of weeds in horticultural crops and four compounds show considerable promise for the control of stork's-bill which had been prevelent on the Western Montana Branch Station.

6. Good weed control was obtained with Geigy products GS 14260 and GS 16065 in potatoes. No reduction in yields were noted but we did notice a reduction of netting of netted gem potatoes.

7. Study established on the Hubbard farm in 1964 measures the effectiveness of picloram for the control of field bindweed.

Table 1. Data from herbicide study on sainfoin. Location in Field X-2, Northwestern Montana Branch Station. Size of plot 200 sq. ft. Plant counts, 6 quadrants per plot 3" x 48".
Seeding Date, May 24, 1966

Treatment	Rate/A in Oz.	Plot #	Fan-weed	Shep-erds Purse	Other	Grasses	Sain-foin	Weed Score 0-10
Trifluralin	8	1	5	124	7	5	58	0
		36	30	90	2	3	56	0
		63	1	32	2	5	33	8
		Total	36	246	11	13	147	
		x̄	2.0	13.7	.6	.7	8.2	3
Trifluralin	16	2	15	114	3	4	50	3
		32	8	138	4	4	36	0
		44	8	116	6	6	73	0
		Total	31	368	13	14	159	
		x̄	1.8	20.4	.7	.8	8.8	1
Benefin	8	3	8	151	11	8	53	0
		37	9	95	8	1	56	0
		50	4	100	17	5	28	2
		Total	21	346	36	14	137	
		x̄	1.2	19.2	2.0	.8	7.6	1
Benefin	16	4	0	137	5	7	51	0
		40	5	82	8	2	45	2
		49	7	112	4	2	50	2
		Total	12	331	17	11	146	
		x̄	.7	18.4	.9	.6	8.2	1
Benefin	24	5	2	118	8	2	61	4
		33	16	124	7	4	48	0
		62	2	63	4	2	41	4
		Total	20	305	19	8	150	
		x̄	1.1	16.9	1.1	.4	8.3	3
4(2,4-DB)ester	8	6	3	104	12	26	39	6
		29	2	94	32	16	58	4
		57	3	111	23	15	54	3
		Total	8	309	67	57	151	
		x̄	.4	17.2	3.7	3.2	8.4	4
4(2,4-DB)amine	8	7	11	104	30	19	49	1
		34	3	104	29	11	50	2
		45	10	103	21	29	58	0
		Total	24	311	80	59	157	
		x̄	1.3	17.3	4.4	3.3	8.7	1

Table 1. (con't)

Treatment	Rate/A in Oz.	Plot #	Fan-weed	Shep-herds Purse	Other	Grasses	Sain-foin	Weed Score 0-10
4(2,4-DB)amine	16	8	4	106	33	21	49	3
		26	7	118	30	10	40	3
		43	5	102	30	43	46	0
1.8 0.0	509	Total	16	326	93	74	135	
		$\bar{x}$	.9	18.1	5.2	4.1	7.5	2
Bromoxynil	2	9	0	73	11	35	40	5
		38	11	47	11	9	53	6
		52	10	73	8	16	43	8
40.7 38.0	304	Total	21	193	30	60	136	
		$\bar{x}$	1.2	10.7	1.7	3.3	7.6	6
Bromoxynil	4	10	0	28	7	41	33	9
		42	0	9	2	6	53	9
		47	1	23	8	31	49	6
69.6 68.4	156	Total	1	60	17	78	135	
		$\bar{x}$	.05	3.3	.9	4.1	7.6	8
Bromoxynil	6	11	0	17	4	26	42	9
		41	0	6	0	14	46	0
		53	0	18	3	30	42	3
77.0 76.1	118	Total	0	41	7	70	130	
		$\bar{x}$	0	2.3	.4	3.9	7.2	6
Bromoxynil+4(2,4-DB)	2+2	12	0	75	13	15	43	5
		35	11	71	10	13	43	7
		48	1	66	4	30	54	7
39.8 37.3	309	Total	12	212	27	58	140	
		$\bar{x}$	.7	11.8	1.5	3.3	7.8	6
Bromoxynil+4(2,4-DB)	3+3	13	1	51	6	19	50	8
		28	1	47	23	11	63	8
		56	3	60	7	43	36	8
42.4 44.8	272	Total	5	158	36	73	149	
		$\bar{x}$	.3	8.8	2.0	4.1	8.3	8
ACP 63-57	16	14	0	1	26	18	49	8
		27	0	0	20	19	52	7
		58	3	0	22	18	39	6
75.2 74.2	127	Total	3	1	68	55	140	
		$\bar{x}$	.2	.05	3.8	3.1	7.8	7
ACP 63-57	32	15	0	0	15	22	56	8
		23	0	0	16	31	50	8
		54	0	0	18	25	40	8
75.2 74.2	127	Total	0	0	49	78	146	
		$\bar{x}$	-	-	2.7	4.3	8.1	8

Table 1. (con't)

Treatment	Rate/A in Oz.	Plot #	Fan-weed	Shep-herds Purse	Other	Grasses	Sain-foin	Weed Score 0-10
ACP63-57+Bromoxynil	8+2	16	0	0	2	41	45	8
		25	0	0	4	20	51	7
		46	0	0	2	47	51	7
	116	Total	0	0	8	108	147	
		$\bar{x}$	-	-	.44	6.0	8.2	7
ACP63-57+Bromoxynil	8+4	17	0	1	6	38	46	7
		39	0	0	1	9	45	8
		55	0	0	1	43	31	8
	99	Total	0	1	8	90	122	
		$\bar{x}$	-	.06	.44	5.0	6.8	8
Check	0	18	3	109	32	16	58	0
		31	13	157	24	8	42	0
		60	6	60	43	22	37	0
	493	Total	22	326	99	46	137	
		$\bar{x}$	1.2	18.1	5.6	2.6	7.6	0
Sindone+2,4-DBester	32+8	19	4	64	17	20	69	8
		30	5	97	28	15	54	7
		59	5	44	24	18	36	8
	341	Total	14	205	69	53	159	
		$\bar{x}$	.8	11.4	3.8	2.9	8.8	8
Eptam	32	20	12	109	35	0	55	3
		24	12	87	17	0	62	4
		51	8	92	36	0	51	3
		Total	32	288	88	0	168	
	408	$\bar{x}$	1.8	16.0	4.9	-	9.3	3
Dalapon + 2,4-DBester	1.5+8	21	3	120	33	26	48	6
		22	5	105	39	12	35	4
		61	6	42	24	9	48	7
	424	Total	14	267	96	47	131	
		$\bar{x}$	.8	14.8	5.3	2.6	7.3	6

	Post Plant	Pre Plant
Date Applied	June 23	May 24
Temperature	60°	40°
Humidity	57	86
Wind Volicity	Calm	Calm
Soil Type	Creston Silt Loam	
Soil Moisture	Excellent	
Volume of H_2O	54.4 g/a	54.4 g/a
Nozzle Size	8004	8004

Table 2. Summary of herbicide study on a new seeding of sainfoin. Plant counts of sainfoin and total weeds.

Herbicide	Rate/A in oz.	Application	Plant Count[1] Weeds	Sainfoin	% Weed Control	Weed Score 0-10	Remarks
Check	0	Post Emerg.	28.5a[2]	8.1	0.0	0	
4(2,4-DB)amine	16	" "	28.3ab	7.5	.8	2	
4(2,4-DB)amine	8	" "	26.3ab	8.6	7.6	1	
4(2,4-DB)ester	8	" "	24.5ab	8.4	14.0	4	
Trifluralin ✓	16	Pre Plant	23.6ab	8.8	17.3	1	
Dalapon + 2,4-DB ester	24+8	Post Emerg.	23.6ab	7.3	17.3	6	leaves wild-buck wheat & chickweed
Benefin	8	Pre Plant	23.2ab	7.6	18.7	1	
Eptam	32	" "	22.7ab	9.3	20.5 20.3	3	
Benefin	16	" "	20.6abc	8.1	27.7 27.1	1	
Benefin	24	" "	19.6abcd	8.3	31.4	3	controled chickweed
Sindone + 2,4-DB ester	32+8	" "	18.9abcde	8.8	33.5	8	
Bromoxynil + 4(2,4-DB)	2+2	Post Emerg.	17.2abcdef	7.8	39.8	6	
Trifluralin ✓	8	Pre Plant	17.0abcdef	8.4	40.3	3	Controled chickweed
Bromoxynil	2	Post Emerg.	16.9abcdef	7.6	40.7	6	leaves chickweed
Bromoxynil + 4(2,4-DB)	3+3	" "	15.1 bcdef	8.3	47.0	8	
Bromoxynil	4	" "	8.7 cdef	7.5	69.6	8	leaves chickweed
ACP 63-57 ✓	16	" "	7.1 def	7.8	75.2	7	leaves chickweed
ACP 63-57 ✓	32	" "	7.1 def	8.1	75.2	8	
Bromoxynil	6	" "	6.6 ef	7.2	77.0	6	leaves chickweed

Table 2 . (con't)

Herbicide	Rate/A in oz.	Application	Plant Count[1] Weeds	Plant Count[1] Sainfoin	% Weed Control	Weed Score 0-10	Remarks
ACP 63-57 + Bromoxynil	8+2	Post Emerg.	6.4	f 8.2	77.4	8	
ACP 63-57 + Bromoxynil	8+4	" "	5.5	f 6.8	80.7	8	

[1] Average of 6 counts per plot 3" x 48", three replications.
[2] Duncans multiple range test.

SAINFOIN POPULATION

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	5.03174	
Treatment	20	6.86984	
T x R	40	16.47896	1.62*
Error	315	10.13386	
Total	377		

WEED POPULATION

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	243.57905	5.31**
Treatment	20	1080.86852	23.54**
T x R	40	106.83771	2.33**
Error	315	45.91217	
Total	377		

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Table 3. Summary of herbicide study on a new seeding of sainfoin by weed species, giving numbers and percent control.

Herbicide	Rate/A in oz.	Shepherds Purse	% Control	Fanweed	% Control	Other Weeds	% Control	Grass	% Control
		PLANT COUNTS [1]							
Trifluralin	16	20.4a[2]	0.0	1.8	0.0	.7	87.5	.8	89.5
Benefin	8	19.2ab	0.0	1.2	0.0	2.0	64.3	.8	89.5
Benefin	16	18.4ab	0.0	.7	41.7	.9	83.9	.6	92.1
4(2,4-DB)amine	16	18.1ab	0.0	.9	25.0	5.2	7.1	4.1	46.1
Check	0	18.1ab	0.0	1.2	0.0	5.6	0.0	7.6	0.0
4(2,4-DB)amine	8	17.3ab	4.4	1.3	0.0	4.4	21.4	3.3	56.6
4(2,4-DB)ester	8	17.2ab	5.0	.4	66.7	3.7	33.9	3.2	57.9
Benefin	24	16.9ab	6.6	1.1	8.3	1.1	80.3	.4	94.7
Eptam	32	16.0ab	11.6	1.8	0.0	4.9	12.5	0.0	100.0
Dalapon + 2,4-DB ester	24+8	14.8ab	18.2	.8	33.0	5.3	5.4	2.6	65.8
Trifluralin	8	13.7abc	24.3	2.0	0.0	.6	89.3	.6	89.3
Bromoxynil + 4(2,4-DB)	2+2	11.8abcd	34.8	.7	41.7	1.5	73.2	3.3	56.6
Sindone + 4(2,4-DB)	32+8	11.4abcd	37.0	.8	33.0	3.8	32.1	2.9	61.8
Bromoxynil	2	10.7 bcde	40.9	1.2	0.0	1.7	69.6	3.3	56.6
Bromoxynil + 4(2,4-DB)	3+3	8.8 bcdef	51.4	.3	75.0	2.0	64.3	4.1	46.1
Bromoxynil	4	3.3 def	81.8	.05	95.8	.9	83.9	4.1	46.1
Bromoxynil	6	2.3 f	87.3	0.0	100.0	.4	92.9	3.9	48.7
ACP63-57+Bromoxynil	8+4	.06 f	99.7	0.0	100.0	.4	92.9	6.8	10.5
ACP63-57	16	.05 f	99.7	.2	83.3	3.8	32.1	3.1	59.2
ACP63-57	32	0.0 f	100.0	0.0	100.0	2.7	51.8	4.3	43.4
ACP63-57+Bromoxynil	8+2	0.0 f	100.0	0.0	100.0	.4	92.9	6.0	21.1

[1] Average of three replications with 6 counts in each plot in 3"x48" quad.
[2] Duncan multiple range test.

Table 4. Summary of weed and beet counts from herbicides study on sugar beets, grown on the Homer Bailey farm, Stevensville, Montana in 1966.

Treatment	Rate/A in Lbs.	Lambs-quarter[1]	% Weed Control	Pig-weed[1]	% Weed Control	Night-shade[1]	% Weed Control	Beets[1]	Beet Stand % of Check
R 2063	4	0	100.0	1	75.0	8	93.3	33	118
Pyramin	5	3	62.5	2	50.0	103	14.2	43	154
Pyramin + TD 282	3 + 2	2	75.0	3	25.0	125	0.0	28	100
Check	0	8	0.0	4	0.0	120	0.0	28	100
Tillam	3	4	50.0	4	0.0	102	15.0	28	100
Pyramin + CP31393	4 + 2	3	62.5	0	100.0	98	18.3	38	136
Pyramin + R 2063	3 + 2	8	0.0	0	100.0	221	0.0	25	89
Pyramin + Sindone	3 + 2	14	0.0	0	100.0	100	16.7	39	139
Pyramin (Wettable Powder)	8	20	0.0	0	100.0	90	25.0	35	125
TD 282	3	11	0.0	1	75.0	100	16.7	51	182
R 2063 + Avadex	3 + 1.5	6	25.0	2	50.0	92	23.3	32	114

[1] Average of eight counts in a quadrant 3" x 48" (1 sq. ft.)

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Table 5. Summary and analysis of sugar beet stands from herbicide study grown in two locations. (1. Charles Stipe, Moiese, 2. Homer Bailey, Stevensville)

Treatment	Rate Lb./A.	Stipe Beet	Bailey Counts*	Total	Beet Stand % of Check
Pyramin	5	45	33	78	118
Pyramin + Sindone	4 + 1.5	44	39	83	126
Pyramin + R 2063	3 + 2	50	25	75	114
Pyramin + TD 282	3 + 2	24	28	52	79
R 2063	4	43	33	76	115
R 2063 + Avadex	3 + 1.5	40	32	72	109
Tillam	3	34	28	62	94
TD 282	3	44	51	95	144
Pyramin + CP31393	4 + 2	48	38	86	130
Check	0	38	28	66	100
Pyramin	8	48	35	83	126

Plot Size	600 sq ft	600 sq ft
Application Date	4/22/66	4/10/66
Temperature	56-60°F	26-38°F
Humidity	30-32%	24%
Cloud Cover	Cloudy	Clear
Wind	0-10	Calm
Soil Type	Round Butte Very Fine Sandy Loam	Hamilton Silt Loam

* Average of eight counts per plot in a quadrant 3" x 48" (1 sq. ft.)

Analysis of Variance

Source	D.F.	Mean Square	F.
Blocks	1	44.00	
Treatment	10	9.03864	5.373NS
T x B	10	4.525	1.10 NS
Error	154	8.18831	
Total	175		

Table 6. Data from herbicide study on winter wheat for the control of red spurry Spergularia rubra. Conducted on the Art Weaver farm, Route 4, Kalispell, Montana.

Size of Plot: 18.66656 sq.ft.

Herbicide	Rate/A in Oz.	Grams/Plot I	II	III	Total Grams	Yield Bu./A	Bu. Wt. in Lbs.
Dicamba	4	299	450	175	924	26.4	59.5
Dicamba	2	205	385	280	870	24.9	60.4
Bromoxynil ester	4	340	250	575	1165	33.3	60.0
Bromoxynil ester	8	235	202	389	826	23.6	-
Picloram + 2,4-D	1 + 16	197	265	139	601	17.2	-
Picloram + 2,4-D	½ + 8	330	145	240	715	20.4	-
2,4-D LV	8	265	230	184	679	19.4	-
2,4-D LV	16	410	252	240	902	25.8	59.6
Check	0	200	189	199	588	16.8	-

Date Applied: April 14, 1966
Temperature: 58°F
Humidity: 38-45%
Wind Volicity: Calm

$\bar{x}$..... 23.1
S.E.$\bar{x}$..... 5.1957
L.S.D..... N.S.
C.V.%..... 22.30

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	355.148	
Treatment	8	11268.6483	1.02
Error	16	11016.4815	
Total	26		

Table 7. Data from herbicide study on delmar wheat for control of field gromwell (Lithospernium arvense). Plots, 12 rows, 20 feet long. Three replications. Grown at Northwestern Montana Branch Station in Field No. R-8 in 1965-66.

Date Seeded: September 22, 1965 Date Harvested: August 23, 1966 Size of Plot: 32 sq. ft.

Treatment	When Applied	Rate/A in Oz.	Plot #	Lodging %	Weed Score 0-10	Grams per Plot	Yield Bu/A.	Bu. Wt. in Lbs.	Remarks
Check		0	1	0	0	944	47.2	60.1	
			51	0	0	1095	54.8	61.0	
			77	0	0	985	49.3	60.5	
			Total			3024		181.6	
			$\bar{x}$	0	0		50.4	60.5	
Check (hand weeded)		0	2	0	10	1235	61.8	61.0	
			32	5	10	674	33.7	61.1	
			75	0	10	1142	57.1	61.1	
			Total			3051		183.2	
			$\bar{x}$	2	10		50.9	61.1	
Tordon, 2,4-D	Spring	½ + 4	3	0	4	1135	56.8	60.4	All species but gromwell were controled. Some delay in maturity.
			38	0	2	1110	55.5	60.4	
			86	5	0	1266	63.3	60.8	
			Total			3511		181.6	
			$\bar{x}$	2	2		58.5	60.5	
Tordon, 2,4-D	Fall	½ + 4	4	0	7	1405	70.3	60.5	Delayed maturity
			37	0	7	1216	60.8	60.4	
			61	0	9	1165	58.3	60.5	
			Total			3786		181.4	
			$\bar{x}$	0	8		63.1	60.5	
Tordon, 2,4-D	Spring	½ + 8	5	0	4	1186	59.3	62.5	Some distortion of heads
			50	0	2	1180	59.0	60.4	
			65	0	1	1265	63.3	60.6	
			Total			3631		183.5	
			$\bar{x}$	0	2		60.5	61.2	

Table 7. (con't)

Treatment	When Applied	Rate/A in Oz.	Plot #	Lodging %	Weed Score 0-10	Grams per Plot	Yield Bu./A	Bu. Wt. in Lbs.	Remarks
Tordon, 2,4-D	Fall	½ + 8	6	5	8	1336	66.8	60.5	Delayed maturity, lodging
			45	50	10	1226	61.3	59.6	
			73	0	9	1320	66.0	60.9	
			Total			3882		181.0	
			$\bar{x}$	18	9		64.7	60.3	
Tordon, 2,4-D	Spring	1 + 16	7	0	4	1110	55.5	59.6	Delayed maturity, head distortion, no control of gromwell.
			33	0	9	1074	53.7	60.4	
			85	0	4	1185	59.3	59.5	
			Total			3369		179.5	
			$\bar{x}$	0	6		56.2	59.8	
Tordon, 2,4-D	Fall	1 + 16	8	0	10	1174	58.7	59.9	Delayed maturity, stand reduction
			31	20	10	656	32.8	58.6	
			70	35	10	1235	61.7	59.5	
			Total			3065		178.0	
			$\bar{x}$	18	10		51.1	59.3	
Tordon	Spring	.5	9	15	6	1200	60.0	60.2	Delayed maturity
			59	0	0	955	47.8	60.0	
			74	0	3	1270	63.5	61.0	
			Total			3425		181.2	
			$\bar{x}$	5	3		57.1	60.4	
Tordon	Fall	.5	10	0	3	900	45.0	60.3	Fair control of gromwell, left false flax
			42	0	3	1235	61.7	60.5	
			71	0	6	1260	63.0	60.6	
			Total			3395		181.4	
			$\bar{x}$	0	4		56.6	60.5	

Table 7 . (con't)

Treatment	When Applied	Rate/A in Oz.	Plot #	Lodging %	Weed Score 0-10	Grams per Plot	Yield Bu./A	Bu. Wt. in Lbs.	Remarks
LV 2,4-D	Spring	16	11	0	9	1000	50.0	60.0	Severe distortion of heads
			35	0	8	928	46.4	60.0	
			66	0	9	1304	65.2	60.5	
			Total			3232		180.5	
			$\bar{x}$	0	9		53.9	60.2	
LV 2,4-D	Fall	16	12	30	10	920	46.0	59.1	Delayed maturity
			40	20	10	1120	56.0	60.0	
			69	35	10	960	48.0	60.1	
			Total			3000		179.2	
			$\bar{x}$	28	10		50.0	59.7	
Bromoxynil K Salt(64-386)	Spring	4	13	0	3	949	47.5	61.0	
			36	0	0	1002	50.1	60.0	
			67	0	3	1259	63.0	61.2	
			Total			3210		182.2	
			$\bar{x}$	0	2		53.5	60.7	
Bromoxynil K Salt(64-386)	Fall	4	14	0	8	1116	55.8	60.8	Delayed maturity
			44	0	6	1267	63.4	60.8	
			90	0	4	1180	59.0	60.6	
			Total			3563		182.2	
			$\bar{x}$	0	6		59.4	60.7	
Bremoxynil K Salt(64-386)	Spring	8	15	0	8	1160	58.0	60.9	No control of mustard and
			46	0	7	1281	64.1	60.5	false flax
			64	0	3	1245	62.3	61.0	
			Total			3686		182.4	
			$\bar{x}$	0	6		61.5	60.8	

Table 7 . (con't)

Treatment	When Applied	Rate/A in Oz.	Plot #	Lodging %	Weed Score 0-10	Grams per Plot	Yield Bu./A	Bu. Wt. in Lbs.	Remarks
Bromoxynil K Salt(64-386)	Fall	8	16	0	8	1160	58.0	61.8	Left some false flax,
			60	0	9	1155	57.8	60.5	some delay in maturity
			79	5	8	1230	61.5	60.4	
			Total			3545		182.7	
			$\bar{x}$	2	8		59.1	60.9	
Bromoxynil K Salt(64-386)	Spring	16	17	0	9	1102	55.1	63.0	Left some false flax
			43	0	8	1150	57.5	61.1	
			88	0	4	1180	59.0	60.3	
			Total			3432		184.4	
			$\bar{x}$	0	7		57.2	61.5	
Bromoxynil K Salt (64-386)	Fall	16	18	0	9	1290	64.5	60.6	Left some mustard
			52	0	10	799	40.0	60.7	
			63	0	6	1106	55.3	60.5	
			Total			3195		181.8	
			$\bar{x}$	0	8		53.3	60.6	
Bromoxynil ester(65-15B)	Spring	4	19	0	10	1170	58.5	60.6	Delayed maturity
			34	0	8	1145	57.3	60.4	
			68	30	10	1417	70.9	60.6	
			Total			3732		181.6	
			$\bar{x}$	10	9		62.2	60.5	
Bromoxynil ester(65-15B)	Fall	4	20	0	9	995	49.8	60.6	Left some false flax
			41	6	9	1306	65.3	61.0	
			80	0	10	1586	79.3	60.4	
			Total			3887		182.0	
			$\bar{x}$	2	9		64.8	60.7	

Table 7 . (con't)

Treatment	When Applied	Rate/A in Oz.	Plot #	Lodging %	Weed Score 0-10	Grams per Plot	Yield Bu/A.	Bu. Wt. in Lbs.	Remarks
Bromoxynil ester(65-15B)	Spring	8	21	0	10	1134	56.7	60.8	Delayed maturity, some breaking over of plants
			48	10	10	1280	64.0	60.0	
			81	0	10	1345	67.3	60.8	
			Total			3759		181.6	
			$\bar{x}$	3	10		62.7	60.5	
Bromoxynil ester(65-15B)	Fall	8	22	0	10	1357	67.8	61.1	
			53	0	10	570	28.5	60.5	
			82	35	9	1705	85.3	60.9	
			Total			3632		182.5	
			$\bar{x}$	12	9		60.5	60.9	
Bromoxynil ester(65-15B)	Spring	16	23	80	10	995	49.8	59.5	Delayed maturity, severe chlorosis following application
			58	15	10	1446	72.3	60.5	
			78	5	9	1189	59.5	60.2	
			Total			3630		180.2	
			$\bar{x}$	33	9		60.5	60.1	
Bromoxynil ester(65-15B)	Fall	16	24	50	10	1535	76.7	60.6	Delayed maturity
			54	0	10	899	45.0	60.3	
			83	35	9	1070	53.5	60.0	
			Total			3504		180.9	
			$\bar{x}$	28	9		58.4	60.3	
Bromoxynil ester + 2,4-D	Spring	4 + 8	25	0	10	1376	68.8	60.1	Delayed maturity, some distortion of heads
			56	20	10	1030	51.5	60.2	
			76	0	10	1420	71.0	60.9	
			Total			3826		181.2	
			$\bar{x}$	7	10		63.8	60.4	

Table 7 . (con't)

Treatment	When Applied	Rate/A in Oz.	Plot #	Lodging %	Weed Score 0-10	Grams per Plot	Yield Bu/A.	Bu. Wt. in Lbs.	Remarks
Bromoxynil ester + 2,4-D	Fall	4 + 8	26	80	10	1185	59.3	60.8	Delayed maturity
			47	20	10	1175	58.8	60.0	
			84	50	10	836	41.8	59.6	
			Total			3196		180.4	
			$\bar{x}$	50	10		53.3	60.1	
Bromoxynil K Salt+2,4-D	Spring	4 + 8	27	25	10	1445	72.3	60.0	Delayed maturity, left some gromwell, head distortion
			39	0	5	1239	62.0	60.5	
			87	0	2	1440	72.0	60.5	
			Total			4124		181.0	
			$\bar{x}$	8	6		68.8	60.3	
Bromoxynil K Salt+2,4-D	Fall	4 + 8	28	15	10	1090	54.5	60.1	Delayed maturity
			49	20	10	1155	57.8	60.0	
			89	20	10	1105	55.3	59.8	
			Total			3350		179.9	
			$\bar{x}$	18	10		55.9	60.0	
Amch-65-16 ester	Spring	8	29	0	8	1115	55.8	60.5	Left some false flax
			55	0	10	605	30.3	60.6	
			72	0	9	1450	72.5	60.9	
			Total			3170		182.0	
			$\bar{x}$	0	9		52.9	60.6	
Amch-65-16 ester	Fall	8	30	0	9	1280	64.0	59.9	Delayed maturity
			57	10	10	1528	76.4	60.9	
			62	0	8	1336	66.8	60.9	
			Total			4144		181.7	
			$\bar{x}$	3	9		69.1	60.5	

Table 7. (con't)

Analysis of Variance

Source	D. F.	Mean Square	F.
Replications	2	204605.3	
Treatment	14	38943.23571	1.59
Error (A)	28	24428.89642	
Whole Plots	(44)		
Fall vs Spring	1	4271.9	N.S.
FS * T	14	28026.24285	N.S.
Error (B)	30	55344.8566	
Total	89		

	Fall	Spring
Date Applied	October 26, 1965	April 13, 1966
Temperature	52°F	43°F
Humidity	58%	64%
Wind Volicity	Calm	Calm

Table 8. Summary of yield and weed control data from herbicide study on Delmar Winter Wheat - Northwestern Montana Branch of the Agricultural Experiment Station, MSU, Route 4, Kalispell, Montana

Herbicide	Rate/A. in Oz.	Yield Bu/A		Weed Control 0-10		Lodging in %	
		Spring	Fall	Spring	Fall	Spring	Fall
Check	0	50.4	50.4	0	0	0	0
Check(hand weeded)	0	50.9	50.9	10	10	0	0
Picloram + 2,4-D	¼ + 4	58.5	63.1	2	8	2	0
Picloram + 2,4-D	½ + 8	60.5	64.7	2	9	0	18
Picloram + 2,4-D	1 + 16	56.2	51.1	6	10	0	18
Picloram	0.5	57.1	56.6	3	4	5	0
LV 2,4-D	16	53.9	50.0	9	10	0	28
Bromoxynil K Salt (64-386)	4	53.5	59.4	2	6	0	0
Bromoxynil K Salt (64-386)	8	61.5	59.1	6	8	0	2
Bromoxynil K Salt (64-386)	16	57.2	53.3	7	8	0	0
Bromoxynil Ester (65-15B)	4	62.2	64.8	9	9	10	2
Bromoxynil Ester (65-15B)	8	62.7	60.5	10	9	3	12
Bromoxynil Ester (65-15B)	16	60.5	58.4	9	9	33	28
Bromoxynil Ester + 2,4-D	4 + 8	63.8	53.3	10	10	7	50
Bromoxynil K Salt + 2,4-D	4 + 8	68.8	55.9	6	10	8	18
Amch-65-16 Ester	8	52.9	69.1	9	9	0	3
	$\bar{x}$	58.2	57.5				
$\bar{x}$ for 7 Bromoxynil & Ioxynil Treatments-		58.6	60.6				
$\bar{x}$ for 6 2,4-D Treatments-		60.2	56.4				

Table 9. Effect of certain herbicides on weed species found in horticultural crops. Located on the Western Montana Branch Station, Corvallis, Montana in 1966.

Herbicide	Rate/A in Lbs.	Cranes-bill	Lambs-quarter	Pig-weed	Mustard	Shepherds Purse	Remarks
Benefin	1		F	G			Limited control of cranesbill & lambsquarter
Trifluralin	1	P	F	G	G	P	Fair control of cranesbill & lambsquarter
Dacthal	8	G	G	G	G	O	Good control of cranesbill, fair control of pigweed
Amiben	4	O	G	G	G	G	No effect on cranesbill
Eptam	3	G	G	P	G	G	Fair control of cranesbill & lambsquarter
Check	0						
Dalapon	8.5	O	O	O	O	O	
Pyramin	3	G	G	O	G	G	Scattered lambsquarter
Prometryne	2	G	G	G	G	G	Scattered pigweed

CODE: P - poor F - fair G - good O - no weed control

Table 10. Effect of certain herbicides on horticultural crops. Located on the Western Montana Branch Station Corvallis, Montana in 1966. Size of Plot, 600 sq. ft.

Date of Herbicide Application: May 17, 1966 Date Seeded: May 17, 1966

Herbicide	Rate/A in Lbs.	Corn	Pole Beans	Bush Beans	Peas	Beets	Spin-ach	Swiss Chard	Car-rots	Rad-ishes	Head Lettuce	Leaf Lettuce	Cab-bage	Pep-pers	Cucum-bers
Benefin	1	#	#	#	#	*	#	*	#	#	#	#	*	0	0
Trifluralin	1	#	#	#	#	0	*	0	#	#	#	#	#	*	0
Dacthal	8	*	0	#	#	0	*	0	#	#	#	#	#	#	0
Amiben	4	*	0	#	#	0	#	0	*	*	#	#	#	*	0
Eptam	3	#	0	#	#	#	#	#	0	#	*	0	*	0	#
Check	0	#	#	#	#	#	#	#	#	#	#	#	#	#	#
Dalapon	8.5	0	0	0	*	#	*	*	0	#	#	#	#	*	#
Pyramin	3	0	0	0	*	#	#	#	0	#	0	0	#	0	0
Prometryne	2	0	#	#	#	0	0	0	0	#	0	0	*	0	0

CODE: 0 - Killed crop # - Crop not injured * - Crop retarded from check

Table 11. Weed score and yield data from herbicide study on Netted Gem Potatoes, Northwestern Montana Branch Station, Route 4, Kalispell, Montana in 1966

Date of herbicide application: June 9, 1966 Date seeded: May 26, 1966

Date harvested: October 4, 1966 Size of plot: 66 square feet

Treatment	Rate/ Acre Pounds	Plot No.	Weed Score 0-10	Lbs/ Plot	Yield cwt/ Acre	Injury 0-none 10-complete	Estimated % of No. 1's
G. S. 14260	1	1	10	34.0	222.4	0	30
		12	10	29.0	189.7	5	50
		21	10	45.0	294.3	2	80
	$\bar{x}$		10		235.5	2	53.3
G.S. 14260	2	2	10	36.0	235.4	0	65
		14	10	43.5	284.5	0	65
		17	10	40.5	264.9	0	80
	$\bar{x}$		10		261.6	0	70.0
G. S, 14260	3	3	10	36.0	235.4	3	65
		13*	10	33.0	215.8	4	33
		15	10	40.0	261.6	5	40
	$\bar{x}$		10		237.6	4	46.0
G. S. 16065	1	4	10	34.0	222.4	0	70
		9	10	28.0	183.1	6	65
		19	10	35.0	228.9	0	85
	$\bar{x}$		10		211.5	2	73.3
G. S. 16065	2	5	10	40.5	264.9	2	60
		11	10	33.5	219.1	4	40
		20	10	32.5	212.6	2	80
	$\bar{x}$		10		232.2	3	60.0
G. S. 16065	3	6	10	29.0	189.7	6	75
		10	10	30.5	199.5	3	35
		18	10	38.0	248.5	5	65
	$\bar{x}$		10		212.6	5	58.3
Check	0	7	0	39.0	255.1	0	50
		8	0	33.5	219.1	0	50
		16	5	41.0	268.1	0	70
	$\bar{x}$		2		247.4	0	56.7

* Tubers badly skinned.

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	60.46426	3.46
Varieties	6	22.54762	1.29
Error	12	17.46429	
Total	20		

$\bar{x}$.....	234.0
S.E.$\bar{x}$.....	15.779
L.S.D.....	N.S.
C.V.%.....	6.74

YEAR: 1966

TITLE: Forage Investigations

LOCATION: Western Montana Branch Station, Corvallis, Montana

PERSONNEL: Leader: Vern R. Stewart
Cooperator: E. R. Hehn
D. R. Merkley

DURATION: Indefinite

OBJECTIVES:

1. To determine the adaptability of certain commercial corn hybrids.
2. To determine the effect of silage yields due to spacing with similar plant populations.

EXPERIMENTAL DESIGN AND PROCEDURES:

The variety study was seeded in rows spaced thirty-six inches, eighteen feet long, located at the Western Montana Branch Station. This study was set up in a randomized block. Two rows were harvested for yield, or a total of ninty-six square feet. The spacing study also located on the Western Montana Branch Station at Corvallis, consisted of four row plots with three spacings with the same number plants, 40,000 per acre, in each spacing. Spacings were twelve, twenty-four and thirty-six inches. Two center rows were harvested for yield. In the twelve inch spacing there were thirty-two square feet harvested, in the twenty-four spacing, sixty-four square feet, and in the thirty-six inch spacing, ninty-six square feet. There were one hundred pounds nitrogen applied to both nurseries when the corn was three to four inches high. This was a surface application. The study was irrigated.

RESULTS AND DISCUSSION:

Yields were exceptional at the Western Montana Branch Station as far as corn production was concerned. Forty-four tons of green silage was harvested from the variety DeKalb 640. DeKalb 640 was the leading entry in the nursery yielding approximately 25.1 tons per acre when corrected to seventy percent moisture. This variety was significantly better in yield than three other entries, including the Sudan x DeKalb SX-6 a sorghum, which produced only 19.4 tons per acre, corrected to seventy percent moisture. Again as in past studies most of the higher yielding entries in the nursery are in the 120-140 day maturity range. Few entries reached the milk stage of maturity. A complete analysis of this study is found in Table 1.

In Table 2, is found the data from the spacing study. These data show the thirty-six inch spacings to be approximately three tons per acre more in yield on a seventy percent moisture basis, than the twelve inch spacing, however these differences were not found to be significant. The co-efficient of varibility would indicate that this was a fairly good test. The variety used in this study was Kingscrest KM567 a 101-119 day maturity range.

FUTURE PLANS:

To continue to evaluate commercial corn hybrids and the cultural techniques for the production of silage corn.

SUMMARY:

The 120-140 day maturity range is the leading entry in the nursery for yield. The Sudan hybrid was not competitive in yield with corn.

Table 1. Agronomic data from corn silage study grown on the Western Montana Branch Station, Corvallis in 1966. Two row plots, four replications.

Date Seeded: May 18, 1966 Date Harvested: September 14, 1966 Size of Plot: 96 sq.ft.

Variety	Maturity Range	Population Plants/ A.	Plot yield in Pounds 1	2	3	4	Total	Tons/A. Dry	% Moisture	Corrected to 70% Moisture Tons/A	Alfalfa Equil. Tons/A
DeKalb 640	120-140	41,291	33.0	26.7	37.9	34.7	132.3	7.5a [1]	83.1	25.1	8.4
Haapala Sweet Dent 80	120-140	39,930	32.9	26.7	34.6	29.1	123.3	7.0ab	83.8	23.4	7.8
Kingscrost 626	120-140	40,838	32.0	27.2	31.1	33.6	123.9	7.0ab	82.7	23.4	7.8
Kingscrost PX 610	100-119	42,199	33.5	27.0	29.4	29.0	118.9	6.7abc	83.5	22.4	7.5
Kingscrost KM 567	100-119	39,930	25.8	30.0	28.2	34.9	118.9	6.7abc	80.6	22.4	7.5
DeKalb 664	120-140	41,291	32.5	28.3	27.4	26.7	114.9	6.5abc	83.4	21.7	7.3
DeKalb XL 362	120-140	39,476	30.9	27.8	23.3	30.4	112.4	6.4 bc	84.1	21.4	7.1
Sudan x DeKalb SX-6	100-119	-	24.8	24.2	26.2	27.2	102.4	5.8 c	79.2	19.4	6.5
Kingscrost KT 665	120-140	39,930	26.8	24.9	26.1	23.2	101.0	5.7 c	83.6	19.1	6.4

[1] Duncan Multiple Range Test

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	19.39852	2.27
Varieties	8	25.64257	2.99**
Error	24	8.56414	
Total	35		

$\bar{x}$..... 6.6
S.E.$\bar{x}$..... .33196
C.V.%..... 5.03

Table 2. Data from corn silage spacing study grown at the Western Montana Branch Station, Corvallis, Montana in 1966. Four row plots, four replications.

Date Seeded: May 18, 1966 Date Harvested: September 14, 1966 Size of Plot: 12" - 32 sq.ft.
24" - 64 sq.ft.
30" - 96 sq.ft.

Variety	Treatment	Population Plant/Acre	% Moisture	Tons per Acre Dry 1	2	3	4	Total	Average Tons/A.	Corrected to 70% Moisture	Alfalfa Equil.
Kingscrost KM 567	12" spacing	39,476	82.2	6.7	6.6	8.7	4.9	26.9	6.7	22.4	7.5
Kingscrost KM 567	24" spacing	42,709	81.4	8.0	7.8	7.6	6.3	29.7	7.4	24.8	8.3
Kingscrost KM 567	36" spacing	38,342	82.5	7.0	9.0	6.3	7.6	29.9	7.5	25.1	8.4

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	1.34305	N.S.
Spacings	2	.70333	N.S.
Error	6	1.48888	
Total	11		

$\bar{x}$.....7.2
S.E.$\bar{x}$..... .6101
C.V.%.....8.47

YEAR: 1966

TITLE: Small Grain Investigations (Spring Barley) 756

LOCATION: Northwestern Montana Branch Station and off station locations in Western Montana

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

DURATION: Indefinite

OBJECTIVES:

1. To determine the adaptation of new and introduced barley varieties and selections.

2. To aid in overall experient station breeding program.

EXPERIMENTAL DESIGN AND PROCEDURES:

Standard nursery procedures are used in the variety testing program. Description of breeding studes are given in the text, under each study, if techniques are not the same as used for variety testing.

RESULTS AND DISCUSSION:

Attached

FUTURE PLANS:

Will continue about the same program as in 1966.

SUMMARY:

1. Unitan was the highest yielding entry in the irrigated nursery, followed by Ingrid. Because of high rain fall this study was not irrigated in 1966.

2. Dryland yields were above average. Larker the highest yielding entry in 1966.

3. A summary of station and off station nurseries list Unitan as the highest yielding variety.

4. The Isogenic nursery dryland - six row types out yielded two row types. Late maturing lines higher in yield than early lines. Glacier x Compana crosses highest yielding of the three used.

5. Irrigated isogenic - six row type out yielded two row type. Late maturity out yielded early maturity. Glacier x Munsing cross is the highest yielding.

6. Unitan barley was the highest yielding variety when harvested at high moisture.

RESULTS AND DISCUSSION:

Intrastate Nursery

A dryland and irrigated intrastate and station yield nursery were grown in 1966. Growing conditions were excellent. Above average rainfall occured in June, therefore the irrigated nursery was not irrigated in 1966.

Unitan was the highest yielding entry in the irrigated nursery with 90.8 bu. per acre. It is felt by the author that the entry called Ingrid was not. Lodging was severe throughout the nursery, therefore no data was secured on lodging. Table 1 shows complete data with a mean yield of 70.7 bushels per acre.

Yields in the dryland nursery were above average for this location. Larker was the highest yielding entry. The mean for the nursery was 68.9 bushels per acre. See Table 2 for complete data on this nursery.

Off Station Nurseries

Four off station nurseries were seeded plus a comparison nursery in the Ravalli County location. These nurseries contained ten entries and were grown in four row plots, two replications. The Ravalli County location contained four replications and the comparison nursery was single row plots with six replications. A discription by counties follows.

Missoula County - No significant yield differences were found in the Missoula County nursery. Table 3.

The nursery seeded on the Hay's ranch was abandoned because of weeds.

Ravalli County - The comparison between a single row plot nursery and a four row nursery was made in this location. In the four row nursery Betzes was the highest yielding entry which was also true for the single row nursery. Table 6 gives a comparison of the two types. The difference between varieties were found to be significant in the four row nursery, whereas in the single row nursery they were found to be non-significant. Table 4 gives the data from the four row nursery, Table 5 the single row nursery.

Barley quality in the single row nursery was superior to that in the four row nursery. This can be accounted for in part due to the uneven emergence of the four row nursery. Stands were not as good in the four row nursery as found in the single row. Table 6.

Lake County - Yields were excellent in the Lake County Nursery, with a mean of 97.0 bushels per acre. Freja was the leading entry in the nursery. When analyzed statistically there were no significant differences found in yield between varieties. Table 7.

A summary of irrigated barley yield nurseries are found in Table 8. Unitan was the highest yielding entry. Ingrid is fourth, however there is some doubt

Spring Barley, Results and Discussion, con't.

that the seed used was truly Ingrid.

Ten year summaries for dryland and irrigated are found in Table 9 and 10 respectively.

Two row - six row Isogenic Barley Yield Nurseries

This nursery is grown to test the yield merits of two row type barley against a six row type with identical genetic backgrounds.

Data from the dryland study shows that the highest yields were obtained from the six row selections, and late maturity. The Glacier Compana cross is the highest yielding cross in the study. Table 11.

The irrigated isogenic study shows six row types giving the most yield, late maturity are high in yield compared to the early group. The Glacier x Munsing crosses are the highest in yield of the three used. See Table 12.

Hill Study:

The Ks hill study of Betzes x Ingrid and Heimdal barley is found in Dr. Hockett's section of the Feed Crops Research Committee report (1966). These data are summarized state wide in the above mentioned report.

High Moisture Barley:

This study is state wide with Mr. J. L. Krall as coordinator.

In the irrigated study Betzes had a total dry matter increase of 19.8 bushels per acre when harvested at 34.6% moisture over the mature harvest. A 11.9 bushel per acre increase at mature harvest was found for Ingrid in this study. The overall gain in yield by immature harvest of all varieties was 4.1 bushels per acre. There were significant difference in varieties, but none in date of harvest. Unitan was the highest yielding entry. See Table 13.

In the dryland study immature harvest date resulted in a significant increase in yield. However, the moisture level was not in the 35% range. Varieties were significantly different in yield with Unitan giving top production. See Table 14 for complete details.

Table 1. Agronomic data from irrigated intrastate and station yield nursery grown in field Y-5 at the Northwestern Montana Branch Station, Rt. 4, Kalispell, Montana. Four row plots, five replications in randomized blocks.

Date Seeded: April 29, 1966
Date Harvested: August 24, 1966
Size of Plot: 16 sq. feet

Variety	C. I. No.	Yield Bu/A	Test Wt Lb/ Bu	Ht. In.	Heading Date	% Plump
Unitan	10421	90.8	45.3	47	7/ 1	74
Ingrid	10083	88.9	49.6	42	7/ 8	77
Glacierx Mars MT 386350	13101	88.4	45.5	46	6/28	75
Piroline	9558	87.3	48.2	46	7/ 5	69
Glacier	6976	85.2	44.3	43	6/27	76
Trebi x Lubin	13100	83.7	45.5	38	6/29	78
Domen x Betzes	211761	80.7	48.2	41	7/10	88
Freja	7130	79.3	53.4	40	7/ 6	70
Domen x Betzes	211741	77.7	48.0	45	7/ 7	76
Svalof 02148	11497	76.5	46.3	41	7/ 8	64
Domen x Betzes	211812	76.5	49.5	41	7/ 9	92
Grande	11758	73.7	43.0	44	6/29	90
Hypana	11772	72.4	47.9	48	6/30	90
Domen x Betzes	211742	71.5	49.0	43	7/ 7	83
Domen x Betzes	211601	69.3	47.6	44	7/ 8	74
BetxHII 2xPir 7155-60	11868	68.8	48.0	43	7/ 5	64
CI 5461 Sel 59745	25428	68.2	44.4	48	7/ 7	56
Vantage	7324	67.8	46.9	48	7/ 2	59
Betzes	6398	67.6	47.6	43	7/ 5	60
Larker	10648	66.3*	49.1	49	6/30	83
Domen x Betzes	211749	64.9*	47.6	44	7/ 8	84
Lico x Ogalitsu	12130	64.8*	46.0	46	6/29	68
Palliser	10860	64.2*	47.5	44	7/ 5	86
Galt	11770	62.9*	49.5	45	7/ 1	54
Nupana Bulk	37724	62.3*	52.0	38	6/30	66
Dickson	10968	60.9*	48.3	46	7/ 4	66
Compana	5438	60.0*	48.5	37	7/ 1	84
Keystone	10877	57.7*	45.4	51	7/ 3	58
Conquest	11638	51.2*	46.0	51	7/ 1	67
Shrunken Betzes	102881	32.0*	28.0	37	7/11	5

NOTE: Ingrid used as the check in this nursery.
* Varieties yielding significantly less than the check .05

$\bar{x}$..... 70.7
S.E.$\bar{x}$..... 7.9
L.S.D..... 22.3
C.V.%..... 11.27

Analysis of Variance

Source	D.F.	Mean Square	F.
Replicatinns	4	281.1	.88
Varieties	29	786.2	2.47*
Error	116	318.1	
Total	149		

Table 2. Agronomic data from dryland intrastate and station yield nursery grown in field A-1c at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana. Four row plots, four replications in randomized block design.

Date Seeded: April 28, 1966
Date Harvested: August 24, 1966
Size of Plot: 16 square feet

Variety	C.I. No.	Yield Bu/A	Test Wt Lb/Bu	Ht. In.	Heading Date	% Plump	% Lodging
Larker	10648	82.0	51.5	42	7/ 1	93	23
Galt	11770	81.1	52.2	37	6/30	90	20
Svalof 02148	11497	80.6	51.9	32	7/ 5	87	53
Freja x Betzes	207196	79.0	51.9	36	7/ 3	90	45
Betzes x Compana	207769	78.1	49.2	35	7/ 3	85	68
Dickson	10968	77.5	51.8	40	7/ 1	89	53
Keystone	10877	77.5	50.9	40	7/ 2	93	43
CI 5461 Sel 59745	25428	73.8	48.5	35	7/ 5	85	34
Grande	11758	73.5	45.6	40	6/28	97	77
Domen x Betzes	211741	73.0	52.6	36	7/ 6	96	21
Unitan	10421	72.6	47.1	40	6/30	80	57
Freja x Betzes	207168	72.4	51.6	34	7/ 3	88	37
Freja	7130	71.9	51.9	32	7/ 2	80	32
BetxHII 2xPir 7155-60	11868	71.9	53.5	33	7/ 2	88	42
Freja x Betzes	207165	70.5	51.7	33	7/ 2	82	86
Domen x Betzes	211749	70.3	49.7	36	7/ 6	95	46
Betzes x Compana	207739	69.9	48.3	38	7/ 5	82	71
Betzes	6398	69.9	52.5	35	7/ 2	89	75
Glacier x Mars MT586350	13101	69.7	47.2	36	6/29	95	80
Herta	8097	69.3	52.3	34	7/ 7	94	14
Piroline	9558	69.1	52.3	33	7/ 2	91	32
Domen x Betzes	211742	69.1	52.9	37	7/ 7	95	17
Domen x 2 Betzes	211601	68.7	50.0	36	7/ 5	85	70
Hypana	11772	66.2	50.6	39	6/29	97	29
Conquest	11638	65.5	51.0	42	6/30	93	49
Palliser	10860	63.2	48.0	42	7/ 2	92	77
Lico x Ogalitsu	12130	63.2	48.2	39	6/29	93	52
Betzes x Compana	207726	63.0	48.8	33	7/ 5	88	63
Compana	5438	62.9	49.0	33	6/30	95	95
Dekap	3351	56.5*	51.6	31	7/ 2	75	71
Nupana Bulk	37724	50.0*	55.6	31	6/30	62	60
Shrunken Betzes	102881	22.9*	23.5	33	7/ 8	2	9

NOTE: Freja used as a chekc in this nursery.
* Varieties yielding significantly less than the check .05.

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	863.4	8.04*
Varieties	31	475.3	4.43*
Error	93	107.2	
Total	127		

$\bar{x}$..... 68.9
S.E.$\bar{x}$..... 5.1
L.S.D.(.05) 14.6
C.V.%..... 7.51

Table 3. Agronomic data from irrigated off station spring barley nursery grown on the Neilson farm Frenchtown, Montana in 1966. Four row plots, 2 replications. Randomized block design.

Seeding Date: May 4, 1966
Harvest Date: August 17, 1966
Size of Plot: 16 square feet

Variety	C.I. No.	Yield Bu/A	Test Wt Lb/ Bu	Ht. In.	% Plump
Unitan	10421	103.1	50.4	39	89
Ingrid	10083	96.8	54.0	34	94
Glacier x Mars MT586350	13101	96.7	49.5	39	95
Piroline	9558	91.6	54.5	39	95
Palliser	10860	90.5	51.4	43	96
Hypana	11772	86.4	52.2	38	98
Betzes	6398	85.4	54.0	35	91
Freja	7130	83.8	52.9	29	87
Bet x HII 2xPir 7155-60	11868	82.9	54.5	32	90
Domen x Betzes	211741	81.8	53.4	39	94

NOTE: Ingrid used as a check in this nursery.

$\bar{x}$..... 89.9
S.E.$\bar{x}$..... 6.4
L.S.D.(.05).. N.S.
C.V.%..... 7.19

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	1	.2	
Varieties	9	101.3	1.21
Error	9	83.7	
Total	19		

Table 4 .. Agronomic data from irrigated barley nursery grown on the Western Montana Branch Station, Corvallis, Montana. Four row plot, four replications. Randomized block design. 1966

Date Seeded: April 26, 1966
Date Harvested: August 17, 1966
Size of Plot: 16 square feet

Variety	C.I. Number	Yield Bu/A	Test Wt Lb/Bu	Ht. In.	Heading Date	% Plump
Betzes	6398	73.0*	53.1	27	7/ 4	88
Domen x Betzes	211741	66.9*	51.3	32	7/ 6	92
Palliser	10860	64.8	48.8	32	7/ 7	91
Piroline	9558	64.3	51.6	28	7/ 3	92
BetxHII 2xPir 7155-60	11868	61.2	52.3	26	7/ 4	90
Freja	7130	60.8	51.1	24	7/ 8	89
Unitan	10421	53.8	49.5	29	6/28	85
Hypana	11772	52.7	49.5	29	6/28	94
Ingrid	10083	52.2	51.4	26	7/ 9	91
Glacier x Mars MT586350	13101	50.1	46.6	28	6/28	94

NOTE: Ingrid used as a check in this nursery.
* Varieties yielding significantly more than the check .05.

$\bar{x}$..... 60.0
S.E.$\bar{x}$..... 4.8
L.S.D.(.05).. 14.1
C.V.%..... 8.12

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	339.7	3.57*
Varieties	9	225.9	2.37
Error	27	95.0	
Total	39		

Table 5. Agronomic data from irrigated barley nursery grown on the Western Montana Branch Station, Corvallis, Montana in 1966. Single row plot, six replications. Randomized block design.

Date Seeded: April 26, 1966
Harvest Date: August 17, 1966
Size of Plot: 16 square feet

Variety	C.I. Number	Yield Bu/A	Test Wt. Lb/ Bu	Ht. In.	Heading Date	% Plump
Betzes	6398	98.0	53.4	31	7/ 3	93
Freja	7130	92.4	53.9	27	7/ 7	95
BetxHII 2xPir 7155-60	11868	90.6	53.5	30	7/ 3	92
Palliser	10860	86.7	52.5	34	7/ 2	97
Ingrid	10083	84.9	54.3	30	7/ 5	95
Domen x Betzes	211741	84.6	53.9	33	7/ 6	93
Unitan	10421	83.9	50.1	30	6/24	91
Glacier x Mars Mt586350	13101	80.1	47.9	31	6/24	96
Hypana	11772	78.1	50.3	31	6/27	97
Piroline	9558	77.6	54.3	30	7/ 1	92

$\bar{x}$..... 85.7
S.E.$\bar{x}$..... 6.4
L.S.D.(.05).. N.S.
C.V.%..... 7.49

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	5	2987.1	12.06
Varieties	9	254.7	1.02
Error	45	247.6	
Total	59		

Table 6. Comparison of single row and 4-row nurseries for yield. Grown at the Western Montana Branch Station in 1966.

Variety	Yield/Plot		Test Wt/Plot		% Plump/Plot	
	4 row	1 row	4 row	1 row	4 row	1 row
Betzes	73.0	98.0	53.1	53.4	88	93
Domen x Betzes	66.9	84.6	51.3	53.9	92	93
Palliser	64.8	86.7	48.8	52.5	91	97
Piroline	64.3	77.6	51.6	54.3	92	92
Bet x HII 2x Pir	61.2	90.6	52.3	53.5	90	92
Freja	60.8	92.4	51.1	53.9	89	95
Unitan	53.8	83.9	49.5	50.1	85	91
Hypana	52.7	78.1	49.5	50.3	94	97
Ingrid	52.2	84.9	51.4	54.3	91	95
Glacier x Mars	50.1	80.1	46.6	47.9	94	96
$\bar{x}$	60.0	85.7	52.4	50.5	90.5	94.2

Table 7. Agronomic data from irrigated nursery grown on the James Fleming farm Pablo, Montana in 1966. Four row plots, two replications. Randomized block design.

Date Seeded: April 26, 1966
Date Harvested: August 17, 1966
Size of Plot: 16 square feet

Variety	C.I. Number	Yield Bu/A	Test Wt Lb/ Bu	Ht. In.	% Plump	Lodg Type	Lodg Prev	Lodg Sever
Freja	7130	106.0	47.4	38	53	6	97	8
Domen x Betzes	211741	103.8	51.0	41	96	5	95	3
Betzes	6398	103.3	50.1	40	73	6	97	6
Unitan	10421	102.5	47.6	45	85	6	55	8
Ingrid	10083	96.6	49.0	42	73	6	97	9
Piroline	9558	96.2	52.5	43	89	6	93	7
Glacier x Mars Mt586350	13101	95.0	47.5	42	95	5	58	7
BetxHII 2xPir 7155-60	11868	93.1	52.5	39	90	6	48	6
Palliser	10860	91.3	48.0	44	90	6	95	6
Hypana	11772	82.5	47.8	46	95	5	95	5

$\bar{x}$..... 97.0
S.E.$\bar{x}$..... 8.1
LS.D.(.05)... N.S.
C.V.%..... 8.42

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	1		
Varieties	9	102.1	.76
Error	9	133.6	
Total	19		

Table 8. Summary of irrigated barley nurseries in Western Montana in 1966

Variety	C.I. Number	Yield Bushels/Acre					$\bar{x}$
		Station	Missoula	Ravalli(1)	Ravalli(2)	Lake	
Unitan	10421	90.8	103.1	53.8	83.9	102.5	86.8
Betzes	6398	67.6	85.4	73.0	98.0	103.3	85.5
Freja	7130	79.3	83.8	60.8	92.4	106.0	84.5
Ingrid	10083	88.9	96.8	52.2	84.9	96.6	83.9
Piroline	9558	87.3	91.6	64.3	77.6	96.2	83.4
DomenxBetzes	211741	77.7	81.8	66.9	84.6	103.8	83.0
Glacier x Mars	13101	88.4	96.7	50.1	80.1	95.0	82.1
Palliser	10860	64.2	90.5	64.8	86.7	91.3	79.5
BetxHII 2xPir	11868	68.8	82.9	61.2	90.6	93.1	79.3
Hypana	11772	72.4	86.4	52.7	78.1	82.5	74.4

1. 4 row plot, 4 replications
2. single row, 6 replications

Table 9. Summary of yields for dryland intrastate and station barley yield nurseries 1955-1966. Northwestern Montana Branch Station, Kalispell, Montana.

Variety	C.I. Number	1955	1956	1957	1958	1959	1960	1961	1964	1965	1966	Station Years	% of Compana
Domen x Betzes	211749										70.3	1	88
Compana	5438	69.1	53.8	60.6	38.9	43.3	45.5	34.9	57.1	79.8	62.9	10	100
Hypana	11772							50.2	69.2	75.8	66.2	4	111
Svalof 02148	11497								69.7	84.5	80.6	3	118
Betzes	6398	95.1	80.9		53.5	43.9	46.1	31.6	61.7	73.9	69.9	9	115
Galt	11770										81.1	1	101
Unitan	10421	72.7	84.2	75.9	74.5	51.9	50.0	37.9	65.5	80.4	72.6	10	122
Herta	8097								69.6	92.7	69.3	3	116
Keystone	10877								62.5	88.8	77.5	3	115
DeKap	3351	83.0	63.5	75.9	65.1	38.6	52.8	45.7	56.8	72.5	56.5	10	112
Grande	11758									75.7	73.5	2	105
Palliser	10860							41.3	65.8	73.4	63.2	4	103
BetxHII 2xPir 7155-60	11868									68.0	71.9	2	98
Lico x Ogalistsu	12130									91.3	63.2	2	108
C.I. 5461 Sel. 59745	25428								66.1	83.3	73.8	3	112
Piroline	9558				60.6	43.0	46.9	54.1	75.3	80.8	69.1	7	119
Domen x Betzes	211742										69.1	1	87
Nupana Bulk	37724								46.8	55.7	50.0	3	76
Domen x 2 Betzes	211601										68.7	1	87
Conquest	11638										65.5	1	83
Domen x Betzes	211741										73.0	1	92
GlacierxMars Mt586350	13101								52.0	90.5	69.7	3	106
Larker	10648								52.3	66.6	82.0	3	101
Shrunken Betzes	102881										22.9	1	29
Freja	7130	89.5	91.8	77.1	60.9	46.7	46.9	40.2	67.6	91.4	71.9	10	125
Dickson	10968										77.5	1	98
Betzes x Compana	207739										69.9	1	88
Betzes x Compana	207769										78.1	1	99
Betzes x Compana	207726										63.0	1	79
Freja x Betzes	207196										79.0	1	100
Freja x Betzes	207165										70.5	1	89
Freja x Betzes	207168										72.4	1	91

Table 10. Summary of yields for the irrigated intrastate and station barley yield nursery, 1954-1966. Northwestern Montana Branch Station, Kalispell, Montana.

Variety	C.I. Number	1954	1955	1956	1957	1958	1959	1960	1961	1965	1966	Station Years	% of Vantage
Glacier	6976			76.2	82.6	53.2				95.0	85.2	5	99
Betzes	6398		62.4	67.2	62.8	71.9	93.0	65.0	66.9	88.5	67.6	9	94
Piroline	9558			76.9	85.8	80.4	94.2	72.4	78.7	95.9	87.3	8	109
C.I. 5461 Sel. 59745	25428									75.2	68.2	2	85
Unitan	10421			76.6	67.9	78.9	102.7	73.0	80.4	84.4	90.8	8	107
Hypana	11772									95.1	72.4	2	99
GlacierxMars Mt 586350	13101									115.0	88.4	2	120
Larker	10648								71.2	59.5	66.3	3	100
Lico x Ogalitsu	12130									108.3	64.8	2	102
Dickson	10968									76.8	60.9	2	81
Nupana Bulk	37724									77.8	62.3	2	84
Vantage	7324	97.0	74.1	74.4	70.4	81.9	90.4	55.8	71.5	101.6	67.8	10	100
Domen x Betzes	211761									89.9	80.7	2	101
Ingrid	10083			98.4	94.2	94.4	101.7	68.8	90.8	92.0	88.9	8	119
Domen x Betzes	211812									82.5	76.5	2	94
Shrunken Betzes	102881										32.0	1	47
Domen x Betzes	211741									89.7	77.7	2	99
Galt	11770										62.9	1	93
Freja	7130	108.2	83.4	81.9	81.8	84.8	90.9	55.6	66.1	77.8	79.3	10	103
Domen x 2 Betzes	211601									81.8	69.3	2	89
BetxHII 2xPir 7155-60	11868									84.9	68.8	2	91
Svalof 02148	11497									110.6	76.5	2	110
Domen x Betzes	211749									85.3	64.9	2	89
Palliser	10860								64.0	77.6	64.2	3	104
Donem x Betzes	211742									82.0	71.5	2	91
Conquest	11638										51.2	1	75
Compana	5438	60.6	51.4	55.1	50.0	60.1	88.7	65.4	46.0	70.7	60.0	10	77
Grande	11758									91.9	73.7	2	98
Keystone	10877									88.4	57.7	2	86
Trebi x Lubin	13100										83.7	1	123

Table 11. Agronomic and yield data from two-six row isogenic nursery grown under dryland conditions at the Northwestern Montana Branch Station, Kalispell, Montana in 1966. Field No. A 1-c. Split plot, latin square design.

Date Seeded: April 28, 1966
Date Harvested: August 16, 1966
Size of Plot: 16 square feet

Cross or Parent	Discription	Heading Date	Heading Ht. In.	Yield Bu/A.	Test Wt Lbs/Bu	% Lodg.	% Plump Top 6/64
Glacier x Munsing	early 2	6/26	27.3	52.6	45.5	47.7	96.7
Glacier x Munsing	early 6	6/25	27.3	70.0	47.1	87.0	76.3
Glacier x Munsing	late 2	6/28	34.0	56.5	45.5	58.3	97.3
Glacier x Munsing	late 6	6/27	32.0	68.7	46.4	86.0	81.3
Munsing	2	6/29	29.0	69.1	49.1	90.7	80.0
Glacier	6	6/27	39.0	75.7	46.1	55.0	93.3
Glacier x Compana	early 2	6/30	31.0	46.1	47.1	15.3	97.7
Glacier x Compana	early 6	6/27	32.0	62.8	48.2	34.3	79.7
Glacier x Compana	late 2	7/ 4	35.7	72.7	49.5	53.3	99.0
Glacier x Compana	late 6	7/ 5	30.3	85.9	45.3	85.0	63.3
Compana	2	6/30	31.7	59.0	49.4	71.7	91.7
Glacier	6	6/26	34.7	62.5	46.0	33.0	95.0
Munsing x Titan	early 2	6/28	34.3	36.8	46.3	74.0	95.3
Munsing x Titan	early 6	6/28	32.7	38.2	47.6	99.0	69.3
Munsing x Titan	late 2	7/ 2	34.7	53.5	47.9	22.7	96.3
Munsing x Titan	late 6	7/ 2	34.7	77.1	49.8	87.7	72.7
Munsing	2	6/28	31.3	74.6	49.0	92.7	73.7
Titan	6	7/ 1	37.3	70.2	49.8	44.3	87.0

Analysis of Variance

Source	D.F.	F values
Columns	2	13.682
Rows	2	3.896
Crosses	2	5.641
Error A	2	
Columns within columns	2	4.472*
Treatments (early,late,parents)	2	37.973**
Treatment x crosses	4	13.935**
Error B	10	
Row type (2 vs 6)	1	18.009**
Crosses x row type	2	.452
Treatment x row type	2	3.317
Cross x Treatment x Row type	4	1.317
Error C	18	
Total	53	

Table 12. Agronomic and yield data from irrigated two-six row isogenic nursery grown at the Northwestern Montana Branch Station, Kalispell, Montana, Field No. Y-5, in 1966. Split plot, latin design.

Date Seeded: April 29, 1966
Date Harvested August 24, 1966
Size of Plot: 16 square feet

Cross or Parent	Discription	Heading Date	Heading Ht. In.	Yield Bu/A	Test Wt. Lbs/Bu	% Plump Top 6/64
Glacier x Munsing	early 2	6/26	38.0	77.5	46.0	95.7
Glacier x Munsing	early 6	6/27	37.7	73.9	43.0	78.0
Glacier x Munsing	late 2	6/30	41.0	79.4	44.0	91.0
Glacier x Munsing	late 6	6/30	34.7	80.2	42.5	78.0
Munsing	2	7/ 1	32.3	86.0	44.5	69.0
Glacier	6	6/27	39.7	105.5	45.5	89.0
Glacier x Compana	early 2	6/29	41.3	45.2	47.0	93.3
Glacier x Compana	early 6	6/27	40.0	66.4	42.8	60.0
Glacier x Compana	late 2	7/ 4	42.7	93.9	48.5	93.7
Glacier x Compana	late 6	7/ 6	41.3	69.7	41.0	51.7
Compana	2	7/ 1	37.3	48.2	43.0	81.3
Glacier	6	6/27	42.0	101.0	46.0	86.0
Munsing x Titan	early 2	6/28	33.7	41.8	47.5	93.0
Munsing x Titan	early 6	6/29	35.0	38.8	43.8	77.0
Munsing x Titan	late 2	7/ 3	36.0	67.5	47.6	89.7
Munsing x Titan	late 6	7/ 3	39.0	55.6	45.7	64.0
Munsing	2	6/30	33.3	74.2	45.0	63.0
Titan	6	6/30	43.3	60.0	47.2	71.0

Analysis of Variance

Source	D.F.	F values
Columns	2	10.754
Rows	2	21.340*
Crosses	2	288.043**
Error A	2	
Columns with columns	2	7.938*
Treatments	2	26.614**
Treatments x crosses	4	3.185
Error B	10	
Row type	1	1.753
Cross x row type	2	5.835*
Treatment x row type	2	8.164**
Cross x treatment x row type	4	5.363**
Error C	18	
Total	53	

Table 13. Dry matter yield and percent moisture obtained from cutting barley at mature and immature stages on irrigated land at Kalispell, Montana, 1966.

Variety	Stage Harvest	Replication I	II	III	IV	V	Total	Ave.	% Moisture	Station Yield Diff.
Betzes	Mature	64.7	52.9	77.3	67.1	42.3	304.3	60.9	10.0	
	Immature	76.9	79.3	76.9	77.8	97.8	408.7	81.7	34.6	
								-19.8		
Unitan	Mature	80.4	64.1	80.0	108.0	76.0	408.5	81.7	10.0	
	Immature	79.3	95.3	63.8	95.4	99.4	433.2	86.6	31.3	
								- 4.9		
Nupana	Mature	65.4	60.8	33.2	65.0	56.3	280.7	56.1	10.0	
	Immature	39.4	68.9	57.8	57.4	54.4	277.9	55.6	29.5	
								+ .5		
Vantage	Mature	42.2	106.2	49.0	47.3	60.8	306.0	61.2	10.0	
	Immature	45.0	70.9	77.1	74.5	93.3	360.8	72.1	40.0	
								-10.9		
Ingrid	Mature	48.4	96.4	66.3	89.4	100.0	400.0	80.1	10.0	
	Immature	63.9	68.2	71.9	68.1	68.9	341.0	68.2	38.9	
								+11.9		
Compana	Mature	34.9	66.9	51.8	50.0	66.9	270.5	54.1	10.0	
	Immature	42.8	71.9	65.1	56.9	40.8	277.5	55.5	32.5	
								- 1.4		- 4.1

Variation	D.F.	SS	MS	F
Replications	4	2,532.54	633.14	3.09*
Varieties	5	6,327.33	1,265.47	6.18**
Dates	1	277.78	277.78	1.36 N.S.
Var. x Date	5	1,527.25	305.45	1.49 N.S.
Error	44	9,013.37	204.85	
Total	59	19,678.27		

Table 14. Dry matter yield and percent moisture obtained from cutting barley at mature and immature stages on dryland at Kalispell, Montana, 1966.

Variety	Stage Harvest	Replications I	II	III	IV	Total	Ave.	% Moisture
Compana	Mature	48.3	57.4	55.7	47.3	208.7	52.3	10.0
	Immature	66.2	67.9	74.9	69.7	278.7	69.7	24.4
							-17.4	
Betzes	Mature	59.1	63.7	63.7	65.3	251.8	63.0	10.0
	Immature	71.0	65.6	67.6	52.7	256.9	64.2	30.5
							- 1.2	
Unitan	Mature	65.7	69.8	52.9	74.5	262.9	65.8	10.0
	Immature	91.2	94.9	60.4	44.7	291.2	72.8	32.3
							- 7.0	
Nupana	Mature	44.0	51.0	45.6	33.1	173.7	43.4	10.0
	Immature	47.0	56.8	56.0	51.4	211.2	52.8	19.8
							- 9.4	
Station Average								-8.8

Variation	D.F.	SS	MS	F
Replications	3	504.19	168.06	1.69 N.S.
Varieties	3	1,919.53	639.84	6.43 **
Dates	1	620.40	620.40	6.23 *
Var. x Date	3	271.24	90.41	.91 N.S.
Error	21	2,089.64	99.51	
Total	31			

YEAR: 1966

TITLE: Small Grains Investigations (Winter Barley) 756

LOCATION: Northwestern Montana Branch Station

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

DURATION: Indefinite

OBJECTIVES:

1. To determine the adapatability of new and introduced winter barley varieties in Western Montana.

EXPERIMENTAL DESIGN AND PROCEDURES:

Standard nursery procedures are used in the variety testing program. Fourteen entries were included in the intrastate winter barley nursery in 1965 which was seeded on October 7, 1965. Three checks were included in the nursery, namely Alpine, Ellis and Olympia.

RESULTS AND DISCUSSION:

The intrastate winter barley nursery grown under irrigation had an average yield of 93.4 bushels per acre of all entries which is very good for winter barley in Western Montana. The highest yielding entry in the nursery was a New York selection 5619B-3B-1, C.I. number 11887, with a yield of 118.7 bushels per acre. This was found to be significant from the check, (Olympia). Several selections made by Mr. Eslick of OAC strains show considerable promise and have excellent straw strength. Of the five OAC strains entered in the nursery all of them had excellent lodging resistance compared to the checks of Alpine, Olympia and Ellis. Yields were excellent for all of these selections. Table 1, gives complete data for this nursery.

FUTURE PLANS:

Four off station nurseries will be grown in 1967 in addition to a similar type nursery to be grown on the station in 1967. These nurseries do not contain any new material but are made up from the nursery just described above.

SUMMARY:

The OAC strain show considerable straw strength and yield ability compared with the check Olympia.

Table _____. Agronomic data from dryland intrastate winter barley nursery grown at the Northwestern Montana Branch Station, Field E-3, 1965-1966. Four row plots, four replications, randomized block design.

Date Seeded: October 7, 1965 Date Harvested: August 4, 1966 Size of Plot: 16 square feet

Variety	C.I.No.	Ht.in Ins.	Grams per Plot I	II	III	IV	Total Grams	Yield Bu/A	Bushel Weight	Lodging Prev.	Severity
N. Y. 5619B-3B-1	11887	38	1005	855	945	995	3800	118.7*	49.0	2	0
N. Y. 5619B-3B-1 (L)	11887	37	934	774	995	1025	3728	116.5	49.4	0	0
O.A.C. Strain 4-Sel. 60-5157-6		35	941	815	838	842	3436	107.4	47.8	0	0
O.A.C. Strain 4-Sel. 60-5157-1		39	841	676	980	750	3247	101.5	47.0	2	0
Catskill	10899	39	819	776	791	857	3243	101.4	48.4	27	4
O.A.C. Strain 4-Sel. 60-5157-14		38	931	820	765	729	3245	101.4	49.3	0	0
Olympia	6107	46	703	882	730	882	3197	99.9	47.2	82	7
O.A.C. Strain 4-Sel. 60-5157-13		39	857	805	671	859	3192	99.8	44.3	0	0
Mass. Sel.	11361	42	631	800	677	723	2831	88.5	47.3	27	2
Nebr. 59171	11892	43	665	714	567	692	2638	82.5	45.8	59	5
O.A.C. W.B. 2-11	11174	44	587	646	690	549	2472	77.3	48.2	93	7
CC 10 Bulk	6625	45	651	593	671	422	2337	73.1	45.9	97	8
Ellis	9529	40	413	649	677	581	2320	72.5	45.6	87	8
Alpine	9578	44	647	362	717	420	2146	67.1	48.7	82	8

NOTE: Olympia was used as a check in this nursery
*: Varieties yielding significantly more than the check (.05)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	4655.47333	
Varieties	13	70836.42307	7.16**
Error	39	9895.18153	
Total	55		

$\bar{x}$..... 93.4
S.E.$\bar{x}$..... 6.219
L.S.D.(.05).. 17.8
L.S.D.(.01).. 23.8
C.V.%..... 6.66

YEAR: 1966

TITLE: Small Grain Investigations (Oats) 756

LOCATION: Northwestern Montana Branch Station

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

DURATION: Indefinite

OBJECTIVES:

To determine the adaptation of new and introduced oat varieties.

EXPERIMENTAL DESIGN AND PROCEDURES:

Standard nursery procedures are used in the variety testing program. Two nurseries were seeded in the spring. The Regional Nursery had twenty-seven entries. The small Montana Nurseries contained ten entries.

RESULTS AND DISCUSSION:

The Regional Nursery was not harvested, because of a severe infestation of Fusarium culmorum. Yields from the Montana Nursery were high, but this nursery too, was severely lodged due to the Fusarium culmorum infestation. The mean yield was 122.3 bushels per acre (34 pounds per bushel used as a standard), with no variety being significantly higher in yield than Basin. See table 1.

FUTURE PLANS:

Continue variety testing and perhaps do some work on the Fusarium culmorum organism in cooperation with the Disease Control Laboratory in Pullman, Washington.

SUMMARY:

1. Severe infestation of Fusarium culmorum in both nurseries. Regional nursery not harvested.

2. Bingham the highest yielding variety in the nursery, not significantly higher than Basin.

Table 1. Agronomic data from dryland oat nursery grown at the Northwestern Montana Branch Station in 1966. Field No. Y-5
Four row plots, three replications.

Date Seeded: April 29, 1966 Date Harvested: September 1,1966
Size of Plot: 16 square feet

Variety	C.I. Number	Heading Date	Replications I	II	III	Total Grams	Yield Bu/A.	Bushel Wt/Lbs.
Bingham	7588	7/13	805	1055	912	2772	163.1	39.9
C x A Cornell Sel.	8263	7/11	712	1012	900	2624	154.4	35.5
Basin	5346	7/13	795	875	719	2389	140.6	37.4
Rodney	6661	7/10	720	614	644	1978	116.4	38.6
Gopher	2027	7/ 8	710	675	570	1955	115.0	35.8
Garry	6662	7/10	535	676	730	1941	114.2	36.9
Andrew x Mission	50-12-18	7/ 2	691	471	748	1910	112.4	31.3
Minn II-22-220	2874	7/11	618	791	500	1909	112.3	33.3
Mission	2588	7/ 9	606	698	488	1792	105.4	35.4
Bridger	2611	7/14	568	455	495	1518	89.4*	37.9

NOTE: Basin used as the check in this nursery
*: Varieties yielding significantly less than the check.

$\bar{x}$..... 122.3
S.E.$\bar{x}$..... 11.38068
L.S.D..... 35.9
C.V.%..... 9.16

Analysis of Variance

Source	D.F.	Mean Square
Replications	2	11636.935
Varieties	9	50835.0222
Error	18	12086.26666
Total	29	

TITLE: Small Grains Investigation (Spring Wheat) 756

LOCATION: Northwestern Montana Branch Station and three Off Station Locations

PERSONNEL: Leader - Vern R. Stewart
Cooperator - F. H. McNeal

DURATION: Indefinite

OBJECTIVES:

To determine the adaptation of new and introduced spring wheat varieties and selection by comparison with recommended varieties.

EXPERIMENTAL DESIGN AND PROCEDURES:

Standard nursery procedures were used in the variety testing program. The station nurseries were grown in four row plots, replicated four times. A randomized block design was used in all nurseries. The off station nurseries were four row plots, two replications in the three locations. The advanced yield hard red spring nursery contained twenty-eight entries. The western regional soft white nursery, twenty-three entries. The off station nurseries consisted of ten entries in this years studies. Yields of the hard red spring wheat nursery were about average for the past season. Not quite measuring up to the yields of 1965 when the average for the nursery was 63.4 compared to 58.1 in 1966. Percipitation was excellant during the growing season, 6.7 inches of moisture falling in June.

RESULTS AND DISCUSSION:

Attached

FUTURE PLANS:

Continue in a limited way spring wheat varietal studies.

SUMMARY:

1. The variety Sheridan did not perform as well in 1966 as in past seasons, but equal to Centana. Over a six year period it is 104 percent of Centana.

2. The variety C.I. 13979 shows considerable promise in the white wheats. Fairly early and fair stripe rust resistance.

Small Grains - Spring Wheat - Results & Discussion

The variety released in 1966 for production, Sheridan, did not perform as well in this years nursery as it has in past years. Being about equal to yield to Centana. Lakota a durm, was the highest yielding variety with 75.3 bushels per acre. Fortuna released for Eastern Montana did well in this years nursery with a yield of 66.2 bushels per acre.

Stripe rust was very prevalent in this nursery in 1966. Sheridan had a severity of 30 percent, a type of five in the 1966 nursery. Montana #6661, which is B 62-91 x B 60-40, was the high yielding entry, (71.5 bushels per acre) and a very low stripe rust severity of .5 and a type of two. This variety indicates some promise.

The Western Regional White Wheat nursery yields were above average with a mean of 59.9 bushels per acre. Stripe rust was severe and took a severe toll in yield of the susceptible varieties. Lemhi a high yielding variety in the absence of stripe rust yielded 15.7 bushels per acre, a severity of 99 and a type of nine. C.I. 13979 fairly early in heading, approximately three days later than Idaed 59, had a yield of 83.4 bushels per acre, stripe rust severity of 11.2 percent and type one. There were very few entries in this nursery that had any degree of resistance to stripe rust, approximately three which would be acceptable. Data for this nursery can be found in Table 2.

Off Station Nurseries:

Missoula County - The Missoula County spring wheat nursery was grown on the A. D. Neilson farm near Frenchtown, Montana. The nursery as previously mentioned was grown in four row plots, two replications. This nursery was grown under ideal growing conditions. The land had previously been in sugar beets. Fertility was excellent, weeds were of no particular problem. Lemhi 66 is the highest yielding entry in the nursery with 61.3 bushels per acre. Test weights were somewhat low and this was due in part to an immature harvest. Using Centana as a check in this nursery, Lemhi 66, North Dakota 60-54 and Sheridan were found to be significantly better in yield than Centana. There was no stripe rust in this area and thus was no factor on yields. Table 3 shows the complete data for this nursery.

Ravalli County - Table 4, shows the data for the nursery grown on the Western Montana Branch Station in Ravalli County. Centana is the highest yielding variety with 37.1 bushels per acre, the mean of 31.7. The statistical analysis indicates that there was no significant difference between varieties in this particular study. There was considerable bird damage in the nursery at harvest time. A note is made on each of these varieties in the data.

Lake County - The study located in Lake County on the James Flemming farm was an ideal location. Growing conditions were excellent. This was grown on land which had previously been in potatoes. These data were not too significant because harvest was premature. Bushel weights are down. There are yield differences, but the analysis indicates that these differences are not significant. Lemhi 66 was the highest yielding entry in the nursery with Idaed 66 in third place.

Table 5 is a ten year summary of spring wheat data from the Advanced Yield nurseries grown at the Northwestern Montana Branch Station, 1957-1966.

Table 6 is a ten year summary of white spring wheat varieties grown at the Northwestern Montana Branch Station, 1956-1966.

Table 1. Agronomic data from the spring wheat advanced yield nursery grown at the Northwestern Montana Branch Station in 1966. Experimental design - RB, four replications.

Date Seeded: April 29, 1966 Harvest Date: September 8, 1966 Size of Plot: 16 sq. ft.

Variety	C.I. Number	Yield Bu/A.	Weight Lbs./Bu.	Ht. In.	Heading Date	Stripe Rust Sever.	Stripe Rust Type	Lodging Type	Lodging Prev.	Lodging Sever.
Lakota	13335	75.3*	57.0	50	7/10/66	30.0	5	8	99	7
II-50-17 x Plt 2X B52-91	6610	72.0*	57.2	51	7/ 8/66	3.7	1	7	99	4
B52-91 x B60-40	6661	71.5*	57.4	47	7/ 8/66	7.5	2	7	99	8
Justin	13462	70.4*	57.0	48	7/ 9/66	7.5	1	8	65	6
K338 x Conley	661	69.9*	58.3	49	7/ 8/66	2.5	0	6	99	4
Wells	13333	67.9*	56.1	53	7/10/66	42.5	3	8	99	8
Manitou, R.L. 4159	13775	67.5*	58.4	48	7/ 9/66	3.0	1	7	96	6
Fortuna	13596	66.2*	58.5	44	7/ 9/66	11.2	4	8	99	9
N058-TC x TC-KF	13743	62.3	56.8	48	7/11/66	13.7	3	8	99	9
Thatcher	10003	62.2	56.7	47	7/ 9/66	5.2	2	7	98	6
N058-TC x TC-KF	13744	61.5	58.0	44	7/ 4/66	91.2	7	8	99	6
II-50-17 x Pilot	6194	60.7	58.0	49	7/ 9/66	40.0	5	9	99	9
K338 x Lee, B61-89	13946	60.4	53.5	47	7/ 7/66	61.2	5	8	99	8
Crim	13465	58.7	57.1	49	7/ 8/66	65.0	3	8	99	8
B52-91 x KF-CNT	6619	58.1	55.2	50	7/ 9/66	95.0	7	6	99	3
Lebsock Durum	60115	55.8	57.4	52	7/10/66	3.7	1	7	93	5
North Dakota 61-107	13937	54.8	57.0	43	7/ 7/66	92.5	8	5	73	4
Sawtana	13304	53.7	52.5	49	7/15/66	1.2	1	7	99	9
Ceres	6900	53.6	58.6	51	7/10/66	58.7	5	7	74	7
II-50-72 x2 M2854	13773	51.4	58.0	48	7/10/66	1.2	0	9	99	9
Chris, 525-1	13751	51.3	51.5	47	7/10/66	16.2	2	7	99	9
Chinook	13220	51.2	56.5	48	7/10/66	10.5	2	8	99	9
Sheridan	13586	50.9	56.4	47	7/ 9/66	30.0	5	9	98	7
(NRN10-BVR14 x TC) x 498	647	50.6	56.0	40	7/ 7/66	7.5	2	9	99	9
Centana	12974	50.4	55.4	47	7/11/66	77.5	5	7	99	7
B57-117 x Rescue	6424	42.6	54.6	47	7/ 8/66	5.5	3	9	99	9
Rescue	12435	39.4	55.5	48	7/10/66	2.2	1	9	99	9
Rescue x II-50-17, B61-23	13832	35.8	53.5	46	7/ 9/66	36.2	6	9	99	9

NOTE: Centana used as a check in this nursery

*: Varieties yielding significantly more than the check (.05)

Table 1. (con't)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	28.5	.30
Varieties	27	403.2	4.29
Error	81	93.7	
Total	111		

$\bar{x}$.....	58.1
S.E.$\bar{x}$.....	4.8
L.S.D.(.05)..	13.6
C.V.%.....	8.33

Table 2. Agronomic data from the western regional white wheat nursery grown at the Northwestern Montana Branch Station in 1966. Experimental design - RB, four replications.

Date Seeded: April 29, 1966 Harvest Date: September 7, 1966 Size of Plot: 16 sq. ft.

Variety	C. I. Number	Yield Bu/A.	Weight Lbs./Bu.	Ht. In.	Heading Date	Stripe Rust Sever.	Stripe Rust Type	Lodging Type	Lodging Prev.	Lodging Sever.
Burt x KF, 58-2025	13736	84.0*	52.7	42	7/18/66	29.0	2	8	72	8
Lee x NO 58-TC A6119S-46	13979	83.4*	57.5	44	7/ 6/66	11.2	1	7	74	5
Lemhi 62 x CI 13636	13981	80.0	57.0	44	7/ 9/66	48.7	4	7	74	5
Eureka-Lemhi x 3 Idaed	13980	78.9	58.3	46	7/ 5/66	11.2	2	8	69	6
Idaed x Burt, Pend 111-1	MT 6	76.9	55.5	41	7/ 9/66	10.0	2	7	15	5
Idaho A613A-3-15	13969	74.0	51.6	46	7/12/66	37.5	4	6	95	6
Premier x 2 FR 2x5 Idaed	13984	73.4	58.5	43	7/ 5/66	18.7	3	6	97	5
Thatcher	10003	72.6	58.7	47	7/ 8/66	32.5	3	6	90	5
Idaed x Burt, 30-2	13742	71.8	57.6	39	7/ 7/66	80.0	4	4	6	2
NO58-TC x TC-KF	13743	67.1	56.8	48	7/13/66	18.7	3	7	98	4
Idaed 59	13631	66.7	57.7	41	7/ 3/66	27.5	3	6	92	5
Premier x 5FR, 62M9-204	13732	60.4	56.6	45	7/10/66	83.5	8	8	95	6
Lemhi 62 x 2 Idaed	13982	58.5	57.2	44	7/ 7/66	30.0	5	7	92	3
Marfed Mutant, 5899	WA4793	58.1	55.4	38	7/15/66	28.7	6	7	89	7
Premier x 2 FR 2x5 Idaed	13983	57.1	56.5	43	7/ 4/66	4.0	1	4	74	3
Burt x Onas 52, Lind 168	WA4737	50.4	51.3	44	7/17/66	45.0	5	9	78	7

Table 2 . (con't)

Variety	C.I. Number	Yield Bu/A.	Weight Lbs./Bu.	Ht. In.	Heading Date	Stripe Rust Sever.	Stripe Rust Type	Lodging Type	Lodging Prev.	Lodging Sever.
N058-TC x TC-KF	13744	48.1	56.1	39	7/ 3/66	87.5	7	6	93	4
Burt x Onas 52, Lind 466	WA4468	45.2	52.6	41	7/15/66	64.7	6	4	5	3
N10-B 2x2 12228 3x L53	13978	44.9	51.1	34	7/ 8/66	99.0	9	8	34	8
N10-B 2x2 12228 3x L53	13977	41.4	49.8	34	7/14/66	73.2	6	6	11	5
Federation	4734	36.6	52.7	44	7/16/66	74.2	7	8	51	6
Baart	1697	32.4	53.6	45	7/ 9/66	99.0	9	7	83	6
Lemhi	11415	15.7	0.0	42	7/12/66	99.0	9	9	48	8

NOTE: Idaed 59 is used as a check in this nursery.

$\bar{x}$.....	59.9
S.E.$\bar{x}$.....	5.7
L.S.D.(.05)..	16.2
C.V.%.....	9.61

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	167.0	1.25
Varieties	22	1317.6	9.91*
Error	66	132.8	
Total	91		

Table 3. Agronomic data from irrigated off station spring wheat nursery grown in Missoula County on the H. Neilson farm, Frenchtown, Montana. Four row plots, two replications.

Date Seeded: May 5, 1966 Date Harvested: August 31, 1966
Size of Plot: 16 square feet

Variety	C.I.No.	Height in Ins.	Grams I	Grams II	Total Grams	Yield Bu/ A	Bu. Wt. in Lbs.
Lemhi 66	13969	45	570	655	1225	61.3	53.5
N D 60-54 Fortuna	13596	42	545	535	1080	54.0	58.0
Sheridan	13586	44	524	545	1069	53.5	57.3
Lakota(durum)	13335	44	529	516	1045	52.3	57.6
Ceres	6900	47	524	430	954	47.7	57.0
Manitou	13775	39	460	477	937	46.9	56.9
Crim	13465	42	444	480	924	46.2	56.0
Centana	12974	42	435	473	908	45.4	57.0
Thatcher	10003	40	429	421	850	42.5	55.1
Idead 59	13631	36	386	430	816	40.8	56.5

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	1	672.80	
Varieties	9	7600.3111	6.68*
Error	9	1136.3555	
Total	19		

$\bar{x}$..... 49.0
S.E.$\bar{x}$..... 23.83653
L.S.D.(.05) 7.6
C.V.%..... 4.86

Table 4. Agronomic data from off station irrigated spring wheat nursery grown in Ravalli County on the Western Montana Branch Station. Four row plots, two replications.

Seeding Date: April 26, 1966 Harvest Date: August 31, 1966
Size of Plot: 16 square feet

Variety	C.I.No.	Heading Date	Grams per Plot I	Grams per Plot II	Total Grams	Yield Bu./A	Bird Damage
Centana	12974	7- 6	415	326	741	37.1	None
Sheridan	13586	7- 5	325	405	730	36.5	None
N D 60-54	13596	6-28	260	425	685	34.3	Moderate
Lakota(durum)	13335	7- 5	325	350	675	33.8	Light
Thatcher	10003	6-28	309	345	654	32.7	Light
Ceres	6900	7- 3	290	341	631	31.6	Light
Manitou	13775	7- 2	205	380	585	29.3	Moderate
Crim	13465	6-28	370	199	569	28.5	Moderate
Idaed 59	13631	6-28	415	125	540	27.0	Moderate
Lemhi 66	13969	7- 3	145	389	534	26.7	Heavy

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	1	2553.80	
Varieties	9	2823.133	
Error	9	13581.244	
Total	19		

$\bar{x}$..... 31.7
S.E.$\bar{x}$..... 8.2405
L.S.D..... N.S.
C.V.%..... 25.97

Table 5. Agronomic data from off station irrigated spring wheat nursery grown in Lake County on the James Fleming farm, Pablo, Montana. Four row plots, two replications.

Date Seeded: April 26, 1966 Date Harvested: August 17, 1966 Size of Plot: 16 square feet

Variety	C.I. No.	Height in Ins.	Lodging			Grams per Plot		Total Grams	Yield Bu./A	Bu. Wt. in Lbs.
			Type	Prev.	Sever.	I	II			
Lemhi 66	13969	50	5	80	6	570	685	1255	62.8	44.2
N D 60-54	13596	44	5	97	2	632	615	1247	62.4	55.9
Idead 59	13631	43	5	92	2	474	626	1100	55.0	55.5
Manitou	13775	44	5	97	6	481	615	1096	54.8	52.5
Lakota(durum)	13335	47	5	95	4	505	574	1079	54.0	53.5
Crim	13465	48	5	75	3	524	450	974	48.7	50.9
Thatcher	10003	45	2	47	1	465	490	955	47.8	55.5
Centana	12974	48	5	92	3	431	496	927	46.4	49.0
Sheridan	13586	50	5	95	6	418	510	928	46.4	54.5
Ceres	6900	49	5	80	5	380	525	905	45.2	51.4

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	1	24921.80	9.10*
Varieties	9	8445.24444	3.08
Error	9	2739.24444	
Total	19		

$\bar{x}$..... 52.3
S.E.$\bar{x}$..... 3.7008
L.S.D..... N.S.
C.V.%..... 7.07

Table 6. Summary of dryland hard red spring wheat yield from the advance yield nursery, Northwestern Montana Branch Station, Route 4, Kalispell, Montana 1956-1966

Variety or Cross	C. I. or N. No.	1956	1957	1959	1960	1961	1962	1963	1964	1965	1966	# Sta. Years	% Centana	% Thatcher
Centana	12974	54.1	12.8	45.4	33.5	28.3	59.1	34.3	47.8	61.1	50.4	10	100	102
Ceres	6900	53.7	11.6	40.0	29.1	26.0	43.2	28.1	56.6	55.0	53.6	10	93	96
Rescue	12435	49.4	8.3	42.0	31.8	23.6	41.1	56.2	42.2	63.5	39.4	10	93	96
Sawtana	13304	49.2	10.5	42.3	34.8	26.4	45.1	48.1	51.0	58.2	53.7	10	98	101
Thatcher	10003	46.3	12.2	42.0	29.0	27.4	49.7	34.7	46.7	65.4	62.2	10	97	100
Chinook	13220	44.4		41.0	29.4	25.6	41.9	29.6	46.7	56.3	51.2	9	88	91
Crim	13465				28.8	22.8	48.8	27.5	43.0	71.8	58.7	7	96	96
Sheridan	13586					38.5	59.4	36.9	50.6	72.8	50.9	6	110	109
Justin	13462					24.8	45.1	42.1	50.6		70.4	5	106	106
Wells	13333						52.6	33.7	57.0	58.4	67.9	5	107	104
Lakota	13335						64.9	37.3	59.1	67.1	75.3	5	120	117
Fortuna	13596								62.9	76.8	66.2	3	129	113
Manitou R.L. 4159	13775								50.8	62.2	67.5	3	113	104
II-50-17 x Pilot	6194								45.0	66.7	60.7	3	108	99
Chris, 525-1	13751								41.8	59.3	51.3	3	96	87
Rescue x II-50-17,B61-23	13832								42.4	54.9	35.8	3	84	76
K338 x Lee, B61-89	13946									68.4	60.4	2	116	101
(NRN10-BVR 1/4 x TC)x 498	647									63.0	50.6	2	102	89
II-50-17xPlt^2 x B52-91	6610										72.0	1	143	116
B52-91 x B60-40	6661										71.5	1	142	115
K 338 x Conley	661										69.9	1	139	112
NO 58-TC x TC-KF	13743										62.3	1	124	100
NO 58-TC x TC-KF	13744										61.5	1	122	99
B 52-91 x KF-CNT	6619										58.1	1	115	93
Lebsock Durum	60115										55.8	1	111	90
North Dakota 61-107	13937										54.8	1	109	88
II-50-72 x QM 2854	13773										51.4	1	102	83
B 57-117 x Rescue	6424										42.6	1	85	69

Table 7. Summary of dryland white spring wheat yields grown at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana from 1956 to 1966.

Variety or Cross	C.I. or N. No.	1956	1957	1958	1959	1960	1961	1962	1963	1964	1966	# Sta. Years	% Lemhi	% Idaed-59
Baart	1697	52.2	59.5	48.1	41.8	29.1	25.5	41.8	21.8	35.0	32.4	10	117	68
Federation	4734	49.2	40.9	40.5	43.2	30.6	24.9	44.1	21.2	29.5	36.6	10	109	69
Thatcher	10003	45.6	53.5	37.0	45.2	25.5	30.0	50.3	35.2	50.1	72.6	10	134	99
Lemhi	11415	56.7	56.0	54.6	38.7	17.8	18.3	52.4	6.2	14.7	15.7	10	100	45
Idaed-59	13631					31.8		52.1	29.1	55.7	66.7	5	220	100
Premierx5FR,62M 9-204	13732								32.3	42.7	60.4	3	370	89
Burt x KF, 58-2025	13736								40.7	58.9	84.0	3	500	121
Idaed x Burt 30-2	13742									53.8	71.8	2	413	103
NO 58-TC x TC-KF	13743									58.6	67.1	2	413	103
NO 58-TC x TC-KF	13744									50.5	48.1	2	324	81
Lee x NO58-TC A61195-46	13979										83.4	1	531	125
Lemhi 62 x CI 13636	13981										80.0	1	510	120
Eureka-Lemhi x 3Idaed	13980										78.9	1	503	118
Idaed x Burt, Pend 111-1	6										76.9	1	490	115
Idaho A613 A-3-15	13969										74.0	1	471	111
Premier x 2FR 2x5 Idaed	13984										73.4	1	468	110
Lemhi 62 x 2 Idaed	13982										58.5	1	373	88
MarFed Mutant, 5899	4793										58.1	1	370	87
Premier x 2FR 2x5 Idaed	13983										57.1	1	364	86
Burt x Onas 52, Lind 168	4737										50.4	1	321	76
Burt x Onas 52, Lind 466	4468										45.2	1	288	68
N10-B 2x2 12228 3xL53	13978										44.9	1	286	67
N10-B 2x2 12228 3xL53	13977										41.4	1	264	62

TITLE: Small Grains Investigations (Winter Wheat) 756

LOCATION: Northwestern Montana Branch Station, Field E-1 and several off station locations.

DURATION: Indefinite

OBJECTIVES:

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

2. To conduct a breeding program in North West 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.

EXPERIMENTAL DESIGN AND PROCEDURE:

Standard nursery procedures were used in the variety testing program. In general station studies were four row plots replicated four times. The design, complete ramdomized block. The discription of a particular study and procedures of each will be included in the results and discussion.

RESULTS AND DISCUSSION:

Attached

FUTURE PLANS:

Plans for 1966-67 will include intra-state nurseries, Western Regional nurseries, and an increase in the amount of breeding material.

SUMMARY:

Yields were average or slightly above in 1966. Harvest conditions were excellent throughout the harvest period. The highest yielding entry in the Intra-state Nursery was Montana #647 or listed as C 63-9, a complex cross named by Dr. Konsak, which yielded 82.6 bushels per acre. Several entries in the nursery were significantly better in yield than Delmar.

Wanser was the highest yielding entry in the Western Regional Nursery with 64.1 bushel per acre, stands were excellent, but it did have a high percent of dwarf smut.

Moro was the highest yielding entry in the White Wheat Nursery with 85.9 bushels per acre. It had good resistance to both dwarf smut, stripe rust and good resistance to lodging. This variety could have a potential in Western Montana.

Only two of the off-station nurseries of the five put out were harvested. A summary of the data shows that Montana #647 C 63-9 is the highest yielding entry of the off-station nurseries in 1966.

Several lines were evaluated in the elite stripe rust nursery for stripe rust and dwarf bunt resistance. Out of the 25 entries included only 5 of the Westmont x P.I. 178383 crosses were left after evaluation.

Summary (con't)

A summary of all data in Western Montana indicates that Westmont^2 x P. I. 178383 8-10-8 is superior in yield to both Cheyenne and Delmar when grown in Western Montana.

RESULTS AND DISCUSSION:

Intra-state Hard Red. There were twenty entries in the intra-state hard red wheat nursery. Eleven commercial varieties, three Burt x P.I. 178383 crosses, two crosses from a complex cross made by Dr. Konzak at Washington State, which are listed as C63-9 and C63-16 and four lines from the Westmont x P.I. 178383 backcross were included in this study. Delmar is used as a check in this nursery. There are eight entries in the nursery that are significantly better in yield than Delmar. Among those is Montana #6619 which is Westmont^2 x P.I. 178383 8-10-8. The highest yielding entry in the nursery is Montana #647, this is also listed as C63-9, one of the lines developed by Dr. Konzak at Washington State University. Westmont was not included in this nursery due to an error in seed packaging. Itana,the most susceptable variety to stripe rust in the nursery had an infection type of 8 with 99 percent severity. Those varieties showing resistance in the study are some of the higher yielding ones, Gaines showed 63 percent rust 8-10-8 had a severity of 2.5 and a pustule type of 0. A high reading of 15 percent or more of smut was found in McCall and several lines of the Westmont^2 x P.I. 178383 were quite resistant to dwarf smut in this study. Test weights were low on the Burt x P.I. 178383 crosses. Maturity of Burt x P.I. 178383 was somewhat later than some of the other commercial lines in the nursery. Generally test weights were good to excellent in this study. Complete data of this nursery is found in Table 1.

Western Regional Hard Red. There were twenty-seven entries in the western regional hard red winter wheat nursery. It was grown in the dwarf smut infested area, Northwest of Kalispell, on the Lance Claridge farm. Susceptiable varieties had a high percentage of dwarf smut as can be seen in Table 2. Stand counts were made of all varieties. Stand loss could be attributed to snow mold. This was prevelant throughout the entire nursery. There are differences in stands between varieties as seen in Table 2. Wanser was the highest yielding entry in the nursery. Wanser contained 34 percent smut. Stands were excellent in this variety of some 86 percent. Delmar, the variety used as a check in the nursery, had a yield of 45.8 bushels per acre compared with Westmont^2 x P.I. 178383 8-10-8 which had a yield of 44.8 bushels per acre. The mean for the entire nursery was 39.1 bushels per acre. Two entries were found to be completely free of smut, these were Westmont^2 x P.I. 178383 lines 21-3 and 15-5-17. There was a trace of 1 percent smut in Westmont^2 x P.I. 178383 8-10-8.

Western Regional White Wheat. The western regional white wheat nursery contained sixteen entries. Stands were excellent, also yields were excellent with a mean of 66.6 bushels per acre. This study was located in Field E-3 on the station, where there are excellent growing conditions for winter wheat. The highest yielding entry in the nursery was Moro with 85.9 bushels per acre, and this was significantly higher than Gaines which is used as a check in this nursery. Moro also had a .3 percent smut reading, compared to Tripplet, a susceptible variety, which had 11 percent smut. Actually the smut level is not adaquately measured in this test because of the low level of smut in the susceptible varieties. Moro also had good stripe rust resistance giving a 0 type reaction and severity being 0 in this particular study. Susceptible varieties such as Tripplet and Omar had a severity of 98 percent and a type of 9.

Results and Discussion (con't)

Off Station:

Growing condition results and other information about each of these nurseries will be discussed under individual county headings. A total of five nurseries were seeded in the Fall of 1965. Each nursery consisted of sixteen entries. These nurseries contained both hard red and soft white entries.

Missoula County - Growing conditions in this area were excellent and moisture was excellent through the growing season. Yields were somewhat higher than usually obtained in this area of Western Montana. Stands were uniform throughout the nursery. Stripe rust and dwarf bunt were not noted in this nursery. The highest yielding entry in the nursery was Omar with 27.9 bushels per acre. The white entries in this nursery all yielded above any of the hard red entries. Westmont was the highest yielding hard red entry, as would be anticipated in the absence of stripe rust. There was 4.4 bushel difference between Westmont and Westmont^2 x P.I. 178383 8-10-8. Data from this nursery is found in Table 4. Protein data is also recorded in this table. Protein was low for all entries as has been the history of this location.

Ravalli County - Moisture was a limiting factor at the location in Ravalli County on the Clark farm. Moisture was inadequate at seeding time, however there was fair emergence and a fair stand. It remained dry throughout the growing season. The yields are somewhat lower than usually found in this area. The high yielding entry in this nursery was C63-9 (Burt x P.I. 178383). Westmont^2 x P.I. 178383 7-14-5 was the highest yielding hard red entry, at 23.3 bushels per acre. The Westmont^2 x P.I. 178383 8-10-8 was the lowest yielding entry in the nursery (14.8 bu. per acre). Protein levels were very good with a high being 16 percent for Westmont^2 x P.I. 178383 15-5-17. Complete data of this study is found in Table 5.

Lake County - The nursery in Lake County was harvested however the data is not recorded because of the very uneven situation that occured in the nursery due to faulty seeding techniques. Therefore these data were not included in the 1966 summaries. However, protein data is recorded.

Mineral County - The nursery in this county was abandoned because of poor location which resulted in very poor stands. This nursery was dropped for this reason.

Table 6, is a summary ofagronmic data from the off station nurseries grown in Western Montana in 1966. The highest yielding entry in the two nurseries is C63-9. The variety with the highest protein for the average of all entries in Western Montana was Cheyenne and Westmont^2 x P.I. 178383 8-10-8 with 14 percent.

In Table 7, is shown a ten year summary, 1957-1966, of winter wheat varieties grown in the intra-state nursery at the Northwestern Montana Branch Station.

Results and Discussion (con't)

Breeding Nurseries:

Stripe Rust Nursery - The elite stripe rust nursery was grown at the Northwestern Montana Branch Station, Field E-3. There were twenty-five entries in the nursery. These lines consisted of Westmont^2 x P.I. 178383 material plus four checks in the nursery. These entries were evaluated for smut and stripe rust. After evaluation for smut, stripe rust and quality, from previous data, nine entries of the nursery were harvested for yield. Four of these were checks leaving a total of five of the Westmont^2 x P.I. 178383 lines for harvest. Selection 1-1-13 was the highest in yield with 74.4 bushels per acre, very slight stripe rust and a trace of dwarf bunt were noted in this line. Material from this nursery will be included in the 1966-67 yield studies in the dwarf bunt area. Table 8.

Burt x P.I. 178383 Selection Nursery - The above named nursery was grown at the Northwestern Montana Branch Station. The lines in this nursery were evaluated for stripe rust, dwarf bunt and other agronomic characterists. A total of sixty entries plus three checks were included. After evaluation for the above mentioned cretria, twenty-one entries were harvested for yield. Material from the nursery has been submitted to the Quality Lab. for quality analysis and further selection pressure will be applied to these lines on the basis of their quality. Generally speaking most of the lines are somewhat later in maturity than we would prefer, however there is potential material in this nursery which could be used in a breeding program as parent material, for increasing yields, straw strength and disease resistance. Table 9.

Table 1. Agronomic data from intrastate winter wheat nursery grown at Kalispell, Montana in 1965-66. Experimental design. Randomized block. Four replications. Four row plots. Field No. E-3.

Date Seeded: September 20, 1965 Size of Plot: 16 square feet

Variety	Number	Yield Bu/A	Test Wt Lb/ Bu	Ht In	Heading Date	Harvest Date	Stripe Rust Severe	Stripe Rust Type	Smut Sever	Lodging Prev	Lodging Sever
IM462N10xIT684/83 C63-9	647	82.6*	57.5	40	6/21	8/19	0.0	0	1	0	0
Burt x 83 C63-11	6646	81.8*	58.5	36	6/20	8/19	1.2	1	2	0	0
Burt x 83 C63-10	6645	81.6*	58.4	40	6/20	8/19	3.7	1	0	0	0
Burt x 83 C63-4	6644	81.4*	57.0	39	6/20	8/19	0.0	0	3	0	0
Gaines	13448	74.0*	58.5	30	6/13	8/12	63.7	5	2	0	0
Wanser	13844	73.9*	62.4	42	6/10	8/12	18.7	5	14	0	0
WMT-2 x 83 8-10-8	6619	73.4*	61.8	38	6/ 7	8/12	2.5	0	5	3	3
Winalta	13670	67.4*	62.5	46	6/11	8/12	11.2	3	8	3	1
Itana W-1	13846	65.4	61.7	43	6/14	8/12	45.0	5	11	0	0
Delmar	13442	64.2	60.5	42	6/ 6	8/12	35.0	4	1	0	0
WMT-2 x 83 13-5-17	6621	63.4	59.3	40	6/ 9	8/12	0.0	0	0	61	8
WMT-2 x 83 7-14-5	6635	62.9	61.6	39	6/ 9	8/12	0.0	0	0	22	3
Rego	13181	62.4	61.0	46	6/10	8/12	11.2	3	5	58	6
WMT x 83 2-1-3	6622	61.1	62.8	42	6/10	8/12	0.0	0	0	65	8
Warrior	13190	59.5	61.0	49	6/11	8/12	56.2	7	11	63	5
Cheyenne	8885	59.3	61.5	44	6/11	8/12	67.5	6	11	3	1
Itana	12933	58.2	60.5	45	6/11	8/12	99.0	8	13	0	0
IM462N10x83 C63-16	648	57.8	53.9	24	6/18	8/19	0.0	0	0	0	0
Lancer	13547	57.0	61.6	40	6/ 8	8/12	28.7	3	13	0	0
McCall	13842	56.4	62.3	40	6/11	8/12	47.5	3	15	0	0

NOTE: Delmar used as a check in this nursery
* Varieties yielding significantly more than the check (.05)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	280.4	3.43*
Varieties	19	337.6	4.12*
Error	57	81.7	
Total	79		

$\bar{x}$.....	67.2
S.E.$\bar{x}$.....	4.5
L.S.D.....	12.88
C.V.%.....	6.72

Table 2. Agronomic data from the Western regional hard red winter wheat nursery grown on the Lance Claridge farm, Kalispell, Montana 1965-1966. Four row plots, four replications. Randomized block design.

Date Seeded: September 22, 1965 Date Harvested: August 22, 1966
Size of Plot: 16 square feet

Variety	Number	Yield Bu/A	Test Wt Lbs/Bu	Ht In	Heading Date	Stand %	% Smut Severe
Wanser	13344	64.1*	59.4	43	6/23	86	34
WMT x 83 2-1-3	6622	56.2	59.7	39	6/22	86	0
WMT-2 x 83 13-5-17	6621	55.8	58.2	41	6/23	79	0
WMt-2 x 83 7-14-5	6625	49.0	59.8	44	6/23	78	18
Cheyenne	8885	46.9	58.6	44	6/25	84	30
Delmar	13442	45.8	59.0	43	6/26	78	9
WMT-2 x 83 8-10-8	6619	44.8	59.2	36	6/21	81	1
CI 12932 x $Burt_2$ Sel 17	661	44.7	58.5	39	6/23	60	29
CLM x Utah 175A-53	275001	43.5	60.4	46	6/23	79	48
Bezosztata 2/Sel B	4836	40.4	59.8	37	6/23	71	25
Rio	10061	40.2	59.1	48	6/26	86	71
CLM x Utah	275002	40.1	59.3	42	6/23	83	48
Hussar x CNN3	13866	40.0	59.8	46	6/24	83	44
A 5598-35-10	13869	39.5	58.2	47	6/26	69	55
Colorow	12865	39.0	59.6	43	6/22	76	26
McCall	13842	38.4	58.8	39	6/23	85	65
Itana W-1	13846	37.6	59.5	42	6/24	75	36
Tendoy	13426	37.4	58.2	44	6/26	80	48
CI 12932 x $Burt_2$ Sel 1	662	34.3	58.3	37	6/24	59	33
Columbia	12928	34.1	59.4	42	6/21	80	91
A 5598-36-3	13870	32.7	58.0	42	6/24	63	85
(Rex-RioxCNN2)x CNN3	13867	32.3	59.2	43	6/20	44	25
A 5598-36-6	13871	27.5	59.5	41	6/23	69	63
Itana	12933	26.0	58.2	45	6/24	59	81
Kharkof	1442	24.0	56.9	45	6/27	60	49
Bankuti 219	4844	22.1	58.6	44	6/22	70	84
Fleischmann 481	4835	20.7	56.5	45	6/24	49	90

NOTE: Delmar used as a check in this nursery
* Variety yielding significantly more than the check (.05)

Analysis of Variance

Source	D.F.	Mean Squre	F.
Replications	3	850.4	5.05**
Varieties	26	429.4	2.55**
Error	78	168.3	
Total	107		

$\bar{x}$.....	39.1
S.E.$\bar{x}$.....	6.4
L.S.D.(.05)..	18.3
C.V.%.....	16.6

Table 3. Agronomic data from the uniform white regional winter wheat nursery grown at the Northwestern Montana Branch Station in 1965-1966. Field No. E-3. Four row plots, four replications. Randomized block.

Date Seeded: September 20, 1965 Date Harvested: August 11, 1966 Size of Plot: 16 sq. ft.

Variety	Number	Yield Bu/A	Test Wt Lbs/Bu	Ht In	Heading Date	Stripe Rust Sever	Stripe Rust Type	Smut Sever	Lodging Prev	Lodging Sever
P.I. 178383 x Omar 2-172	13740	85.9*	59.3	42	6/13	0.0	0	3	3	2
(14-53 x Odin) x 13431	4765	82.3	57.7	31	6/17	0.0	0	10	0	0
(14 x 50-3) x Burt, Sel 7	13968	79.7	60.6	33	6/13	33.7	2	9	0	0
Suwon 92 x Omar, BC-3	4771	78.7	59.5	38	6/14	0.0	0	3	0	2
Brevor	12385	71.0	60.2	40	6/12	45.0	2	3	0	0
Suwon 92 x Omar, BC-3	4780	70.4	59.4	37	6/12	0.0	0	3	0	0
Gaines	13448	68.4	60.1	31	6/12	32.5	3	7	0	0
Suwon 92 x Omar, BC-3	4762	68.2	58.8	30	6/ 9	0.0	0	6	0	0
HH-EG2 x Omar	9129	64.8	59.9	44	6/16	68.7	8	6	0	0
Burt	12696	62.2	58.4	38	6/11	51.2	4	2	0	0
Triplet	5408	59.5	60.5	48	6/10	98.0	9	11	24	2
Omar	13072	58.7	58.5	44	6/15	99.0	9	3	15	1
Golden	11063	55.0	57.9	48	6/14	99.0	9	2	24	3
Elgin	11755	52.3	58.6	43	6/13	99.0	9	8	[illegible]	0
Kharkof	1442	52.1	60.1	53	6/13	23.7	4	11	91	8
Omar x 1834-1	13750	51.4	57.0	34	6/ 7	60.0	3	2	0	0

NOTE: Gaines used as a check in this nursery
* Variety yielding significantly more than check (.05)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	46.8	.40
Varieties	15	504.4	4.36
Error	45	115.5	
Total	63		

$\bar{x}$.....	66.3
S.E.$\bar{x}$.....	5.3
L.S.D.(.05)..	15.4
C.V.%.....	8.1

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Table 4. Agronomic data from off station winter wheat nursery grown on the Al Goodan farm in Missoula County, 1965-1966. Single row plots, six replications. Randomized block design.

Date Planted: September 28.1965
Date Harvested: August 5, 1966
Size of Plot: 16 square feet

Variety	Number	Yield Bu/A	Test Wt Lbs/Bu	Ht In	% Protein
Omar	13072	27.9*	55.6	30	7.6
IM462N10xIT684/83 C63-9	647	25.6*	55.6	28	8.3
Burt x P.I. 178383 C61-9 M	13837	24.7*	58.1	29	9.1
Gaines	13448	23.8*	59.7	23	8.5
P.I. 178383 x Omar 2-172	13740	21.9	55.2	27	8.0
Westmont	12930	21.8	60.4	25	9.2
Rego	13181	21.6	59.2	30	9.5
WMT-2 x 83 13-5-17	6621	21.4	59.0	28	9.0
WMT-2 x 83 7-14-5	6635	21.0	60.7	22	8.8
Burt	12696	19.6	59.3	23	9.4
Warrior	13190	19.0	59.6	32	9.9
Delmar	13442	17.9	58.7	29	10.3
WMT-2 x 83 8-10-8	6619	17.5	58.9	25	9.9
Lancer	13547	17.1	60.7	26	10.1
Cheyenne	8885	17.0	54.7	29	9.7
Winalta	13670	14.2	60.3	27	10.8

NOTE: Delmar used as a check in this nursery
* Varieties yielding significantly more than the check (.05)

$\bar{x}$.....	20.8
S.E.x.....	1.6
L.S.D.....	4.7
C.V.%.....	7.96

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	5	55.6	3.37**
Varieties	15	78.1	4.73**
Error	75	16.5	
Total	95		

Table 5. Agronomic data from off station winter wheat nursery grown in Ravalli County on the L. S. Clark farm, Stevensville, Montana in 1965-1966. Single row plots, six replications. Randomized block.

Date Seeded: September 28, 1965
Date Harvested: August 5, 1966
Size of Plot: 16 square feet

Variety	Number	Yield Bu/A	Test Wt Lbs/Bu	Ht In	Protein %
1M462N10xIT684/83 C63-9	647	25.9	59.8	20	14.8
Burt x P.I. 178383 C61-9 M	13837	24.2	60.9	20	14.5
WMt-2 x 83 7-14-5	6635	23.3	60.6	20	15.2
Delmar	13442	22.8	62.0	20	15.5
Burt	12696	22.6	61.6	18	13.8
Rego	13181	22.0	60.5	22	14.7
Gaines	13448	22.0	61.5	16	13.8
WMT-2 x 83 13-5-17	6621	20.9	61.9	20	16.0
Cheyenne	8885	20.3	62.9	20	15.2
Westmont	12930	19.7	62.0	18	16.3
Omar	13072	19.1*	61.0	17	13.6
Warrior	13190	18.8*	61.5	20	15.7
P.I. 178383 x Omar 2-172	13740	17.2*	61.6	17	----
Winalta	13670	16.7*	62.0	19	15.6
Lancer	13547	16.3*	63.0	18	15.2
WMT-2 x 83 8-10-8	6619	14.8*	60.9	18	15.8

NOTE: Delmar used as a check in this nursery
* Varieties yielding significantly less than the check (.05)

$\bar{x}$.....	20.4
S.E.$\bar{x}$.....	1.1
L.S.D.(.05)..	3.3
C.V.%.....	5.69

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	5	188.0	23.16**
Varieties	15	58.2	7.15**
Error	75	8.1	
Total	95		

Table 6. Summary of off station winter wheat agronomic data 1966.

Variety	Number	Location (County) Missoula Yield Bu/A	Ravalli Yield Bu/A	Ave.	Location (County) Missoula Lbs/Bu	Ravalli Lbs/Bu	Ave.	Location (County) Missoula Ht/In	Ravalli Ht/In	Ave.
1M462N10xIT684/83 C63-9	647	25.7	26.0	25.8	55.6	59.8	57.7	28.3	20.2	24.3
Burt x PI 178383 C61-9	13637	24.8	24.3	24.5	58.1	60.9	59.5	28.7	20.0	24.3
Omar	13072	27.9	19.2	23.5	55.6	61.0	58.3	29.8	16.8	23.3
Gaines	13448	23.9	22.0	23.0	59.7	61.5	60.6	23.5	16.2	19.8
WMT-2 x 83 7-14-5	6635	21.1	23.3	22.2	60.7	60.6	60.7	26.6	20.0	23.0
Rego	13181	21.7	22.1	21.9	59.2	60.5	59.9	30.5	22.3	26.4
WMT-2 x 83 13-5-17	6621	21.4	21.0	21.2	59.0	61.9	60.5	27.8	20.0	23.9
Burt	12696	19.7	22.6	21.1	59.3	61.6	60.5	28.0	18.2	22.6
Westmont	12930	21.8	19.8	20.8	60.4	62.0	61.2	25.2	17.8	21.5
Delmar	13442	18.0	22.8	20.4	58.7	62.0	60.4	29.3	19.7	24.5
PI 178383 x Omar 2-172	13740	22.0	17.3	19.6	55.2	61.6	58.4	27.0	17.3	22.2
Warrior	13190	19.1	18.9	19.0	59.6	61.5	60.6	32.5	19.8	26.2
Cheyenne	8835	17.1	20.4	18.7	54.7	62.9	58.8	29.3	19.7	24.5
Lancer	13547	17.2	16.3	16.8	60.7	63.0	61.9	26.5	18.2	22.3
WMT-2 x 83 8-10-8	6619	17.5	14.9	16.2	58.9	60.9	59.9	25.3	17.8	21.6
Winalta	13670	14.3	16.7	15.5	60.3	62.0	61.2	26.7	19.2	22.9

Table 6.(con't) Protein Data

Variety	Number	Protein % Missoula Co.	Ravalli Co.	Lake Co.	x
1M462N10xIT684/83 C63-9	647	8.3	14.8	14.4	12.5
Burt x PI 178383 C61-9 M	13837	9.1	14.5	13.4	12.3
Omar	13072	7.6	13.6	13.0	11.4
Gaines	13448	8.5	13.8	13.2	11.8
WMT-2 x 83 7-14-5	6635	8.8	15.2	15.9	13.3
Rego	13181	9.5	14.7	16.2	13.5
WMT-2 x 83 13-5-17	6621	9.0	16.0	16.5	13.8
Burt	12696	9.4	13.8	14.5	12.6
Westmont	12930	9.2	16.3	15.5	13.7
Delmar	13442	10.3	15.5	14.4	13.4
PI 178383 x Omar 2-172	13740	8.8	----	14.8	11.8
Warrior	13190	9.9	15.7	16.4	14.0
Cheyenne	8885	9.7	15.2	16.5	13.8
Lancer	13547	10.1	15.2	15.7	13.7
WMT-2 x 83 8-10-8	6619	9.9	15.8	16.4	14.0
Winalta	13670	10.8	15.6	15.1	13.8

Table 7. Summary of selected winter wheat data grown on the Northwestern Montana Branch Station, 1957-1966.

Variety	C.I.No.	Yield in Bushels per Acre											No. Years	Long Term % of Westmont	Average Bu/Acre			
		1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	$\bar{x}$			2yr.	3yr.	4yr.	10yr.
Cheyenne	8885	59.3	49.0	51.8	41.4	49.5	55.5	61.9	57.5	48.7	59.3	53.4	10	111	54.0	55.2	56.9	53.4
Westmont	12930	60.7	64.9	53.3	34.3	51.1	57.2	45.6	41.5	42.4	30.2	48.1	10	100	36.3	38.0	39.9	48.1
Itana	12933	58.1	55.6	50.5	32.6	48.0	50.3	54.5	46.8	38.3	58.2	49.3	10	102	48.3	47.8	49.5	49.3
Rego	13181	50.0	59.8	55.6	35.5	46.7	60.6	60.2	49.9	42.5	62.4	52.3	10	109	52.5	51.6	53.8	52.3
Delmar	13442						55.3	71.8	51.4	47.3	64.2	58.0	5	134	55.8	54.3	58.6	-
Gaines	13448							91.7	68.0	24.7	74.0	64.6	4	162	49.4	55.6	64.6	-
Im462N10 x IT684/83(C63- 9) 647										51.6	82.6	67.1	2	185	67.1	-	-	-
Wanser											73.9	73.9	1	245	-	-	-	-
Winalta									54.4	31.4	67.4	51.1	3	134	49.4	51.1	-	-
Itana V-1	13846							76.6	54.1	42.0	65.4	59.5	4	149	53.7	53.8	59.5	-
Warrior									45.8	37.1	59.5	47.5	3	125	48.3	47.5	-	-
Im462N10x83 (C63-16)	648									20.5	57.8	39.2	2	108	39.2	-	-	-
Lancer											57.0	57.0	1	189	-	-	-	-
McCall											56.4	56.4	1	187	-	-	-	-
BurtxPI178383(C63-11)	6646									50.1	81.8	66.0	2	182	66.0	=	=	-
" " (C63-10)	6645									61.9	81.6	71.8	2	198	71.8	-	-	-
" " (C63- 4)	6644									54.5	81.4	68.0	2	187	68.0	-	-	-
Wmt^2 x 178383 8-10-8	6619									40.8	73.4	57.1	2	157	57.1	-	-	-
" " 13- 5-7	6621									48.8	63.4	56.1	2	155	56.1	-	-	-
" " 7-14-5	6635									56.0	62.9	59.5	2	164	59.5	-	-	-
" " 2- 1-3	6622									55.6	61.1	58.4	2	161	58.4	-	-	-

Table 8. Agronomic data from the elite stripe rust nursery grown at the Northwestern Montana Branch Station in Field E-3, 1965-1966. Single row plots, six replications in a randomized block design

Date Seeded: September 21, 1965
Date Harvested: August 11, 1966
Size of Plot: 16 square feet

Variety	Number	Yield Bu/A	Test Wt Lbs/Bu	Ht In	Heading Date	Stripe Rust Sever	Stripe Rust Type	Smut Sever
WMT x 83 1-1-3	6642	77.4	60.0	43	6/10	1	0	1
Delmar	13442	74.3	59.5	46	6/17	72	2	1
WMT-2 x 83 12-1-1	6631	69.1	61.6	45	6/ 9	0	0	1
WMT x 83 1-1-6	6643	66.5	59.4	46	6/12	0	0	0
WMT-2 x 83 16-1-8	6641	64.8	60.8	49	6/14	1	0	2
Cheyenne	8885	63.8	60.5	50	6/12	66	3	7
Itana	12933	51.9	59.0	50	6/12	99	9	5
Westmont	12930	49.1	58.5	45	6/10	82	7	4
WMT-2 x 83 7-14-4	6634	48.4	58.6	43	6/10	0	0	0

$\bar{x}$..... 62.8
S.E.$\bar{x}$..... 4.7
L.S.D.(.05).. 13.6
C.V.%..... 7.59

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	5	138.2	1.01
Varieties	8	689.2	5.04**
Error	40	136.6	
Total	53		

Table 9. Burt x P.I. 178383 lines grown at the Northwestern Montana Branch Station, Route 4, Kalispell, Montana. Field No. E-3 Single row plots, six replications.

Date Seeded: September 20, 1965 Date Harvested: September 1, 1966
Size of Plot: 16 square feet

Section No.	Grams per Plot I	II	III	IV	V	VI	Total Grams	Bushel Weight	Yield Bu/A.
1190	549	520	438	333	572	393	2805	59.1	46.7
Burt	296	424	542	510	450	414	2636	58.5	43.9
1194	484	424	441	438	454*	320	2561	59.0	42.7
1225	280	445	521	407	452	448	2553	59.2	42.5
1193	429	434	412	403*	380	392	2450	57.5	40.8
1268	355	435	401	479	385	381	2436	59.9	40.6
1202	440	394	315	300	431*	545	2425	58.9	40.4
Delmar	430	434	495	404	429	212	2404	60.4	40.1
1206	402	410	466	419	340	344	2381	59.1	39.7
1201	422	359	269	293	662	315	2320	57.8	38.7
1209	306	284	443	382	365	514	2294	56.1	38.2
1191	315	354	339	529	331	301	2169	59.0	36.2
1200	376	410	335	400	382*	229	2132	57.8	35.5
1189	352*	391	392	360	330	247	2072	56.7	34.5o
1204	387	330	379	335	265	330	2026	58.5	33.8o
1197	339	300	283	248	491	320	1981	59.5	33.0o
1192	309	338	355	355	298	302	1957	57.6	32.6o
1255	381	335	430	99	365	215	1825	58.9	30.4ox
Westmont	347	340	311	336	338	139	1811	58.3	30.2ox
1203	362	312	325	304	271	193	1767	59.0	29.4ox
1210	311	434	213	340	236	198	1732	58.5	28.9ox

* Calculated missing plots.
o Significantly less than Burt
x Significantly less than Delmar

$\bar{x}$.....	37.0
S.E.$\bar{x}$.....	32.47
L.S.D.(05).	9.1
L.S.D.(01).	12.1
C.V.%.....	8.75

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	5	1417.4338	
Varieties	20	16012.223	2.53**
Error	95	6325.66536	
Total	120		