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- CLIMATE -

The effect of the cooler than normal temperatures in March, April and May was to delay the development and maturity of all crops. Heavier than normal precipitation, 11.8 inches compared to normal of 7.8 inches, May through August, and a very cool August, made harvest exceedingly difficult for cereals as well as for forages. August in 1964 was cooler than May in 1958.

The frost free period in 1964 was only 2 days short of normal. Precipitation for the year, September thru August was 2 inches above normal. The mean average temperature for the entire year was slightly above average due to a mild winter with the minimum for the winter only 5 below zero.

The slow snow melt in higher elevations together with unusually heavy June rains produced the heaviest run-off and worst flooding in the Flathead in many years, inundating many homes and farms and drowning hundreds of head of livestock. Fortunately no human lives were lost and fortunately for the station it was a bit too high to be reached by river backwater.

Growth and yield of winter grain and dryland hay was exceptionally good, because of adequate moisture on lands above the flooded area. The main problem was that of curing harvested forages and of finding a time for harvesting grain when the moisture content was not too high. Little irrigation was needed on the station. Alfalfa on the dryland lease produced two good cuttings plus good fall regrowth.

A B.P.I. pan or ground level evaporation tank was in operation May 15 to Sept. 26, 1964. During which time, as near as we can tell, because the tank overflowed during one rainy period, the loss not replaced by rain was 5.8 inches. From August 15 to Sept. 26 the net loss was .21 inches.

A weather summary of temperature and precipitation is included in Table_____.

Table ____. Summary of climatic data by months for the 1963-1964 crop year (September to August) and averages for the period, 1949 - 1964, at the Agricultural Experiment Station, Creston, Montana.

	Month												Total or Average
	Sept. 1963	Oct. 1963	Nov. 1963	Dec. 1963	Jan. 1964	Feb. 1964	Mar. 1964	Apr. 1964	May 1964	June 1964	July 1964	Aug. 1964	Growing Season
Precipitation (inches)													
Current year	1.46	.75	.95	1.70	1.46	.41	1.57	.87	3.33	3.86	3.01	1.64	21.01
Ave. 1949 to 1963-64	1.34	1.60	1.52	1.57	1.58	1.24	1.10	1.28	2.19	2.76	1.31	1.51	19.00
Mean temperature (°F)													
Current year	58.7	47.4	35.8	24.0	28.5	28.3	30.6	42.8	31.1	58.7	64.3	67.2	44.8
Ave. 1949 to 1963-64	54.2	44.0	32.8	26.8	21.2	27.5	32.1	43.1	51.8	58.5	64.3	64.5	43.4

Last killing frost in spring*

1964 - May 25 (28°)

Ave. 1949-1964 - May 27

First killing frost in fall*

1964 - Sept. 11 (28°)

Ave. 1949-1964 - Sept. 11

Frost free period

1964 - 109 days

Ave. 1949-1964 - 107 days

Maximum summer temperature - - - - - - - - - - - - - - - - 91° on July 8, 1964

Minimum winter temperature - - - - - - - - - - - - - - - - 5° below zero on Dec. 12, 1963

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

PART I

1964

Annual Research Report

Northwestern Montana Branch

of the

Montana Agricultural Experiment Station

Kalispell, Montana

by

C.W. Roath

Superintendent

TITLE: Fertilizers for Irrigated Pastures

PROJECT: Fertilizer Investigations 5020

PERSONNEL: C. W. Roath and Soils Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Ten years

OBJECTIVES:

Determine effect of annual nitrogen and phosphorus application on yield and composition of grass-legume irrigated pastures.

PROCEEDURES:

Harvest plot samples from three mixtures, each treated with nine fertilizer treatments in four replications, prior to grazing with sheep.

RESULTS AND DISCUSSION:

The pasture plots in the study were seeded in 1960, and even though treatments have influenced growth and yield there is little evidence that through 1964, stands of legumes have decreased appreciably.

Mixtures are Orchard-Trefoil, Orchard-Ladino and Orchard-Alfalfa. Treatments include 0, 50, and 100 pounds of nitrogen, and 0, 40, and 80 pounds of P_2O_5 per acre, applied in early spring annually.

Table 1, presents yield data based on plot samples harvested prior to each grazing period for Orchard-Trefoil, by dates and treatments. Analysis is on the seasons total. In this seasons work with this mixture treatments containing 100 pounds of N seem essentially equal to those with additional phosphorus, and those with 50 pounds of N to require phosphorus assistance.

Table 2, presents similar data for Orchard-Ladino. Fifty-forty and 100 -0 appear to be essentially equal treatments this year on this mixture.

Table 3, presents data for Orchard-Alfalfa harvested as pasture. Phosphorus seems to have greater effect on yield when used alone than on the other mixtures.

Table 4, showing season total for all mixtures and treatments, permits comparison of mixtures as well as treatments. Mean yields, Orchard-Ladino and Orchard-Alfalfa for all treatments is the same this season, 3.13 tons per acre. For this season it would appear that 50-40 with 3.4 tons per acre might be the most practical treatment.

Table 1. Irrigated pastures fertilization in 1964. Nine square feet. Orchard Trefoil - Tons per acre at 12% Moisutre.

Treatments N	Treatments P_2O_5	Date Cut	Replications 1	2	3	4	Total	Average	Season
50	40	5-26	.72	1.06	1.36	1.14	4.28	1.07	
		7- 1	.76	1.19	.93	.85	3.73	.93	2.00
		8- 3	.72	.89	.85	.76	3.22	.81	2.81
		9- 5	.30	.59	.42	.30	1.61	.40	3.20
		Season	2.50	3.73	3.56	3.05	12.84		3.21**
100	40	5-26	1.14	1.40	1.40	1.19	5.13	1.28	
		7- 1	.72	1.14	.93	.85	3.64	.91	2.19
		8- 3	.55	1.10	.89	.64	3.18	.80	2.99
		9- 5	.25	.68	.42	.25	1.60	.40	3.39
		Season	2.66	4.32	3.64	2.93	13.55		3.39**
0	40	5-26	.38	.64	.51	.47	2.00	.50	
		7- 1	.68	.85	.51	.76	2.80	.70	1.20
		8- 3	.72	1.19	.72	.72	3.35	.84	2.04
		9- 5	.38	.51	.25	.30	1.44	.36	2.40
		Season	2.16	3.19	1.99	2.25	9.59		2.40
100	0	5-26	1.52	1.27	1.27	.97	5.03	1.26	
		7- 1	1.14	.80	1.10	.64	3.68	.92	2.18
		8- 3	.76	1.14	1.02	.68	3.60	.90	3.08
		9- 5	.42	.47	.38	.30	1.57	.39	3.47
		Season	3.84	3.68	3.77	2.59	13.88		3.47**
0	80	5-26	.47	.42	.59	.25	1.73	.43	
		7- 1	.72	.64	.76	.59	2.71	.68	1.11
		8- 3	.97	1.06	.93	.59	3.55	.89	2.00
		9- 5	.34	.38	.34	.34	1.40	.35	2.35
		Season	2.50	2.50	2.62	1.77	9.39		2.35
100	80	5-26	1.36	1.02	1.48	.97	4.83	1.21	
		7- 1	.85	.80	1.10	.93	3.68	.92	2.13
		8- 3	.80	.93	.76	.55	3.04	.76	2.89
		9- 5	.38	.47	.64	.42	1.91	.48	3.37
		Season	3.39	3.22	3.98	2.87	13.46		3.37**
50	80	5-26	.80	1.06	.93	1.36	4.15	1.04	
		7- 1	.80	.72	.72	.93	3.17	.79	1.83
		8- 3	1.06	1.02	.72	.72	3.52	.88	2.71
		9- 5	.47	.64	.21	.25	1.57	.39	3.10
		Season	3.13	3.44	2.58	3.26	12.41		3.10**
50	0	5-26	.93	.51	.85	.42	2.71	.68	
		7- 1	.93	.72	.89	.68	3.22	.81	1.49
		8- 3	.85	.68	.85	.59	2.97	.74	2.23
		9- 5	.51	.59	.38	.21	1.69	.42	2.65
		Season	3.22	2.50	2.97	1.90	10.59		2.65*

Table 1 . (con't)

Treatments N	Treatments P_2O_5	Date Cut	Replications 1	2	3	4	Total	Average	Season
0	0	5-26	.17	.34	.42	.38	1.31	.33	
		7- 1	.47	.42	.55	.51	1.95	.49	.82
		8- 3	.51	.93	.93	.89	3.26	.82	1.64
		9- 5	.21	.30	.34	.42	1.27	.32	1.96
	Season		1.36	1.99	2.24	2.20	7.79		1.95

* Treatments yielding significantly more than the check (.05)
** Treatments yielding significantly more than the check (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.74129	3.35*
Treatments	8	1.21951	5.51**
Error	24	.22118	
Total	35		

$\bar{x}$.....	2.88
S.E.$\bar{x}$.....	.23515
L.S.D.(.05)..	.69
L.S.D.(.01)..	.93
C.V.%.....	8.18

Table 2. Irrigated pasture fertilizers in 1964. Nine square feet. Orchard-Ladino

Treatments N	Treatments P_2O_5	Date Cut	Replications 1	2	3	4	Total	Average	Season
50	40	5-26	1.10	1.23	1.86	1.14	5.33	1.33	
		7- 1	.97	1.02	.97	.97	3.93	.98	2.31
		8- 3	.68	.93	.72	.68	3.01	.75	3.06
		9- 5	.17	.51	.21	.30	1.19	.30	3.36
	Season		2.92	3.69	3.76	3.09	13.46		3.37*
100	40	5-26	1.27	1.91	1.65	1.52	6.35	1.59	
		7- 1	.85	1.14	1.14	.89	4.02	1.01	2.60
		8- 3	.72	1.14	.85	1.02	3.73	.93	3.53
		9- 5	.25	.47	.64	.38	1.74	.44	3.97
	Season		3.09	4.66	4.28	3.81	15.84		3.96**
0	40	5-26	1.02	.93	.89	.89	3.73	.93	
		7- 1	.64	.80	.76	.85	3.05	.76	1.69
		8- 3	.76	.85	.72	.68	3.01	.75	2.44
		9- 5	.21	.42	.34	.25	1.22	.31	2.75
	Season		2.63	3.00	2.71	2.67	11.01		2.75
100	0	5-26	1.23	1.66	1.78	.72	5.39	1.35	
		7- 1	.93	.97	.97	.55	3.42	.86	2.21
		8- 3	.85	1.02	.89	.51	3.27	.82	3.03
		9- 5	.76	.42	1.02	.17	2.37	.59	3.62
	Season		3.77	4.07	4.66	1.95	14.45		3.61**
0	80	5-26	.64	.85	1.14	.59	3.22	.81	
		7- 1	.80	.68	.76	.68	2.92	.73	1.54
		8- 3	.68	.68	1.06	.55	2.97	.74	2.28
		9- 5	.21	.42	.55	.25	1.43	.36	2.64
	Season		2.33	2.63	3.51	2.07	10.54		2.64
100	80	5-26	1.23	1.14	1.57	1.27	5.21	1.30	
		7- 1	.80	.85	1.06	.85	3.56	.89	2.19
		8- 3	.85	.76	.59	.64	2.84	.71	2.90
		9- 5	.51	.51	.42	.30	1.74	.44	3.34
	Season		3.39	3.26	3.64	3.06	13.35		3.34*
50	80	5-26	1.31	1.06	1.02	1.31	4.70	1.18	
		7- 1	.89	.72	.89	.89	3.39	.85	2.03
		8- 3	.97	.89	.76	.80	3.42	.86	2.89
		9- 5	.55	.38	.30	.38	1.61	.40	3.29
	Season		3.72	3.05	2.97	3.38	13.12		3.28*
50	0	5-26	1.19	.72	1.48	.55	3.94	.99	
		7- 1	.80	.97	.97	.55	3.29	.82	1.81
		8- 3	.93	1.10	1.02	.34	3.39	.80	2.61
		9- 5	.47	.25	.34	.08	1.14	.29	2.90
	Season		3.39	3.04	3.81	1.52	11.76		2.94

Table 2 .(con't)

Treatments N	Treatments P_2O_5	Date Cut	Replications 1	2	3	4	Total	Average	Season
0	0	5-26	.38	1.23	.93	.68	3.22	.81	
		7- 1	.51	.68	.59	.64	2.42	.61	1.42
		8--3	.42	.68	.64	.80	2.54	.64	2.06
		9- 5	.17	.21	.17	.34	.89	.22	2.28
	Season		1.48	2.80	2.33	2.46	9.07		2.27

*Treatments yielding significantly more than the check (.05)
**Treatments yielding significatnly more than the check(.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	1.32508	4.10*
Treatments	8	1.10499	3.42**
Error	24	.32292	
Total	35		

$\bar{x}$.....	3.13
S.E.$\bar{x}$.....	.28413
L.S.D.(.05)	.83
L.S.D.(.01)	1.13
C.V.%.....	9.08

Table 3. Irrigated pasture fertilizers in 1964. Nine square feet.
Orchard-Alfalfa

Treatments N	Treatments P_2O_5	Date Cut	Replications 1	2	3	4	Total	Average	Season
50	40	5-26	1.06	1.65	1.57	1.52	5.80	1.45	
		7- 1	.80	.93	1.19	1.19	4.11	1.03	2.48
		8- 3	.64	.64	.85	.89	3.02	.76	3.24
		9- 5	.21	.25	.55	.55	1.56	.39	3.63
		Season	2.71	3.47	4.16	4.15	14.49		3.62*
100	40	5-26	1.65	1.40	1.52	.76	5.33	1.33	
		7- 1	1.02	1.23	1.31	.64	4.20	1.05	2.38
		8- 3	1.06	.89	1.02	.64	3.61	.90	3.28
		9- 5	.42	.42	.59	.38	1.81	.45	3.73
		Season	4.15	3.94	4.44	2.42	14.95		3.74*
0	40	5-26	.59	1.23	.93	1.27	4.02	1.01	
		7- 1	.59	.85	.59	1.06	3.09	.77	1.78
		8- 3	.64	.72	.64	.64	2.64	.66	2.44
		9- 5	.30	.42	.38	.34	1.44	.36	2.80
		Season	2.12	3.22	2.54	3.31	11.19		2.80
100	0	5-26	1.36	1.57	1.52	.93	5.38	1.35	
		7- 1	1.02	1.14	.93	.76	3.85	.96	2.31
		8- 3	.89	.93	.72	.51	3.05	.76	3.07
		9- 5	.38	.38	.30	.08	1.14	.29	3.36
		Season	3.65	4.02	3.47	2.28	13.42		3.36*
0	80	5-26	.55	.59	1.06	1.23	3.43	.86	
		7- 1	.80	.85	1.10	.93	3.68	.92	1.78
		8- 3	.72	.72	.72	.85	3.01	.75	2.53
		9- 5	.55	.47	.30	.42	1.74	.44	2.97
		Season	2.62	2.63	3.18	3.43	11.86		2.97
100	80	5-26	1.40	1.31	1.31	1.19	5.21	1.30	
		7- 1	1.23	1.19	.72	1.19	4.33	1.08	2.38
		8- 3	.64	1.02	.80	.72	3.18	.80	3.18
		9- 5	.25	.42	.25	.51	1.43	.36	3.54
		Season	3.52	3.94	3.08	3.61	14.15		3.54*
50	80	5-26	1.14	1.02	1.14	1.14	4.44	1.11	
		7- 1	.85	.93	.93	1.10	3.81	.95	2.06
		8- 3	.59	.97	.80	.80	3.16	.79	2.85
		9- 5	.30	.34	.38	.68	1.70	.43	3.28
		Season	2.88	3.26	3.25	3.72	13.11		3.28*
50	0	5-26	1.19	1.19	1.52	.42	4.32	1.08	
		7- 1	.80	.93	.97	.34	3.04	.76	1.84
		8- 3	.85	.76	.72	.34	2.67	.66	2.50
		9- 5	.34	.34	.34	.17	1.19	.30	2.80
		Season	3.18	3.22	3.55	1.27	11.22		2.81

Table 3 .(con't)

Treatments N	Treatments P_2O_5	Date Cut	Replications 1	2	3	4	Total	Average	Season
0	0	5-26	.64	.59	.64	.68	2.55	.64	
		7- 1	.59	.51	.64	.68	2.42	.61	1.25
		8- 3	.55	.68	.55	.55	2.33	.58	1.83
		9- 5	.21	.34	.17	.25	.97	.24	2.07
	Season		1.99	2.12	2.00	2.16	8.27		2.07

* Treatments yielding significantly more than the check (.05)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.37434	
Treatments	8	1.11118	2.70*
Error	24	.451152	
Total	35		

$\bar{x}$..... 3.13
S.E.$\bar{x}$..... .32075
L.S.D.(.05).. .93
C.V.%..... 10.24

Table 4. Seasons total yields of three pasture mixtures and nine fertilizer treatments.

Treatments N	Treatments P_2O_5	Orchard Trefoil	Orchard Ladino	Orchard Alfalfa	Total	Average
50	40	3.21	3.37	3.62	10.20	3.40
100	40	3.39	3.96	3.74	11.09	3.70
0	40	2.40	2.75	2.80	7.95	2.65
100	0	3.47	3.61	3.36	10.44	3.48
0	80	2.35	2.64	2.97	7.96	2.65
100	80	3.37	3.34	3.54	10.25	3.42
50	80	3.10	3.28	3.28	9.66	3.22
50	0	2.65	2.94	2.81	8.40	2.80
0	0	1.95	2.27	2.07	6.29	2.10
Total		25.89	28.16	28.19	82.24	
Mean		2.88	3.13	3.13		

TITLE: Potash for forage

PROJECT: Fertilizer Investigations 5020

PERSONNEL: C. W. Roath and Cooperators

LOCATION: Lincoln County

DURATION: Two years

OBJECTIVES:

Determine effect of potash and other major plant foods on forage yield and on potash deficient soil.

PROCEEDURE:

The three major plant foods were applied to strips of newly tilled soil in three replicates and seeded to a clover-grass mixture in the spring of 1963.

RESULTS AND DISCUSSION:

A good stand and vigorous growth was obtained. In July of 1963 the rancher called to ask if we wished to harvest the fertilizer plots. Our reply was that we considered 1963 the seeding year and planned to harvest in 1964. He subsequently harvested hay two times in 1963. The plots were observed August 29 prior to the second harvest and growth appeared to be in relation to the amount of fertilizer used with plots receiving 80 pounds of each material having the greatest growth.

On July 6 of 1964 the plots were harvested as hay and yield in tons per acre at 12% moisture determined. Table 5.

It appears that the fertilizer response apparent the seeding year was missed by not harvesting during the year it was applied.

Table 5. Potash on forage in Lincoln County. First cutting July 6. Tons per acre @ 12% Moisture.

applied in 1963 harvested in 1964

Treatments N	P_2O_5	K_2O	Replications 1	2	3	Total	Average
0	0	0	2.33	2.86	2.71	7.90	2.63
0	0	80	2.79	2.68	2.31	7.78	2.59
0	80	80	2.68	3.09	2.04	7.81	2.60
80	80	80	3.01	2.73	2.70	8.44	2.81

$\bar{x}$..... 2.66
S.E.$\bar{x}$..... .15327
L.S.D..... N.S.
C.V.%..... 5.76

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	2	.16521	1.75
Treatment	3	.03187	
Error	6	.09397	
Total	11		

TITLE: Date of Last Alfalfa Cutting

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath and Forage Research Committee

DURATION: Three to five years

LOCATION: Northwestern Montana Branch Station

OBJECTIVES:

Reasons for study and proceedures are those adopted by the Forage Research Committee.

RESULTS AND DISCUSSION:

In first cutting harvest all plots were harvested on a given date (June 24), and yield per acre at 12% moisture determined. Table 1 presents plot data in tons per acre for the two varieties, five replications and five dates of fall harvest. First cutting yields for the varieties and dates were much the same. Table 2 presents second cutting yields in tons per acre at 12% moisture for the same plots. Yields varied considerably as might be expected since harvest covered a 50 day period. The highest total second cutting yield for Vernal was for the second harvest date (August 27). Leaf drop was less on any given date for Flandria than for Vernal and regrowth was contributing to yield which helps explain why the highest second cutting yield of this variety was obtained on the 4th date (September 18). Average second cutting yield was .6 T/acre more for Flandria than for Vernal. Table 3 presents characteristics of the varieties when cut in the fall; height, leaf drop, bloom and height of regrowth based on five replication averages for the varied dates.

Flandria was taller, further advanced in bloom, had less leaf drop and had made more regrowth at any given date than Vernal.

PLANS:

Continue according to approved proceedures.

SIGNIFICANT FINDINGS:

Delay in harvest reduced yield, probably due primarily to leaf loss.

Table 1. Date of last Alfalfa cutting in 1964.
First cutting yield in tons per acre @ 12% moisture.
All plots harvested June 24.

Variety	Date[1]	Replications 1	2	3	4	5	Total	Average
Vernal	1 st.	1.97	2.07	2.75	2.11	2.34	11.24	2.25
Flandria	1 st.	2.52	2.22	2.91	1.40	2.42	11.47	2.29
Vernal	2 nd.	2.28	2.43	2.25	2.60	2.45	12.01	2.40
Flandria	2 nd.	2.66	2.48	2.45	2.61	2.62	12.82	2.56
Vernal	3 rd.	2.37	2.64	2.17	1.98	2.30	11.46	2.29
Flandria	3 rd.	2.52	2.42	2.60	2.26	1.96	11.76	2.35
Vernal	4 th.	2.20	2.42	2.27	1.71	2.34	10.94	2.19
Flandria	4 th.	2.32	2.32	2.57	1.57	2.69	11.47	2.29
Vernal	5 th.	1.91	2.11	2.34	2.20	2.36	10.92	2.18
Flandria	5 th.	2.13	2.60	2.72	2.64	2.70	12.79	2.56

Vernal-Average 2.26
Flandria-Average 2.41

[1] Date refers to date of fall harvest.
T= 2.407 NS
When comparisons were made between varieties using the "t" test they were found to be non-significant.

Table 2. Date of last Alfalfa cutting in 1964.
Second cutting yield in tons per acre @ 12% moisture.
Variable dates of fall cutting at 10 day intervals.

Variety	Date	Replications 1	2	3	4	5	Total	Average	
Vernal	Aug. 17	2.21	2.22	2.42	2.41	2.39	11.65	2.33	5.32
Flandria	Aug. 17	3.15	2.94	3.18	2.67	3.02	14.96	2.99	
Vernal	Aug. 27	2.68	2.38	2.12	2.70	3.30	13.18	2.64	5.42
Flandria	Aug. 27	2.81	2.23	2.70	3.30	2.88	13.92	2.78	
Vernal	Sept. 8	1.82	1.69	1.57	1.76	2.07	8.91	1.78	4.04
Flandria	Sept. 8	2.29	2.30	2.21	2.12	2.40	11.32	2.26	
Vernal	Sept. 18	1.87	2.44	2.15	2.30	2.40	11.16	2.23	5.56
Flandria	Sept. 18	3.42	3.33	3.05	3.13	3.74	16.67	3.33	
Vernal	Oct. 6	1.60	1.48	1.53	1.32	1.48	7.41	1.48	3.58
Flandria	Oct. 6	2.39	2.04	2.19	1.87	2.03	10.52	2.10	

Vernal - Average 2.09
Flandria - Average 2.69

Highly significant due date and also varieties.
Flandria is the highest yielding variety, August 27 is the best cutting date.

Analysis of Varience

Source	D.F.	Mean Square	F.
Blocks	4	.35962	24.88*
Date	4	2.29247	158.64*
Error	16	.01445	
Main Plots	24		
Varieties	1	5.50493	137.96817**
D x V	4	.05736	1.43759 NS
Error	20	.03990	
Total	49		

Table 3. Date of last Alfalfa cutting in 1964.
Characteristics based on five replication averages.

Variety	Date	Height in Ins.	Per cent Bloom	Leaf Drop	Height(Oct.6) Regrowth
Vernal	Aug. 17	31.4	61.6	31.6	8.6
Flandria	Aug. 17	34.7	68.8	30.7	15.2
Vernal	Aug. 27	36.2	74.0	35.3	6.0
Flandria	Aug. 27	39.0	88.0	30.8	9.0
Vernal	Sept. 8	34.5	Full	43.3	3.6
Flandria	Sept. 8	41.2	Full	39.5	5.6
Vernal	Sept. 18	34.1	Full	52.5	2.2
Flandria	Sept. 18	40.1	Full	41.5	3.0
Vernal	Oct. 6				12.6
Flandria	Oct. 6				15.6
Vernal - Average		34.05	67.8	40.8	
Flandria- Average		38.75	78.4	35.6	

TITLE: Protein related to growth and maturity

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station, two locations, dry and irrigated.

DURATION: One to three years

OBJECTIVES:

Reasons for study and proceedures agreed upon by the Forage Research Committee.

RESULTS & DISCUSSION:

Two sites were selected, one dryland and one irrigated. Fifty stems were randomly selected as near as possible to the desired height or stage of maturity and these weighed and measured to obtain the desired data and sent to R. F. Eslick at M.S.C. for protein and other determinations.

Tables 4 and 5 present the data obtained at Northwestern Montana Branch Station.

PLANS:

Continue if additional data is desired.

SIGNIFICANT FINDINGS:

Height and weight of first cutting alfalfa appears to continue to increase up to the 80% bloom stage even though leaf drop increases.

Table 4. Alfalfa development and protein content, 1964 data sheet
Dryland in R 5 1/10 acre sel 5/12

Sample No.	Stage	Date Harvested	Height at Harvest	Fresh Weight at Harvest	Percent Bloom	Basel Leaf Drop - %	Height of new Basal Shoots	Percentage of Leaves Burned
1	When 10" high	May 18	9 3/4 in	162.8 g	None	None	None	None
2	When 14" high	May 21	13.2 in	221.4 g	None	None	None	None
3	When 18" high	June 2	18.4 in	256.7 g	None	4 %	None	None
4	When 22" high	June 9	24.2 in	373.7 g	None	9.6%	None	None *
5	When 26" high	June 11	26.37 in	466.7	None	11.8%	None	None
6	When 30" high	June 15	30.2	521.4	None	Undetermined	None	None
7	When 34" high)	June 20	33.1 in	587.4	0	16.9%	None	None
8	0 Bloom)							
9	10% Bloom	June 26	34.6	518.4	10	21.2%	None	None
10	30% Bloom	June 30	36.06	510.8	20	28.5%	None	None
11	50% Bloom	July 6	39.33	573.6	50	32.03	3 in(few)	None
12	60% Bloom							
13	80% Bloom	July 10	41.6	679.6	80	30.7	4 in(few)	None
14	Beginning of lilac bloom	May 29	16.16 in	265.1 g	None	None	None	None
15	Kharkof 1/10 head							
16	Endoof lilac Bloom							

* Rain for several days prevented taking sample sooner.

Seeded: 1962

General information needed: Variety Vernal, Age of stand 2 years, Date of first leaf drop June 1.

Kharkof 50% headed June 20.

Table 5. Alfalfa development and protein content, data sheet for 1964.
Irrigated Y-7 1/10 acre sel 5/12

Sample No.	Stage	Date Harvested	Height at Harvest	Fresh Weight at Harvest	Percent Bloom	Basal Leaf Drop --%	Height of New Basal Shoots	Percentage of Leaves Burned
1	When 10" high	May 20	9.85 in	152.3	None	None	None	None
2	When 14" high	May 29	13.75 in	234.1	None	None	None	None
3	When 18" high	June 5	18.22 in	264.6	None	Trace	None	None
4	When 22" high	June 13	22.3 in	288.0	None	4 %	None	None
5	When 26" high	June 20	26.6 in	359.4	None	19.4%	None	None
6	When 30" high	June 24	31.16 in	603.3	None	14.0%	None	None
7	When 34" high)							
8	0 Bloom)	June 24	Sample					
9	10% Bloom	June 30	33.26 in	510.8	10	26.8%	Few 1½	None
10	30% Bloom	July 4	37.15	674.0	30	28.96	Few	None
11	50% Bloom							
12	60% Bloom	July 10	40.03	693.8	60	32.17	Few 2-3	None
13	80% Bloom							
14	Beginning of lilac Bloom	Same as sample 2						
15	Kharkof 1/10 head							
16	End of lilac Bloom							

Seeded: 1963

General information needed: Date irrigated, July 13; Variety, Vernal; Age of Stand, 1 year; Date of first leaf drop, June 6.

TITLE: Intrastate Irrigated Test of White Clover Varieties

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Three years

OBJECTIVES:

Design and proceedure as approved by the Forage Research Committee.

RESULTS & DISCUSSION:

Plots containing five white clover varieties in five replications, established in 1963, survived in excellent stands and made satisfactory and differential growth in 1964.

All plots were harvested four times at near 30 day intervals and yields calculated in tons per acre at 12% moisture.

Table 6, presents yield data by variety and date as well as seasons total. Pilgrim, Merit and Commom Ladino were very similar in yield, each harvest with Merit slightly above the others for the season. Holland White produced somewhat less than Commom White the first two harvests, but then came on strong and equaled Commom by the end of the season.

PLANS:

Continue to observe for winter hardiness and vigor and to harvest for comparative yield.

Table 6. White Clover yields when cut as pasture in 1964. Five replications, 60 square feet. Tons per acre at 12% moisture.

Variety	Date Cut	Replications 1	2	3	4	5	Total	Average	Season
Pilgrim	6- 3	.63	.62	.76	.78	.78	3.57	.71	
	7- 1	.80	1.22	1.25	1.32	1.42	6.01	1.20	1.91
	8- 3	1.68	1.62	1.47	1.44	1.40	7.61	1.52	3.43
	9-15	.96	.75	.77	.89	.65	4.02	.80	4.23
Season		4.07	4.21	4.25	4.43	4.25	21.21		
Merit	6- 3	.79	.76	.68	.83	.81	3.87	.77	
	7- 1	1.26	1.29	1.46	1.14	1.27	6.42	1.28	2.05
	8- 3	1.62	1.53	1.67	1.65	1.53	8.00	1.60	3.65
	9-15	.95	.88	.79	.89	.96	4.47	.89	4.54
Season		4.62	4.46	4.60	4.51	4.57	22.76		
Commom Ladino	6- 3	.67	.73	.72	.84	.52	3.48	.70	
	7- 1	1.20	1.08	1.34	1.39	1.24	6.25	1.25	1.95
	8- 3	1.56	1.64	1.65	1.39	1.67	7.91	1.58	3.53
	9-15	.96	.83	.78	.77	.65	3.99	.80	4.33
Season		4.39	4.28	4.49	4.39	4.08	21.63		
Commom White	6- 3	.52	.64	.44	.60	.61	2.81	.56	
	7- 1	1.51	1.39	1.11	1.51	1.30	6.82	1.36	1.92
	8- 3	.91	.82	.99	.69	.78	4.19	.84	2.76
	9-15	.57	.46	.28	.49	.36	2.16	.43	3.19
Season		3.51	3.31	2.82	3.29	3.05	15.98		
Holland White	6- 3	.36	.43	.50	.50	.49	2.28	.46	
	7- 1	1.31	1.27	1.40	1.27	.97	6.22	1.24	1.70
	8- 3	1.09	1.08	1.09	.93	1.04	5.23	1.05	2.75
	9-15	.39	.51	.45	.45	.39	2.19	.44	3.19
Season		3.15	3.29	3.44	3.15	2.89	15.92		

NOTE: Common white is used as a check in this nursery.

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	4	.02893	
Varieties	4	2.16477	67.38**
Error	16	.03213	
Total	24		

$\bar{x}$.....	3.90
S.E.$\bar{x}$.....	.08016
L.S.D(.05).	.24
L.S.D(.01).	.33
C.V.%.....	2.06

TITLE: Missoula County Grass Nursery

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath

LOCATION: Don Roth ranch, Clinton

DURATION: Discontinue in 1964

OBJECTIVES:

1. Compare grass and legume species with respect to yield and adaptability to this irrigated meadow location.
2. Provide Clinton area ranchers with dependable local data.

EXPERIMENTAL DESIGN AND PROCEEDURE:

Twelve entries were seeded in 1963 in 5 x 20 foot plots. Each entry randomized and replicated four times.

RESULTS AND DISCUSSION:

While not evident at the time the site selected proved unfortunate. Extended flooding during winter and spring climinated some plots entirely. Cold, wet soils restricted growth of all entries. Plots with fair stands and growth were harvested in two cuttings on June 23 and September 8. Yields are reported in Table 7. Little can be said about the species from results of the work, except perhaps that Sanfoin was less vigorous under these conditions than alfalfa and orchard the only grass, possibley due to plot location, that produced two cuttings on all replications.

PLANS:

Discontinue or relocate.

Table 7. Missoula County Grass Nursery in 1964. Cut June 23 and September 8. Tons per acre @ 12%.

Variety	Cutting	Replication 1	2	3	4	Total	Average	Season
Intermediate	1st cut	.73	1.30	1.30	1.09	4.42	1.10	1.10*
Crested	1st cut	1.00	.40	.64[1]	.65	2.69	.68	.68*
Tall Wheatgrass	1st cut	1.04	.98	.50	.88	3.40	.85	
	2nd cut	.84	---	---	1.12		.98	1.83*
Brome	1st cut	1.46	1.42	1.55	.67	5.10	1.28	
	2nd cut	.85	----	----	----		.85	2.13*
Orchard	1st cut	1.52	1.41	.89	.69	4.51	1.13	
	2nd cut	1.17	.86	.64	.84		.88	2.01*
Tall Fescue	1st cut	.85	.66	.88	.66[1]	3.05	.80	.80*
	2nd cut	.91						
Alfalfa	1st cut	1.45[1]	1.51	.94	1.59	5.49	1.35	
	2nd cut	----	.97	1.30	1.93		1.40	2.75
Sanfoin	1st cut	.34[1]	.59	.81	.73	2.47	.71	.71*

[1] Calculated missing plot.
Alfalfa was used as a check in this nursery
* Species yielding significantly less than the check (.05)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.05656	
Species	7	.32469	3.04
Error	17	.10673	
Total	27		

$\bar{x}$.....	.97
S.E.$\bar{x}$.....	.16335
L.S.D.(.05)	.48
C.V.%.....	16.79

TITLE: One Cutting Hay Mixtures

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath, Forage Research Committee and County cooperators

LOCATION: Flathead, Lincoln and Ravalli Counties

DURATION: Three years

OBJECTIVES:

Determine adaptability, yield, and characteristic response of grasses, legumes and mixtures under specificied management in selected locations.

EXPERIMENTAL DESIGN AND PROCEEDURE:

Twelve entries including alfalfa and sanfoin as two cutting checks on productivity of late maturing grass-legume mixtures seeded in 5 x 20 foot plots in randomized blocks and four replications. Checks to be harvested in two cuttings and late mixtures in one hay cutting and measure fall regrowth.

RESULTS AND DISCUSSION:

FLATHEAD COUNTY:

This nursery was seeded on the Northwestern Montana Branch Station in 1963, and is irrigated. Table 8 presents hay yields from one cutting mixtures compared to two cutting checks. Vernal alfalfa produced more hay in two cuttings than sanfoin, and more than any of the late mixtures. If credit is given for regrowth to be grazed in the fall the seasons yields in many cases are essentially equal. Table 9 presents yield of regrowth harvested August 28.

LINCOLN COUNTY:

This nursery was seeded on a recently cleared high bench near Libby. It is not irrigated. No second cutting or regrowth of consequence was obtained. Earlier harvest of the late mixtures would have resulted in somewhat better yields because of less loss of drying leaves. Table 10 presents one cutting yields in tons per acre at 12% moisture for all entries. Sanfoin was yellow and not very vigorous, perhaps indicating need for an innoculant. Great difference in growth of all entries between the replicates is evident in the table. More hay in one cutting was obtained from some grass-clover mixtures than from alfalfa.

RAVALLI COUNTY:

This nursery was seeded on the Western Branch Station where good care and adequate irrigation has been given. Growth of alfalfa seemed to warrant three cuttings, so the comparison here is between Alfalfa in three cuttings, Sanfoin in two cuttings and late mixtures harvested in one cutting. Table 11 presents hay yields in tons per acre at 12% moisture. Alfalfa and sanfoin were equal in first cutting yield but alfalfa considerably ahead for the season. Alfalfa produced more in three cuttings than mixtures in one. However, if mixtures are credited with regrowth for fall

grazing the seasons total is not too different. Table 12 shows the amount of regrowth harvested September 17.

PLANS:

Harvest again in 1965 but cut sanfoin in one cutting and use alfalfa as the check.

SIGNIFICANT FINDINGS:

Hay in one cutting from late maturing grass-clover mixtures plus credit for regrowth for fall grazing equals production from alfalfa in one cutting in Lincoln, in two in Flathead, and in three in Ravalli.

Table 8. Hay production from one cutting mixtures compared to two cutting checks. Flathead County 1964.
Yield in tons per acre at 12% moisture.

Variety	Date Cut	Replications 1	2	3	4	Total	Average Season
Vernal Alfalfa	6-24	2.36	2.57	2.83	4.07		
	8-28	2.24	2.53	2.33	2.65		
Total		4.60	5.10	5.16	6.72	21.58	5.40
Brome & Altasweede	7- 9	3.84	4.40	3.84	3.74	15.82	3.96
Brome & Mammoth	7- 9	4.13	4.05	4.50	1.92	14.60	3.65
Tall Wheat(1) & Altasweede	7- 9	3.84	3.77	3.79	4.78	16.18	4.05
Tall Wheat(1) & Mammoth	7- 9	4.18	3.14	3.94	4.63	15.89	3.97
Tall Wheat(2) & Altasweede	7- 9	3.87	3.96	3.79	3.56	15.18	3.80
Tall Wheat(2) & Mammoth	7- 9	3.65	3.66	3.89	4.27	15.47	3.87
Sanfoin	6-24	1.65	2.13	2.76	3.24		
	8-28	1.33	1.91	1.74	2.21		
Total		2.98	4.04	4.50	5.45	16.97	4.24
Timothy & Altasweede	7- 9	4.31	4.25	3.05	4.88	16.49	4.12
Timothy & Mammoth	7- 9	3.94	3.88	3.91	4.65	16.38	4.10
Intermediate W. & Altasweede	7- 9	3.22	3.55	4.21	3.54	14.52	3.63
Intermediate & Mammoth	7- 9	3.92	4.16	4.36	3.60	16.04	4.01

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.409371	
Treatments	11	.83710	1.96
Error	33	.42721	
Total	47		

$\bar{x}$..... 4.07
S.E.$\bar{x}$... .32681
L.S.D... N.S.
C.V.%... 8.04

Table 9. Regrowth of one cutting mixtures. Flathead County 1964. Tons per acre, harvested August 28 at 12% moisture.

Variety	REPLICATIONS 1	2	3	4	Total	Average	Season Total(1)
Brome & Altasweede	1.09	1.37	1.28	1.98	5.72	1.43	5.39
Brome & Mammoth	1.24	1.32	1.13	1.30	4.99	1.25	4.90
Tall Wheat(1) & Mammoth	1.24	1.17	1.02	1.50	4.93	1.23	5.28
Tall Wheat(1) & Altasweede	1.26	1.35	1.20	1.15	4.96	1.24	5.21
Tall Wheat(2) & Altasweede	1.15	1.21	1.23	1.42	5.01	1.25	5.05
Tall Wheat(2) & Mammoth	1.51	1.23	1.17	1.26	5.17	1.29	5.16
Timothy & Altasweede	1.33	1.22	1.42	1.68	5.65	1.41	5.53
Timothy & Mammoth	1.27	1.28	1.34	1.66	5.55	1.39	5.49
Intermediate W. & Altasweede	1.28	1.51	1.26	1.43	5.48	1.37	5.00
Intermediate W. & Mammoth	.95	1.38	1.16	1.55	5.04	1.26	5.27

(1) Hay yield Table 8 + Regrowth Table 9

$\bar{x}$..... 1.31
S.E.$\bar{x}$..... .08092
L.S.D..... N.S.
C.V.%..... 6.80

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.15835	6.04
Treatment	9	.02461	
Error	27	.02620	
Total	39		

Table 10. One cut hay mixtures, Lincoln County in 1964. Tons per acre at 12% moisture.

Dryland

Variety	Date Cut	Replications 1	2	3	4	Total	Average
Vernal	6-25	1.50	.51	1.26	1.83	5.10	1.28
Brome & Altasweede	7-13	2.20	1.63	1.40	3.24	8.47	2.12
Brome & Mammoth	7-13	2.43	2.54	1.88	1.82	8.67	2.17
Tall Wheat(1) & Mammoth	7-13	1.73	2.39	1.53	1.72	7.37	1.84
Tall Wheat(1) & Altasweede	7-13	2.15	.81	1.52	.85	5.33	1.33
Tall Wheat(2) & Altasweede	7-13	2.29	1.92	1.44	.63	6.28	1.57
Tall Wheat(2) & Mammoth	7-13	1.74	.93	1.81	1.34	5.82	1.46
Sanfoin	6-25	.42	.18	.32	.36	1.28	.32
Timothy & Altasweede	7-13	1.33	2.57	2.46	2.01	8.37	2.09
Timothy & Mammoth	7-13	1.21	2.45	2.74	1.75	8.15	2.04
Intermediate & Altasweede	7-13	1.64	2.43	3.31	1.91	9.29	2.32
Intermediate & Mammoth	7-13	1.71	1.25	2.65	2.43	8.04	2.01

NOTE: Vernal is used as a check in this nursery.
* Mixyure yielding more than the check (.05) level.

$\bar{x}$..... 1.71
S.E.$\bar{x}$... .30103
L.S.D... .86
L.S.D... 1.16
C.V.%... 17.58

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.12477	
Treatments	11	1.25820	3.47**
Error	33	.36247	
Total	47		

Table 11. Hay yields from one cutting mixtures, Ravalli County in 1964. Tons per Acre @ 12% moisture. at Corvallis irrigated

Varieties	Date Cut	REPLICATIONS 1	2	3	4	Total	Average
Vernal Alfalfa	6/22	2.91	2.93	3.48	3.17		
	7/15	1.66	1.44	1.22	1.03		
	9/17	1.43	1.47	1.54	1.58		
Season		6.00	5.84	6.24	5.78	23.86	5.97
Brome & Altasweede	7/15	3.89	5.42	4.35	4.02	17.68	4.42
Brome & Mammoth	7/15	3.52	3.55	4.00	5.29	16.36	4.09
Tall Wheat(1) & Altasweede	7/15	5.51	4.57	4.22	4.54	18.84	4.71
Tall Wheat(1) & Mammoth	7/15	4.12	3.70	3.76	4.91	16.49	4.12
Tall Wheat(2) & Altasweede	7/15	4.30	3.31	3.53	4.96	16.10	4.03
Tall Wheat(2) & Mammoth	7/15	3.84	4.73	3.75	4.63	16.95	4.24
Sanfoin	6/22	2.35	3.27	3.63	3.20		
	9/17	.95	1.12	1.07	1.09		
Season		3.30	4.39	4.70	4.29	16.68	4.17
Timothy & Altasweede	7/15	4.14	3.54	4.15	4.79	16.62	4.16
Timothy & Mammoth	7/15	4.64	5.09	4.08	3.15	16.96	4.24
Intermediate & Altasweede	7/15	5.07	3.74	3.64	4.40	16.85	4.21
Intermediate & Mammoth	7/15	5.83	4.43	5.60	5.92	21.78	5.45

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.38367	
Treatment	11	1.47981	3.60**
Error	33	.41124	
Total	47		

$\bar{x}$.....	4.48
S.E.$\bar{x}$.....	.32064
L.S.D.(.05)..	.92
L.S.D.(.01)..	1.23
C.V.%.....	7.15

Table 12. Regrowth from one cutting mixtures Ravalli County in 1964. Tons per acre @ 12% moisture, cut September 17.

Varieties	Replications 1	2	3	4	Total	Average	Seasons Total(1)
Brome & Altasweede	.89	1.53	1.33	1.33	5.08	1.27	5.69
Brome & Mammoth	1.07	.95	.61	1.57	4.20	1.05	5.14
Tall Wheat(1) & Altasweede	1.25	1.10	1.07	1.14	4.56	1.14	5.85
Tall Wheat(1) & Mammoth	1.17	.96	1.17	1.24	4.54	1.14	5.26
Tall Wheat(2) & Altasweede	1.05	.77	1.44	1.27	4.53	1.13	5.16
Tall Wheat(2) & Mammoth	.83	.89	.65	.92	3.29	.82	5.06
Timothy & Altasweede	1.70	1.65	1.26	1.20	5.81	1.45	5.61
Timothy & Mammoth	1.16	1.20	1.15	.89	4.40	1.10	5.34
Intermediate & Altasweede	1.07	.83	1.14	.87	3.91	.98	5.19
Intermediate & Mammoth	.89	1.17	1.04	1.20	4.30	1.08	6.53

(1) Hay yield Table 11 & regrowth Table 12

TITLE: Intrastate Sanfoin Evaluation Study

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Three to five years

OBJECTIVES AND PROCEEDURES:

As determined by the Forage Committee

RESULTS AND DISCUSSION:

Seven entries were seeded in four replications on dryland in 1961 to be harvested as pasture. Sanfoin was the legume used and this was seeded alone and with three grasses which were also seeded alone. Plots are grazed with sheep after plot samples are taken for yield.

The 1964 yield data in tons per acre at 12% moisture is presented in Table 13. Three harvests were obtained. Sanfoin alone produced equal to any of the Sanfoin-grass mixtures and considerably more than either grass used. Green Stipa has improved each year since seeding and this year was equal to Neb. 50 intermediate in yield.

PLANS:

Continue or discontinue as determined by the Forage Research Committee.

SIGNIFICANT FINDINGS:

Sanfoin and sanfoin-grass mixtures equal unfertilized checks in the irrigated pasture fertilizer trial across the road in seasons yield.

Table 13 . Dryland Sanfoin Pastures in 1964. .1694 x dry ozs from nine square feet. Tons per acre @ 12% moisture.

Variety	Date Cut	Replications 1	2	3	4	Total	Average	Season
Sanfoin	5-26	.59	.47	.55	.59	2.20	.55	
	7- 1	1.06	1.06	.76	.64	3.52	.88	1.43
	8-28	1.06	1.14	.85	.85	3.90	.97	2.40**
	Season	2.71	2.67	2.16	2.08	9.62		
San & Neb 50	5-26	.72	.85	.59	.42	2.58	.65	
	7- 1	.80	.80	.55	.38	2.53	.63	1.28
	8-28	1.02	.89	.59	.76	3.26	.82	2.10
	Season	2.54	2.54	1.73	1.56	8.37		
San & Stipa	5-26	.55	.38	.64	.51	2.08	.52	
	7- 1	1.10	.72	.89	.89	3.60	.90	1.42
	8-28	1.06	1.19	1.10	.76	4.11	1.03	2.45**
	Season	2.71	2.29	2.63	2.16	9.79		
Stipa	5-26	.42	.42	.42	.38	1.64	.41	
	7- 1	.93	.72	.59	.47	2.71	.68	1.09
	8-28	.76	.72	.85	.68	3.01	.75	1.84
	Season	2.11	1.86	1.86	1.53	7.36		
San & Nordan	5-26	.55	.55	.59	.59	2.28	.57	
	7- 1	.85	.55	.68	.68	2.76	.69	1.26
	8-28	.97	.68	1.02	.85	3.52	.88	2.14*
	Season	2.37	1.78	2.29	2.12	8.56		
Nordan	5-26	.38	.59	.55	.51	2.03	.51	
	7- 1	.21	.25	.30	.25	1.01	.25	.76
	8-28	.42	.55	.42	.34	1.73	.43	1.19
	Season	1.01	1.39	1.27	1.10	4.77		
Neb 50	5-26	.72	.59	.68	.85	2.84	.71	
	7- 1	.55	.55	.42	.42	1.94	..49	1.20
	8-28	.51	.76	.38	.51	2.16	.54	1.74
	Season	1.78	1.90	1.48	1.78	6.94		

Nebraska 50 is used as a check in this nursery

* Mixtures yielding significantly more than the check (.05)

** Mixtures yielding significantly more than Ck. (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.22552	3.29*
Treatments	6	.75814	11.04*
Error	18	.06865	
Total	27		

$\bar{x}$.....	1.98
S.E.$\bar{x}$.....	.13101
L.S.D.(.05)..	.39
L.S.D.(.01)..	.53
C.V.%.....	6.62

TITLE: Intrastate Legume Nursery

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Three to five years

OBJECTIVES:

Design and proceedures specified by Forage Research Committee.

RESULTS AND DISCUSSION:

This nursery was seeded in dry and irrigated locations May 22, 1964.

Some entries were mixed with and seeded with wheat which made determination of percent of occupancy of the legume practically impossible, so this will be determined in 1965. However, from observation and count of plants per foot of row in the irrigated nursery September 26, Table 14, it would appear that on the average about six plants per foot of the Sanfoin from Bozeman, four plants per foot of the Sanfoin from Hall and the Cicer, and eleven plants per foot of the alfalfa have become established the seeding year. This should provide for productive stands in 1965.

Table 14. Irrigated intrastate legume nursery in 1964. Plants in 3 ft. of row, September 26.

Varieties	Replications 1	2	3	4	Average 3 ft.	Average per ft.
Sanfoin, Bozeman	15	18	21	23	19	6
Sanfoin, Hall	15	12	13	10	12	4
Cicer, A13107	11	15	17	11	13	4
Ladak Alfalfa	18	31	42	39	33	11

TITLE: Uniform Intrastate Wheatgrass Variety Trial

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Completed in 1964

OBJECTIVES:

Objectives, design and proceedures are those determined by the Forage Research Committee.

RESULTS AND DISCUSSION:

As agreed in the Forage Research Committee the dryland nursery was continued intact in 1964 for the harvest of seed. This particular year maturity of all crops was about two weeks later than normal due to a cold backward growing season. Tall Wheatgrass was not ripe until the first of Oct.

Seed heads of the desired variety and species were carefully selected from 36 square feet of each harvested plot so as to exclude volunteer grasses and mixtures, threshed with a Vogel nursery thresher, cleaned with an office Clipper and weighed on a gram scale with yields computed in pounds per acre.

Yield data is presented in Table 15. On the average Tall Wheat varieties produced 161 pounds per acre, Intermediates 54, and Pubescents 59. Within the Intermediate group there were great differences however, from 17 pounds per acre to 147 pounds per acre for Oahe. These yields are from plots seeded in 1960 and harvested as hay for three years without fertilizer.

SIGNIFICANT FINDINGS:

Oahe leads other Intermediate varieties in seed production and Alkar leads other Tall varieties under conditions of this study.

Table 15 . Wheatgrass Seed Yields in 1964 at the Northwestern Montana Branch Station, Creston, Montana.
Pounds per acre from 36 square feet.

Entry	Species & Variety	Replications 1	2	3	4	Total	Average	Species Average
2	Siberian	40.0	53.35	133.38	26.68	253.41	63.4	63.4
4	Tall - 1422	266.75	66.69	160.05	80.03	573.52	143.38**	
5	Tall Neb.985263	333.44	93.36	53.35	80.03	560.18	140.05**	161.4
6	Tall S-64	266.75	93.36	80.03	146.71	586.85	146.71**	
7	Tall Alkar	346.78	113.38	160.05	200.06	840.27	210.07**	
8	Tall A 12465	173.39	160.05	213.40	120.04	666.88	166.72**	
	Intermediate							
9	Amur	186.73	53.35	40.01	26.68	306.77	76.69	
10	Greenar	66.69	26.68	26.68	26.68	146.73	36.68	
11	Idaho 3	26.68	26.68	13.34	40.01	106.71	26.68	53.91
12	Neb. 50	13.34	13.34	26.68	13.34	66.70	16.68	
13	Ree	13.34	13.34	13.34	40.01	80.03	20.01	
14	Oahe	93.36	80.03	240.08	173.39	586.86	146.72**	
	Pusescent							
15	M - 759	26.68	26.68	66.69	13.34	133.39	33.35	
16	Topar	53.35	40.01	40.01	66.69	200.06	50.02	58.9
17	Utah 109	53.35	80.03	53.35	186.73	373.46	93.34	

Nebraska 50 is used as a check in this nursery
* Species yielding significantly more than the check (.05)
** Species yielding significantly more than the check (.01)

Analysis of Varaince

Source	D. F.	Mean Square	F.
Replications	3	11909.32556	3.33*
Varieties	14	15,684.54371	4.39**
Error	42	3576.49731	
Total	59		

$\bar{x}$..... 91.36
S.E.$\bar{x}$..... 29.90191
L.S.D.(.05) 85.42
L.S.D.(.01)114.18
C.V.%..... 32.73

TITLE: Miscellanous Forage Work in 1964.

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath, Forage Research Committee and cooperators.

OBJECTIVES:

A. Produce seed of Sanfoin
B. Observe forages wherever grown with respect to adaptability and use.
C. Develop plans for future work.

RESULTS & DISCUSSION:

A. Nine hundred pounds of Sanfoin seed was harvested by swathing and threshing swaths after drying from 8/10 acre seeded in rows in 1963, and cultivated and approximately 2 acres seeded for dryland hay in 1962. Greater yield was obtained from the hay field than from the seed plot and this was thought due to greater insect activity in the hay field.

New plants emerging in both fields after harvest indicate that much seed was lost thru shattering and that swathing should be done at an earlier stage of maturity.

B. Observations of the relative growth and vigor of alfalfa and Sanfoin in several Western Montana locations in 1964 in nurseries seeded in 1963, Table 16, in which alfalfa yields are from 1.28 to 5.40 tons per acre and Sanfoin yields from .32 to 4.24 tons in the same locations, do not necessarily mean that alfalfa is definitely better. A different table of yields in other locations and under other conditions would refute such a conclusion. It does mean however, that before Sanfoin replaces alfalfa for hay production in Western Montana some problems need be solved. The yellow color and poor growth at Clinton and Libby indicate a possibility of need for seed innoculation. The lesser yield for the season at Corvallis where first cutting yields were equal might indicate need for a study of harvest dates, cutting frequency or height of cut.

C. Tentative plans based on the observations in A & B call for:

1. Discussion of forage possibilities in Western Montana with Extension Agents and others concerned.

2. Introduction of insects into seed fields.

3. Harvesting Sanfoin in one cutting nurseries in 1965 in one late cutting.

4. A study of Sanfoin needs for and response to various plant foods by soils would provide useful information.

Table 16. Relative Yields of Alfalfa and Sanfoin in Western Montana Nurseries in 1964. (Based on four replication average)

LOCATION:	Creston	Corvallis	Clinton	Libby	4 location Average
CONDITION:	Irrigated	Irrigated	Irrigated	Dry	
ALFALFA T/A:	5.40	5.97	2.75	1.28	3.85
SANFOIN T/A:	4.24	4.17	.71	.32	2.36

TITLE: Alfalfa Phenological Plants

PROJECT: Forage Investigations 5022

PERSONNEL: Joe Caprio and C. W. Roath

LOCATION: Northwestern Montana Branch Station

DURATION: Indefinite

OBJECTIVES & PROCEEDURES:

Devised and furnished by Caprio.

RESULTS & DISCUSSION:

Plants and frame received July 24, 1964 and set in prescribed manner. All plants survived and made sufficient growth to indicate satisfactory establishment prior to freeze-up.

PLANS:

Make observations as instructed.

TITLE: Potato Rotation Study

PROJECT: Potato Production 5027

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

LOCATION: Northwestern Montana Branch Station

DURATION: Twelve years

OBJECTIVES:

Determine effect of various preceeding crops in a rotation on the yield, quality and amount of scab of potatoes.

PROCEEDURE:

Rotations are on single plots of ¼ acre of uniform medium texture loam soil and are two year, three year and six year rotations scheduled so that all plots are in potatoes the last year of each six year period to permit measurement of effect of previous crops in the same year under identical climatic conditions. The first year for such measurement will be 1965.

RESULTS AND DISCUSSION:

Crops grown in 1964 to be followed by potatoes are: 1. Soybeans 2. Sweetclover 3. Barley 4. Red Clover 5. Alfalfa. A thin stand of soybeans resulted from this years seeding and only a very thin stand of sweet clover seeded with grain in 1963 came through, so in these cases there was little to plow down on plots 1 and 2. Actually more plant material in barley stuble was turned under on plot 3, but at a later date. A good second clover crop was turned under in plot 4 and a good stand but poor growth of alfalfa in plot 5. One of the problems in this study has been that without special treatment,ie use of phosphorus fertilizer, alfalfa has made little growth. A moderate application of nitrogen and phosphorus will be applied to potatoes uniformly on all plots in 1965, and it would probably be wise to make a uniform and quite heavy application of phosphorus fertilizer to all plots in 1966 to insure good growth of all crops during the second six year period.

PLANS:

Grow potatoes on all plots in 1965 to measure effects of the previous crops (Rotation Systems) on potatoes.

TITLE: Montana Seedling Evaluation

PROJECT: 5027 Potato Production

LOCATION: Northwestern Montana Branch Station and Small Farm

PERSONNEL: C. W. Roath, H. N. Metcalf & Horticulture Committee

DURATION: Indefinite

OBJECTIVES:

Select from among Montana seedlings,and or material from other sources, varieties that will improve yield and quality of Montana potatoes and with greater resistance to common scab.

PROCEEDURE:

Observe and measure essential differences and desirable traits in single row plots in two locations. The number of hills in each row, generally 12-24, was dependent upon the available seed.

RESULTS AND DISCUSSION:

Sixty seedlings, 51 Montana selections and 9 from other sources, were seeded on the station May 22. Forty-seven of the same for which sufficient seed was available were furnished Small and Yaeger and planted by them after the first of June. Table 1 of this report lists some of the measurements and observations made. More detail is contained in notes supplied to H. N. Metcalf. Samples for scab readings specific gravity determination, or other measurements were taken and delivered to Mr. Metcalf in Bozeman.

This group appears to contain some promising selections. Ten were found to have five or more tubers per hill, four ounces or over August 20, indicating good early development and two pounds or more per hill in two locations when dug in the fall. Scab was noticeable without washing on only a few selections. Hollow centers and surface checks were the most common faults noted.

Table 1. Potato seedling Evaluation for 1964

Entry	Variety or Selection	Size Vines	Color Bloom	Tubers Aug. 20[1]	Maturity Sept. 28	Pounds/Hill		Number/Hill		Color Tubers[2]
						Station	Small's	Station	Small's	
1	5901 - 3	Med.	White	11	Good	2.6	1.4	7.1	4.0	White
2	5903 - 4	Large	?	15	Good	3.8	3.4	10.8	8.6	Red
3	5903 - 6	Large	?	10	Good	4.3		10.6		Red
4	5908 - 1	Large	Pink	18	Good	4.0	1.8	10.0	7.4	
5	5908 - 2	Med.	Cream	12	Good	3.7	2.5	8.3	11.3	
6	25908 - 1	Large	White	8	Fair	2.7		6.2		
7	5922	Large	Violet	5	Good	3.3	Rogued	8.7		Red
8	5943 - 1	Small	Cream	6	Good	1.6	1.5	3.2	4.5	
9	5959 - 3	Med.	Cream	9	Good	3.0	1.3	6.0	4.2	
10	5962 - 2	Small	White	6	Good	1.7	2.0	4.7	4.9	
11	5962 - 7	Large	Violet	12	Good	5.0	1.0	11.2	3.6	Red
12	5969 - 5	Small	Cream	3	Fair	1.8	1.9	3.6	4.4	
13	25971 A	Large	Lt.Blue	8	Good	4.8		14.4		Red
14	5978 - 3	Small	Cream	6	Good	2.3	2.4	7.1	9.8	
15	5978 - 4	Med.	Cream	4	Good	2.8	1.9	5.3	6.4	
16	5979	Med.	Cream	1	Good	3.6	Rogued	8.6		
17	5979 - 1	Small	Cream	8	Good	2.3	1.3	5.4	6.5	
18	6012	V.Large	Blue	0	Good	3.3	Rogued	8.5		Beet Red
19	6012 - 1	Large	Lt.Blue	14	Good	5.2	2.5	11.4	7.4	Lt. Red
20	26016 - 4	Med.	?	6	Fair	2.5		10.0		
21	Blance	Large	Lt.Blue	7	Good	4.1	2.3	9.3	7.8	
22	26016 - 9	Large	Cream	6	Fair	3.1		5.5		
23	26016- 11	Large	Purple	15	Good	4.8		11.3		
24	26016 -12	Large	Cream	0	Fair	2.1		7.1		
25	6024	Med.	Cream	0	Good	2.4		6.7		
26	6031	Large	Cream	10	Good	2.5	3.9	8.0	13.9	
27	6053	Small	Cream	6	Good	Wt.Lost	1.5	5.3		
28	A-386 -4	Large	Pink	2	Fair	3.1	1.1	11.3	3.1	
29	26070 - 1	Large	Lt.Blue	0	Good	3.5		10.2		
30	6083	Large	Cream	8	Good	4.6	2.1	11.1	4.3	
31	260103	Large	Pink	4	Fair	4.8		13.3		Red
32	60201	Large	?	12	Good	4.1		10.6		Red

Table 1. (con't)

Entry	Variety or Selection	Size Vines	Color Bloom	Tubers Aug. 20[1]	Maturity Sept. 28	Pounds/Hill Station	Pounds/Hill Small's	Number/Hill Station	Number/Hill Small's	Color Tubers[2]
33	60266 - 1	Med.	Lt.Blue	8	Good	3.0		8.9		Lt. Red
34	60280 - 1	Large	Pink	4	Poor	4.1	2.9	10.4	7.0	
35	6102 - 7	Small	Violet	0	Good	1.6	Rogued	4.8		
36	6104 - 6	Small	?	4	Good	2.2	1.3	6.6	3.0	
37	6112 -16	Large	Cream	5	Poor	3.2	Rogued	9.3		
38	6119 -14	Large	Violet	8	Good	4.1	2.3	11.4	5.5	
39	6120-- 8	Large	Pink	18	Good	3.9	2.1	12.3	9.3	
40	6124 -17	Large	Lt.Blue	10	Fair	2.7	2.5	8.4	5.0	
41	6124 -20	Large	Lt.Blue	18	Fair	3.9	2.3	10.5	8.8	
42	6127 - 3	Large	Violet	7	Fair	2.9	2.2	6.9	5.0	
43	6127 -18	Large	White	3	Fair	3.3	2.7	10.6	10.0	
44	6128 - 6	Large	Violet	3	Good	2.6	1.3	8.9	6.4	
45	6130 - 4	Med.	Pink	3	Good	2.6	2.4	6.6	9.2	
46	6143 -18	Med.	Violet	6	Good	2.2	.25	7.9	1.2	
47	6146	Med.	Yellow	1	Fair	2.2	1.2	7.3	4.4	
48	6152 -15	Med.	Cream	6	Poor	3.5	1.8	6.9	3.8	
49	6167 - 5	Large	White	4	Fair	4.1	5.9	9.4	15.7	
50	6167 - 7	Large	White	5	Poor	3.8	1.4	8.9	4.3	
51	6167 - 9	Large	Cream	6	Poor	4.2	1.1	10.4	2.4	
52	6191 -18	Med.	Cream	8	Good	3.1	1.8	No.Lost	4.9	
53	6192 - 1	Med.	Cream	5	Fair	3.2	2.8	8.2	6.0	
54	6192 -27	Med.	Pink	6	Good	3.2	1.8	10.3	7.0	
55	A-483 - 6	Large	Cream	10	Good	4.0	4.2	8.2	11.5	
56	A-483 -13	Large	Cream	8	Good	4.1	3.3	7.8	10.1	
57	B-1639	Large	Violet	8	Good	5.2		17.5		Red
58	P.51.1.53-15	Large	Cream	10	Good	3.2	4.5	5.9	6.5	
59	Neb.143-50-2	Large	Purple	12	Good	4.1	2.9	7.1	7.3	Red
60	P.50.3.52- 9	Large	Cream	4	Good	2.2	1.0	5.7	3.7	

[1] Two hill sample to indicate early growth.
[2] Tubers white or russett unless red color indicated.

KS
CWR

42

TITLE: Farm Flock

PROJECT: 5029

LOCATION: Northwestern Montana Branch Station

Work done and results are discussed below:

The station farm flock utilizes creek bottom pasture and other surplus feeds and forages in the production of marketable products; wool, lambs and breeding stock. It permits exploration of certain flock management practices that may be useful to other flock owners. It provides the animal units needed for grazing experimental pasture plots.

On January 1, 1964 the flock contained 18 Registered Columbia ewes, 6 grade Columbia ewes, 10 crossbred ewes, and 18 ewe lambs for a total of 52 females and 2 rams.

Receipts from sales during 1964 were as follows:

Wool (315.3 lbs. clean basis)	$ 344.32
Wool payments	114.53
Lambs (32)	473.53
Ewes (12)	285.00
Total	1190.38
Per ewe (52)	22.89

On hand January 1, 1965 are the same number (52) females, 12 are Registered, 8 are grade or Purebred Columbia not registered and 20 are crossbred ewes, making a total of 40 one year and over, plus 12 ewe lambs. Three ram owned by the station are on hand January 1, 1965.

Wool receipts and receipts from ewe sales are quite comparable to those in 1963, but total receipts are down nearly $5.00 per ewe under 1963 because of fewer in 1964. The percentage of lambs weaned in 1964 based on ewes over one year was 129% compared to 175% in 1963. Ewes that lambed normally in 1964 have been vaccinated for Vibrio in an attempt to reduce 1965 losses.

Selection:

Young Columbia breeders were supplied with 6 Registered Columbia ewes, and 6 grade or crossbred ewes were sold while maintaining the flock size by keeping 12 ewe lamb replacements. The average three year wool equivalent index (lbs wool + $\frac{1}{4}$ of lbs of weaned lamb $\div$ 3) for those in the flock with three years of record is 28.1. Our goal is a flock average of 30, which a ewe could earn by shearing 36 lbs of wool and weaning 216 lbs of lamb by the end of her third summer. Our best three year index in the flock at present is 36.4.

Selection in the crossbred flock is on the basis of breeding habit. Disirable Dorcet-Columbia ewe lambs are kept for summer breeding as yearlings and those producing fall lambs and all their fall born female projeny retained. One such Dorcet-Columbia crossbred was found and with her fall born female projeny we now have five. One of these had two lambs in 1964, one in March (which was lost) and another in September. As numbers increase the production index method of selection can be applied to this flock. If we are successful in increasing lamb production by lambing on a 9 months schedule without any considerable loss in value of wool the aver-

age index for this flock should be higher than for the Columbia flock.

Self Feeding of Early Weaned Lambs:

Twenty-one lambs weaned at 3-4 months of age weighing an average of 74.3 lbs, full less 4% shrink, were placed on a self fed ration. Nineteen were wethers, one a ewe with horns and one a ram lamb that was castrated when placed on feed. This lamb made no gain during the period which reduced the group average. There were no losses. After 34 days on feed the average weight (full less 4% shrink) was 92.1 lbs, the average gain 17.8, the average daily gain .5235. This is somewhat less than during the previous two summer feeding trials but still quite satisfactory considering the circumstances:

1. No losses
2. Little work, just keep feed in bunks.
3. Gains figured frm weaning day to sale day.
4. Gain cost less than sale price.

The ration used was equal parts by weight of whole oats, whole barley, and dry beet pulp. Whole alfalfa was fed sparingly once a day. Salt, fresh water, and shade provided continuously.

Table 1, presents a summary of feed costs and gains.

Columbia--Crossbred Comparison:

The wether lambs in the self feeding trial were of varied breeding, and Table 2 summarizes the gain by breed. Numbers are too small and too variable to reach any definite conclusions so this is included only as a matter of interest. The three breed crosses made the least average gain and (for the first time in three years) the Columbia lambs made the best average gain in this years trial.

Plans:

Unless in 1965 there is some indication of superiority of three breed crosses over one breed lambs or two breed crosses the three bred crosses will be dropped. Unless superior sires of the Polled Dorcet breed can be obtained or raised and made available to Montana sheepmen it seems pointless to continue making the Dorcet-Columbia cross. More real flock improvement may result if work at Northwestern Branch is limited to fewer objectives.

If a real good foundation Polled Dorcet flock could be obtained Northwestern would be agreeable to concentrating on its increase, improvement and distribution. Otherwise, after 1965 concentrate on improvement of the Registered Columbia flock as the major immediate objective. A second objective which might in time become the major one is to increase the flock with off-season breeding habit from the present five to fifty or whatever the station can accomodate, while making a through study of management and possible advantages of producing a lamb crop every nine months.

Table 1. Feed weights, Lamb weights, Gains and Costs for Self-fed Lambs in 1964.

FEED:

Alfalfa hay	500#	@	$20.00 T	$ 5.00
Whole Oats	700#	@	40.00 T	14.00
Whole Barley	700#	@	40.00 T	14.00
Dry Beet Pulp	700#	@	60.00 T	21.00
Salt	10#	@	2½¢ Lb.	.25
			Total Feed Cost	$54.25

LAMB WEIGHTS:

21 lambs	8/31	minus 4%	1934
21 lambs	7/28	minus 4%	1560
		Total Gain	374
		Average gain per lamb	17.8
		Average gain per lamb per day	.5235

COST OF GAIN:

Total feed cost	$54.25
Cost per lamb average	$ 2.58
Cost per pound of gain	$ .145
Sale price per pound	$18.15 cwt.

Table 2. Comparison of feedlot gain by breeds,19 wethers in 1964

Breed	No.	Total	Average	HDG	Range
C S D	3	50	16.66	.49	.32 to .68
½ D	7	139	19.86	.58	.38 to .68
¼ D	3	52	17.33	.51	.24 to .79
Columbia	5	103	20.6	.61	.41 to .82
3/4 D	(1)	.25	25	.735	.74

PART II

1964

Annual Research Report

Northwestern Montana Branch

of the

Montana Agricultural Experiment Station

Kalispell, Montana

by

Vern R. Stewart

Associate Agronomist

YEAR: 1964

TITLE: Fertilizer Investigations

LOCATION: Northwestern Montana Branch Station
Clifford Haines Farm - 8 miles east of Kalispell

PERSONNEL: Leader - Vern R. Stewart

DURATION: Indefinite

OBJECTIVES:

1. To determine the effect of nitrogen and phosphorus on yield of small grains and the protein content.
2. To determine the effectiveness of commercial fertilizer on dwarf essex rape.

EXPERIMENTAL DESIGN AND PROCEDURE:

All studies were of field type. Field machinery was used in all operations of both the spring and winter annual studies. Yields were obtained with a combine. In the winter annual yields were calculated on the basis of weight of the entire plot.

The spring wheat yields were obtained from random samples, taken with the combine. An analysis of variance was used in measuring differences.

RESULTS & DISCUSSION:

Table 1 presents data obtained from several crops with various fertilizer applications.

Comparisions can be made between Delmar, Gaines and Westmont which had similar fertilizer applicatins, in fields R 2c, R 3c, and R 4c. Delmar was the highest yielding in the comparison.

A comparison between Gaines and Westmont in fields R 7c and R 8c can be made. In this comparison Gaines out yielded Westmont by 23.2 bushels per acre.

Barley yields were low because of snow mold damage in the winter,reducing the stand up to 50% in some areas.

Yields in Table 2 are from a comparison of high rates of commercial fertilizer on Gaines and Westmont winter wheat. Yield differences are great in this study. Most of the effect is from a sever rust infestation and sever lodging of the variety Westmont. This can be seen by the test weight which is very low.

Fertilizer formulations were found to have little or no difference on yield of spring wheat when they are compared. See Table 3. These data indicate the need for fertilizers but no significant difference due to formulations.

FUTURE PLANS:

The fertilizer program in the future will be carried by Mr. Graham. The author will continue a general fertilizer program for fields to maintain high yields on the station.

SUMMARY:

Adequate fertility is necessary to obtain high yields of small grains and winter annuals.

Table 1. Yield of field crops in rotation R.

Field Number	Number Acres	Type	Rate/A	N1	P	K	Crop	Variety	Yield per Acre	Bu. Wt. in Lbs.
R1c	2.45	0- 0- 0	0	0	0	0	Wheat	Delmar	48.4 bu	
R1b	2.45	13-13-13	200	26.0	11.4	21.6	Oats	Park	3024 lbs.	
R2c	2.82	16-20- 0 33.5- 0- 0	146 150	23 50	12.8 0	0 0	Wheat	Gaines	50.3 bu.	60.0
R3c	3.18	16-20- 0 33.5- 0- 0	146 150	23 50	12.8 0	0 0	Wheat	Westmont	41.3 bu.	60.0
R4c	3.30	16-20- 0 33.5- 0- 0	146 150	23 50	12.8 --	0 -	Wheat	Delmar	55.4 bu.	
R5c	3.30	13-13-13	200	26	11.4	21.6	Barley	Olympia	49.1 bu.	48.0
R6c	3.30	13-13-13	200	26	11.4	21.6	Rape	Dwarf-Essex	1803 lbs.	
R7c	3.10	23-23- 0	260	60	26.3	0	Wheat	Gaines	55.3 bu.	60.0
R8c	2.82	23-23- 0	260	60	26.3	0	Wheat	Westmont	32.1 bu.	60.0

Table 2. Yield from a comparisinn of Gaines and Westmont grown under conditions of high moisture and fertility.

X-3	16-20- 0 33.5- 0- 0	200 182	32 61.3	17.6 0	0 0	Wheat	Westmont	23.1	54.0
X-3	16-20-0 33.5- 0- 0	16.20 33.5- 0- 0	200 182	32 61.3	0 0	Wheat	Westmont	66.9	57.0

Table 3. Yield and Protein data from a fertilizer study conducted on the Haines Brothers farm, Route 4, Kalispell, Montana.

Date Planted: May 8, 1964 Date Harvested: September 29, 1964
Size of Plot: 637.5 sq. ft.

Treatment Rate/A N	P	S	Plot yields in pounds I	II	III	IV	Total Pounds	Yield Bu/A	Protein
58.5	25.8	0	34.0	32.5	39.0	46.0	151.5	43.0**	13.6
51.2	11.8	0	35.0	32.0	45.5	41.0	153.5	43.7**	11.9
58.6	11.5	8	35.0	34.5	47.5	41.0	158.0	45.0**	12.4
0	0	0	18.5	18.5	23.5	19.5	80.0	22.8	13.5

** Treatments yielding significantly more than the check (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	86.39583	8.62**
Treatment	3	347.1875	34.64**
Error	9	10.02083	
Total	15		

$\bar{x}$.....	38.7
S.E.$\bar{x}$.....	1.80205
L.S.D.(.05)	5.8
L.S.D.(.01)	8.3
C.V.%.....	4.66

YEAR: 1964

TITLE: Weed Investigations 5021

LOCATION: Northwestern Montana Branch Station. Field No. R-4, R-8 and the Zito Farm, Corvallis, Montana

PERSONNEL: Leader - Vern R. Stewart
Members of the Weed Research Committee and industry research personnel.

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 deletarious effect on wheat yield.
2. To determine what herbicides will effectively control weeds in sugar beets and further measure the effect of these herbicides on the sugar beet plant.

EXPERIMENTAL DESIGN AND PROCEDURES:

Thirteen herbicides alone and in various combinations were evaluated as to their effectiveness in winter wheat and sugar beets.

Two studies on winter wheat were conducted. One was a constant rate study, the second a logarithmic evaluation. Both were conducted on the weed, field gromwell. The constant rate plots were 10 feet wide and 20 feet long. The logarithmic plots were 10 feet wide and 60 feet long. Materials in these two studies were applied in a water solution with a research type sprayer. All treatments were post emergence.

The sugar beet study was conducted with field equipment. The herbicide was applied, incorporated in the soil and the beets seeded in one operation.

RESULTS AND DISCUSSION:

Chemical Control of Field Gromwell(Lithospernium arvense) in winter wheat.

TRIAL I

Fall application of herbicides were made in this study. The fall application of the herbicides was made when the wheat was in the five leaf stage and gromwell in the three leaf stage. Spring applications were made when the wheat was well tillered and gromwell in the rosette stage. Climatic condition at the time of application are given in tabular form below. All materials were applied in 54.4 gallons of water with a research type sprayer.

Generally the higher rate of any material used gave the most effective weed control. Two pounds of 2,4-D LV4 gave 90% control of gromwell. Seventy to 80% control was obtained with the one pound rate of the other herbicides used, the exception being, 2,4-D amine and the 1.00 pound rate of ioxynil applied in the spring.

The highest yield of grain was obtained from the treatment of .50 pounds of ioxynil with a surfactant of 64.6 bushels per acre and 70% weed control. This is not significantly different from the 1.00 treatment with the surfactant. Yield 60.9 bushels per acre and 80% weed control. Table 1.

A comparison is made between spring and fall applications of ioxynil. In all cases the oil soluable amine was most effective when applied in the spring using a surfactant at 2% by volume. A wetable powder at 1 pound applied in the fall was equal to the spring applications of ioxynil with a surfactant. Table 2.

The lower rates of ioxynil are not as effective in weed control. In the ioxynil treatments , as the weed control decreased, the yield also increased. With the 2,4-D formulations at the higher rates the yields were decreased as the weed control increased. Table 1.

TRIAL II

The log plot contained 20 treatments. The rates and combination of herbicides are given in Table 3. Yield data was obtained at 2, 20, 40 and 60 foot points. The half distance rate in the study was 20 feet. Weed scores were secured at harvest time and are found in Table 4.

No yield pattern by treatments can be found in these data, however, it is noted that the yield percentage in relationship to the check is less than a 100% at the 2 foot harvest point, however, this is also true of the 60 foot point.

Spraying of these plots was done when the wheat was jointing and the gromwell was in the bloom. This no doubt accounts for the lack of control. Previous work by the author has shown the gromwell is best controlled when sprayed in the rosette stage of growth. In almost all treatments the gromwell recovered from herbicidial injury and recovered and showed little or no sign of injury later in the growing season. See Table 3 and 4.

Chemical weed control in sugar beets.

The 1964 sugar beet weed control plots were constant rate plots and approximately $\frac{1}{2}$ acre in size. These were located in Ravalli County on the Zito Brothers farm near Corvallis. The soil type is classified as Corvallis silt loam, slighty saline.

Counts of weeds and beet plants were made just pior to blocking and thinning (by hand) when the beets had four true leaves. Two major weed species were found in this field, namely, lambs quarter (Chenopoduim album) and night shade (Solanum spp.). The weed population was quite low in this field. The night shade population somewhat higher than the lambs quarter population. The best control of lambs quarter was with pyramin and the combination of pyramin and CP 32179. The best control of night shade was obtained with pyramin at the four pound rate per acre. CP 32179 was effective in the control of both night shade and lambs quarter, but caused considerable injury to the sugar beet plants, including a reduction in stand. The 4 and 8 pound rates of pyramin gave up to 50 percent reduction in the night shade population, also 3 pounds pyramin plus TD 202 at $1\frac{1}{2}$ pounds per acre. See Table 5 and 6.

Yields and sugar contents are found in Table 7. The yields when analyzed statistically were found to be non-significant. However, close examination of these data indicate a reduction in beet stand resulted in a reduction in yield, namely the CP 32179 treatment.

Table 8, shows a summary of all data.

Climatic, cultural and spraying information are presented in tabular form as pertains to the weed study on sugar beets.

Date of application	April 22, 1964
Volume of H_2O	20 gallons per acre
Nozzle Size	
Air Temperature	42° F
Soil Temperature	X
Relative Humidity	100%
Wind Volicity	Calm
Cloud Cover	Cloudy and Raining
Soil Type	Corvallis Silt Loam, slightly saline
Type of Incorporation	Hoe Type Machine
Depth of Incorporation	$1\frac{1}{2}$ to 2 inches
Soil Moisture	Excellent
Date of Emergence	May 10 (approximately)
Type of Thining	Hand
Date of Thining	June 2, 1964

FUTURE PLANS:

Work will be continued on sugar beets, field gromwell and field bindweed.

SUMMARY:

1. Ioxynil shows promise as a fall application to control field gromwell in winter wheat.
2. One pound per acre of low volatile ester of 2,4-D applied in the spring when gromwell is quite small (Rossette stage) will give effective control of this weed. Higher rates tend to decrease yield of winter wheat.
3. Pyramin was quite effective in the control of night shade alone and in combination with other herbicides.

TABLE 1. The effect of certain herbicides on field gromwell (Lithospernium arvense) in winter wheat, at Creston, Montana in 1964.

Treatment	Rate #/A	Application Date	Weed Score 1-10[3]	Grams per Plot I a	I b	II a	II b	III a	III b	Total Grams	Average Yield Bu/A	Remarks
Check	0.00		0	285	240	435	416	370	305	2051	52.1	
2,4-D amine	2.00	4-24-64	8	364	316	380	339	210	388	1997	50.7	
2,4-D amine	1.00	4-24-64	4	360	310	440	390	460	349	2309	58.7	
Ioxynil (62-70)	1.00	10-31-63	7	385	324	440	435	400	403	2387	60.6	
Ioxynil (62-70)	.50	10-31-63	2	374	231	389	304	326	190	1814	46.1	Weeds growing, Look undamaged.
Ioxynil (62-70)	.25	10-31-63	1	305	375	255	350	400	360	2045	51.9	" " " "
Ioxynil (62-70)	1.00	4-24-64	5	355	290	482	265	330	310	2032	51.6	" " " "
Ioxynil (62-70)	.50	4-24-64	3	335	250	380	374	190	210	1739	44.2	" " " "
Ioxynil (62-70)	.25	4-24-64	2	339	345	305	200	250	285	1724	43.8	
Ioxynil (62-177)	1.00	10-31-63	7	315	401	390	366	490	394	2356	59.8	Wheat short, Reduction in stand.
Ioxynil (62-177)	.50	10-31-63	6	416	402	432	260	384	365	2259	57.4	Reduction in stand.
Ioxynil (62-177)	.25	10-31-63	3	430	374	264	280	330	460	2138	54.3	
Ioxynil (62-177)	1.00	4-24-64	7	425	389	350	340	389	375	2268	57.6	Wheat shorter.
Ioxynil (62-177)	.50	4-24-64	5	435	430	300	320	359	324	2168	55.1	
Ioxynil (62-177)	.25	4-24-64	2	405	285	365	305	339	235	1934	49.1	
Ioxynil (62-70)[1]	1.00	10-31-63	7	385	320	275	359	355	405	2099	53.3	Stand reduction.
Ioxynil (62-70)[1]	.50	10-31-63	8	345	331	240	310	290	340	1856	47.1	" "
Ioxynil (62-70)[1]	.25	10-31-63	6	405	465	385	275	430	315	2275	57.8	" "
Ioxynil (62-70)[1]	1.00	4-24-64	8	464	426	395	350	446	315	2396	60.9	
Ioxynil (62-70)[1]	.50	4-24-64	7	375	455	476	380	469	388	2543	64.6	Growing weed undamaged
Ioxynil (62-70)[1]	.25	4-24-64	4	294	415	199	280	325	335	1848	46.9	
2,4-D LV 4D[2]	2.00	4-24-64	9	415	405	231	355	275	160	1841	46.8	Wheat leaf burning.
2,4-D LV 4D[2]	1.50	4-24-64	9	276	275	376	305	417	220	1869	47.5	
2,4-D LV 4D[2]	1.00	4-24-64	8	456	385	515	300	375	245	2276	57.8	

[1] With surfactant 2% by volume
[2] Diamand.
[3] 0 no control - 10 complete control

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TABLE 1. (con't)

Spraying and Climatic Information

Date	10/31/63	4/24/64
Groundspeed	2½ mile/hour	2½ mile/hour
Volume H_2O	54.4 gal/A.	54.4. gal/A.
Nozzle Size	8004 Tejet	8004 Tejet
Air Temperature	40° F	52° F
Soil Temperature	X	X
Relative Humidity %	X	X
Wind Volicity	X	0-4 mile/hour
Cloud Cover	Cloudy	Partly cloudy
Soil Type	Creston Sandy Loam	Creston Sandy Loam

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	6798.67000	1.77
Treatment	23	8989.31260	2.35*
Treatment x Rep.	46	5291.07304	1.38
Error	72	3830.00000	
Total	143		

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Table 2. Yield and weed score data from field gromwell study conducted at Kalispell, Montana in 1963-1964 (Fall vs Spring treatments)

Treatment	Date	Rate #/A	Weed Score 0-10	Yield Bu/A
Ioxynil (62-70)	Fall	.25	1	51.9
" "	Spring	.25	2	43.8
Ioxynil (62-70)	Fall	~~.05~~.50	2	46.1
" "	Spring	~~.05~~.50	3	44.2
Ioxynil (62-70)	Fall	1.00	7	60.6
" "	Spring	1.00	5	51.6
Ioxynil (62-70)[1]	Fall	.25	6	57.8
" "	Spring	.25	4	46.9
Ioxynil (62-70)[1]	Fall	.50	8	47.1
" "	Spring	.50	7	64.6
Ioxynil (62-70)[1]	Fall	1.00	7	53.3
" "	Spring	1.00	8	60.9
Ioxynil 177	Fall	.25	3	54.3
" "	Spring	.25	2	49.1
Ioxynil 177	Fall	.50	6	57.4
" "	Spring	.50	5	55.1
Ioxynil 177	Fall	1.00	7	59.8
" "	Spring	1.00	7	57.6
Check			0	52.1
2,4-D amine	Spring	1.00	4	58.7
" "	Spring	2.00	8	50.7
2,4-D LV 4D	Spring	1.00	8	57.8
" " "	Spring	1.50	9	47.8
" " "	Spring	2.00	9	46.8

[1] Surfactant, 2% by volume.

Table 3. Yield data from a log plot weed control study on Winter Wheat at Creston, Montana in 1964. Field R-8c.

Date Seeded: September 18, 1963 Date Harvested: September 9, 1964 Size of Plot: 10.5 sq.ft.

Herbicide	Variable Starting Rate #/A	Constant Rate #/A	Replication	Grams per Plot 2	20	40	60	Remarks
Ioxynil	2		1	288	165	361	290	Burned tip of grain. Browned some gromwell plants up to 30 feet. No control of mustard.
			2	165	385	336	415	
			Total	453	550	697	705	
			$\bar{x}$ Bu/A	34.5	41.9	53.1	53.7	
			% of Check	89	121	133	91	
Ioxynil		½	1	355	325	446	331	No apparent control or effect on winter wheat
MCPP	2		2	90	365	305	315	
			Total	445	690	751	646	
			$\bar{x}$ Bu/A	33.9	52.6	57.2	49.2	
			% of Check	87	152	143	83	
Ioxynil		½	1	231	285	325	383	Some injury to gromwell to 30 ft. other broad leaves controled.(Fan Weed)
2,4-D amine			2	76	308	305	405	
			Total	307	593	630	788	
			$\bar{x}$ Bu/A	23.4	45.2	48.0	60.0	
			% of Check	60	130	120	102	
Ioxynil		½	1	255	205	375	365	No apparent control
2,4-DP	3		2	100	85	310	290	
			Total	355	290	685	655	
			$\bar{x}$ Bu/A	27.0	22.1	52.2	49.9	
			% of Check	69	64	131	84	
Ioxynil		½	1	435	276	345	327	Some injury of gromwell to 20 ft. No significant control, slight injury to fan weed.
MCPA	3		2	302	385	275	415	
			Total	737	661	620	742	
			$\bar{x}$ Bu/A	56.2	50.4	47.3	56.6	
			% of Check	145	145	118	96	

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Table 3 . (con't)

Herbicide	Variable Starting Rate #/A	Constant Rate #/a	Replication	Grams per Plot 2	20	40	60	Remarks
Ioxynil		½	1	295	240	477	385	Noticeable effect across total plot, of
Dicamba	1		2	170	185	350	421	gromwell injury. Small gromwell plants
			Total	465	425	827	806	more effected. Fan weed control, no
			$\bar{x}$ Bu/A	35.4	32.4	63.0	61.4	apparent injury to winter wheat.
			% of Check	91	93	158	104	
Dicamba	1		1	360	260	415	404	Gromwell injured to 10 feet. Some
			2	316	330	335	395	effect to 60 feet but no control.
			Total	676	590	750	799	
			$\bar{x}$ Bu/A	51.5	45.0	57.2	61.0	
			% of Check	132	130	143	103	
Dicamba		1/8	1	396	245	360	400	Slight injury to gromwell across plot.
2,4-D amine	2		2	325	305	415	365	Similar at beginning and ending points.
			Total	721	550	775	765	
			$\bar{x}$ Bu/A	54.9	41.9	59.1	58.3	
			% of Check	141	121	148	99	
Dicamba		1/8	1	460	276	140	325	Sever injury up to 20 feet. Noticeable
MCPA	3		2	215	415	315	440	injury across entire plot. Somewhat
			Total	675	691	455	765	more injury at 60 feet than at 40 ft.
			$\bar{x}$ Bu/A	51.4	52.7	34.7	58.3	
			% of Check	132	152	87	99	
Dicamba		1/8	1	299	250	255	292	Little injury, but some at the 60 foot
2,4-DP	3		2	85	70	365	432	point.
			Total	384	320	620	724	
			$\bar{x}$ Bu/A	29.3	24.4	47.3	55.2	
			% of Check	75	70	118	93	

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Table 3 . (con't)

Herbicide	Variable Starting Rate #/A	Constant Rate #/A	Replication	Grams per Plot 2	20	40	60	Remarks
TD 440	2		1	430	225	390	300	Some injury of gromwell up to 24 feet, noticeable effect across the plot. No control of fan weed.
			2	305	395	331	475	
			Total	735	620	721	775	
			$\bar{x}$ Bu/A	56.0	47.3	54.9	59.1	
			% of Check	144	136	137	100	
Dacamine	2		1	340	400	450	325	Sever injury to gromwell across the plot. Noticeable effect across the plot.
			2	110	295	280	300	
			Total	450	695	730	625	
			$\bar{x}$ Bu/A	34.3	53.0	55.6	47.6	
			% of Check	88	153	139	81	
2,4-D amine	2		1	244	285	465	410	Similar to Dacamine plot listed above.
			2	80	411	260	310	
			Total	324	696	725	720	
			$\bar{x}$ Bu/A	24.7	53.0	55.3	54.9	
			% of Check	64	153	138	93	
2,4-D LV-4	2		1	205	270	324	400	Control to 12 feet, some injury beyoni this point to gromwell.
			2	125	241	395	420	
			Total	330	511	719	820	
			$\bar{x}$ Bu/A	25.1	38.9	54.8	62.5	
			% of Check	64	112	137	106	
Dacamine		½	1	220	160	290	340	Some injury to gromwell the length of the plot.
			2	180	429	366	435	
			Total	400	589	656	775	
			$\bar{x}$ Bu/A	30.5	44.9	50.0	59.1	
			% of Check	78	129	125	100	

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Table 3 . (con't)

Herbicide	Variable Starting Rate #/A	Constant Rate #/A	Replication	Grams per Plot 2	20	40	60	Remarks
2,4-D amine		½	1	170	298	446	330	Little or no control.
			2	90	365	305	315	
			Total	260	663	751	645	
			$\bar{x}$ Bu/A	19.8	50.5	57.2	49.2	
			% of Check	51	146	143	83	
Check	0	0	1	300	225	265	376	Check
			2	210	230	260	400	
			Total	510	455	525	776	
			$\bar{x}$ Bu/A	38.9	34.7	40.0	59.1	
Ioxynil		½	1	330	290	297	375	No control
			2	205	393	235	445	
			Total	535	683	532	820	
			$\bar{x}$ Bu/A	40.8	52.1	40.5	62.4	
			% of Check	105	150	101	105	
Ioxynil		2	1	255	240	200	388	Some burning of both wheat and
			2	170	285	326	336	gromwell, but no apparent control.
			Total	425	525	526	724	
			$\bar{x}$ Bu/A	32.4	40.0	40.1	55.2	
			% of Check	83	115	100	93	
Average of all percentages				94.37	126.22	128.83	95.28	

Spraying and Climatic Information

Date Applied	5/19/64	Soil Temperature	X
Ground Speed	2½ mile per hour	Relative Humidity	35%
Volume H_2O	54.4 gal per acre	Wind Volicity	3½-6 miles per hour
Nozzle Size	8004 Tejet	Cloud Cover	Clear
Air Temperature	82° F.	Soil Type	Creston Sandy Loam

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Table 4. Weed score from herbicide study to control field gromwell in winter wheat. Creston, Montana in 1964. Field No. R 8c.

Date Seeded: Sept. 18, 1963 Date Harvested: September 9, 1964

Size of Plot: 10.5 sq. ft.

Herbicide	Variable Starting Rate #/A	Constant Rate #/A	Replication	Weed Score 0-10[1] 2	20	40	60
Ioxynil	2		1	0	0	0	2
			2	1	4	6	1
			Total	1	4	6	3
			$\bar{x}$	1.5	2.0	3.0	1.5
Ioxynil MCPP	2	½	1	0	0	0	1
			2	3	8	3	3
			Total	3	8	3	4
			$\bar{x}$	1.5	4.0	1.5	2.0
Ioxynil 2,4-D amine		½	1	1	1	0	0
			2	2	4	4	2
			Total	3	5	4	2
			$\bar{x}$	1.5	2.5	2.0	1.0
Ioxynil 2,4-DP	3	½	1	0	0	0	0
			2	0	0	5	3
			Total	0	0	5	3
			$\bar{x}$	0	0	2.5	1.5
Ioxynil MCPA	3	½	1	1	0	0	1
			2	1	0	2	5
			Total	2	0	2	6
			$\bar{x}$	1.0	0	1.0	3.0
Ioxynil Dicambe	1	½	1	2	0	1	0
			2	0	0	4	8
			Total	2	0	5	8
			$\bar{x}$	1.0	0	2.5	4.0
Dicamba	1		1	0	0	1	0
			2	0	5	2	6
			Total	0	5	3	6
			$\bar{x}$	0	2.5	1.5	3.0
Dicamba 2,4-D amine	2	1/8	1	2	1	1	1
			2	6	0	5	0
			Total	8	1	6	1
			$\bar{x}$	4.0	.5	3.0	.5
Dicambe MCPA	3	1/8	1	4	1	0	0
			2	2	7	2	4
			Total	6	8	2	4
			$\bar{x}$	3.0	4.0	1.0	2.0
Dicambe 2,4-DP	3	1/8	1	3	0	0	0
			2	0	0	6	7
			Total	3	0	6	7
			$\bar{x}$	1.5	0	3.0	3.5

Table 4 . (con't)

Herbicide	Variable Starting Rate #/A	Constant Rate #/A	Replication	Weed Score 0-10[1] 2	20	40	60
TD 440	2		1	5	6	1	0
			2	1	2	1	1
			Total	6	8	2	1
			$\bar{x}$	3.0	4.0	1.0	0.5
Dacamine	2		1	2	3	0	0
			2	0	6	5	1
			Total	2	9	5	1
			$\bar{x}$	2	4.5	2.5	0.5
2,4-D amine[1]	2		1	0	1	1	0
			2	2	2	7	0
			Total	2	3	8	0
			$\bar{x}$	1.0	1.5	4.0	0
2,4-DLV-4	2		1	0	4	1	0
			2	1	2	6	8
			Total	1	6	7	8
			$\bar{x}$	.5	3.0	3.5	4.0
Dacamine		½	1	0	1	0	0
			2	0	0	2	2
			Total	0	1	2	2
			$\bar{x}$	0	.5	1.0	1.0
2,4-D amine		½	1	2	0	0	0
			2	3	8	3	3
			Total	5	8	3	3
			$\bar{x}$	2.5	4.0	1.5	1.5
Check	0	0	1	0	0	0	0
			2	5	0	7	0
			Total	5	0	7	0
			$\bar{x}$	2.5	0	3.5	0
Ioxynil		½	1	0	0	0	1
			2	5	0	7	0
			Total	5	0	7	1
			$\bar{x}$	2.5	0	3.5	.5
Ioxynil		2	1	0	1	0	7
			2	1	0	3	6
			Total	1	1	3	13
			$\bar{x}$	.5	.5	1.5	6.5

[1] 0-10
0 - No control
10 - Complete control

Table 5. Weed counts in sugar beet weed study on the Zito Farm, Corvallis, Montana in 1964. Weeds counted in 4" band, 50 inches long, in 8 locations in the plots.

Treatment	Rate #/A Acid	Lambs quarter a	b	c	d	$\bar{x}$	Night shade a	b	c	d	$\bar{x}$
Rep. I											
1 Check	0	0	3	2	5	2.5	1	4	28	13	11.5
2 Pyramin	4	1	0	0	1	.5	0	10	2	8	5.0
3 Pyramin	8	0	0	1	0	.2	0	3	0	1	1.0
4 Pyramin + CP32179	3 +1	3	0	0	0	.8	0	3	4	19	6.5
5 Pyramin + TCA	3 +5	0	2	1	0	.8	3	2	16	10	7.7
6 Pyramin + TD 282	3 +1½	2	3	0	1	1.5	0	4	2	1	2.2
7 Pyramin + Tillam	3 +1½	0	1	1	0	.5	2	7	18	2	7.2
8 Tillam	3	0	2	1	0	.8	3	14	6	7	7.5
9 Avadex + Tillam	1½+2½	2	1	2	0	1.2	2	7	4	5	4.5
10 CP 32179	2	1	0	1	0	.5	1	6	3	2	3.0
Rep. II											
11 Pyramin + CP32179	3 +1	0	0	1	0	.2	0	1	1	18	5.0
12 Pyramin + TD 282	3 +1½	0	4	0	0	1.0	11	4	4	4	5.7
13 Pyramin + Tillam	3 +1½	2	3	1	1	1.7	0	2	2	10	3.5
14 Pyramin	4	0	3	0	4	1.7	6	12	3	3	6.0
15 Check	0	2	2	0	9	3.2	6	4	4	9	5.7
16 Pyramin	8	1	2	0	0	.7	0	16	2	5	5.7
17 Avadex + Tillam	1½+2½	1	4	1	0	1.5	0	4	13	4	5.2
18 Tillam	3	0	3	1	0	1.0	1	4	7	4	4.0
19 CP 32179	2	0	0	0	0	0.0	0	3	7	8	4.5
20 Pyramin + TCA	3 +5	2	1	0	0	.7	0	11	12	8	7.7

Summary		Reps. I	II	$\bar{x}$	Reps. I	II	$\bar{x}$
Check	0	2.5	3.2	3.0	11.5	5.7	8.6
Pyramin	4	.5	1.7	1.1	5.0	6.0	5.5
Pyramin	8	.2	.7	.5	1.0	5.7	3.3
Pyramin + CP 32179	3 +1	.8	.2	.5	6.5	5.0	5.7
Pyramin + TCA	3 +5	.8	.7	.7	7.7	7.7	7.7
Pyramin + TD 282	3 +1½	1.5	1.0	1.3	2.2	5.7	3.9
Pyramin + Tillam	3 +1½	.5	1.7	1.1	7.2	3.5	5.3
Tillam	3	.8	1.0	.9	7.5	4.0	5.7
Avadex + Tillam	1½+2½	1.2	1.5	1.8	4.5	5.2	4.8
CP 32179	2	.5	.0	.3	3.0	4.5	3.7

Analysis of Variance		(Lambs quarter)		(Night shade)	
Source	D.F.	Mean square	F.	Mean square	F.
Replication	1	1.5125		1.25	
Treatment	9	4.3125	1.95	23.08333	
Interaction	9	.90138		22.97222	
Error	60	2.20416		32.67333	
Total	79				

Table 6. Beet plant counts in a 4 inch band, 50 inches long, grown on the Zito Brothers farm, Corvallis, Montana in 1964.

Date Seeded: April 22, 1964 Date Harvested: October 3, 1964

Treatment	Rate #/A	Rep. I a	Rep. I b	Rep. I c	Rep. I d	Rep. II a	Rep. II b	Rep. II c	Rep. II d	Average # Plants
Check	0	4	10	12	14	12	13	16	22	12.9
Pyramin	4	2	4	20	19	14	17	21	14	13.9
Pyramin	8	5	6	12	13	9	17	20	12	11.8
Pyramin + CP32179	3 +1	3	12	32	19	2	6	13	15	12.8
Pyramin + TCA	3 +5	5	25	17	16	8	14	16	21	15.3
Pyramin + TD 282	3 +1½	18	12	18	30	14	12	20	23	18.4
Pyramin + Tillam	3 +1½	17	8	14	14	12	18	14	27	15.5
Tillam	3	18	13	18	16	7	12	16	26	15.8
Avadex + Tillam	1½+2½	20	8	15	20	10	15	14	14	14.5
CP 32179	2	16	6	17	15	4	2	8	14	10.3

Analysis of Variance

Source	D.F.	Mean Square	F.
Blocks	1	.05.	
Treatment	9	42.80139	
Interaction	9	49.54167	1.28
Error	60	38.42167	
Total	79		

Table 7. Yield and sugar content of beets from the weed study grown on the Zito farm, Corvallis, Montana in 1964.

Date Seeded: April 22, 1964 Date Harvested: October 31, 1964

Treatment	Rate #/A	Yield Tons per Acre I	Yield Tons per Acre II	Yield Tons per Acre Total	$\bar{x}$	% Sugar Content
Pyramin	8	14.0	14.9	28.9	14.5	17.6
Pyramin + TCA	3 +5	13.3	14.4	27.7	13.9	17.9
Tillam	3	12.9	14.7	27.6	13.8	17.2
Pyramin	4	13.3	13.6	26.9	13.5	17.4
Pyramin + CP32179	3 +1	13.4	12.9	26.3	13.2	17.0
Pyramin + Tillam	3 +1½	12.0	14.2	26.2	13.1	17.0
Pyramin + TD 282	3 +1½	12.0	13.8	25.8	12.9	17.4
Avadex + Tillam	1½+2½	11.3	14.0	25.3	12.7	17.4
Check	0	11.1	14.0	25.1	12.6	17.0
CP 32179	2	12.5	11.9	24.4	12.2	16.7

Analysis of Variance

Source	D.F.	Mean Square	F.
Blcoks	1	7.938	10.31*
Treatment	9	.94088	1.22
Error	9	.77022	
Total	19		

$\bar{x}$..... 13.2
S.E.X..... .62057
L.S.D..... N.S.
C.V.%..... 4.69

Table 8. Summary of sugar beet data secured from weed study conducted on the Zito Brothers farm at Corvallis, Montana in 1964.

Date Seeded: April 22, 1964 Date Harvested: October 31, 1964

Treatment	Rate #/A	Weed population in 50" of row		Sugar Beet population in 50" of row	Yield Tons/A	% Sugar Content
		Lambs quarter	Night shade			
Pyramin	8	.5	3.3	11.8	14.5	17.6
Pyramin + TCA	3 +5	.7	7.7	15.3	13.9	17.9
Tillam	3	.9	5.7	15.8	13.8	17.2
Pyramin	4	1.1	5.5	13.9	13.5	17.4
Pyramin + CP 32179	3 +1	.5	5.7	12.8	13.2	17.0
Pyramin + Tillam	3 +1½	1.1	5.3	15.5	13.1	17.0
Pyramin + TD 282	3 +1½	1.3	3.9	18.4	12.9	17.4
Avadex + Tillam	1½+2½	1.8	4.8	14.5	12.7	17.4
Check	0	3.0	8.6	12.9	12.6	17.0
CP 32179	2	.3	3.7	10.3	12.2	16.7

Soil Type - Corvallis silt loam, slighty saline.

KS
VRS

YEAR: 1964

TITLE: Forage Investigations 5022

LOCATION: Western Montana Branch Station, Corvallis, Montana

PERSONNEL: Leader - Vern R. Stewart
Cooperators - E. R. Hehn
D. R. Merkley

DURATION: Indefinite

OBJECTIVES:

1. To determine the adaptability of certain commercial corn-varieties.

EXPERIMENTAL DESIGN AND PROCEDURES:

The corn silage study was grown in two row plots, 20 feet long, spaced 42 inches. The planting rate was 35,000 seeds per acre. The study was in a randomized block design with four replications. Fifty pounds of nitrogen was side dressed following seeding. The study was irrigated during the growing season.

RESULTS AND DISCUSSION:

A cold growing season in 1964 caused a reduction in the usual silage yields obtained in this area. Stands were short 10 to 11 thousand plants compared to the number of seeds planted. The 80-99 range had kernels formed which were in the milk stage. Table 1.

Haapala SD-60 was the highest yielding entry. The 100-119 maturity range as a group was the highest yielding, but only .5 ton greater than the 120-140. Table 2.

FUTURE PLANS:

Will continue evaluated commercial hybrid corn lines.

SUMMARY:

The 100-119 day maturity range group was .5 ton higher in yield than the 120-140 day group.

Table 1. Agronomic data from corn nursery grown in Ravalli County on the Western Montana Branch Station. Two row plots, four replications.

Date Planted: May 20, 1964 Date Harvested: September 17,1964
Size of Plot: 112 square feet

Variety or Cross	Range	Maturity Stage[1] at Harvest	I	II	III	IV	Total	Average	Alfalfa Hay equal Tons/Acre	Moisture Content @ Harvest %	Plant Population Plants/ A
Haapala SD-60	100-119	B	17.7	19.0	20.1	14.7	71.5	17.9a[2]	6.1	69.3	24,308
N-K KT-652-5076	120-140	S	13.6	11.3	13.9	11.6	50.4	12.6 b	4.2	75.0	23,530
N-K PX 84-5071	120-140	S	11.8	13.6	12.0	12.0	49.4	12.4 b	4.2	80.0	24,891
P.A.G. 323	120-140	S	12.9	9.8	12.1	13.7	48.5	12.1 b	4.1	75.0	21,294
N-K KT-665-4730	120-140	S	11.7	12.1	12.8	10.8	47.4	11.9 b	4.1	80.6	24,308
N-K KT-626-5066	100-119	S	11.4	10.9	11.0	11.6	44.9	11.2 bc	3.8	78.4	21,294
DeKalb 633	120-140	S	12.3	10.6	12.4	8.7	44.0	11.0 bc	3.8	75.5	20,127
N-K KM-567-5053	100-119	S	11.7	9.4	10.7	11.3	43.1	10.8 bcd	3.7	77.6	23,919
DeKalb 640	120-140	S	9.4	11.9	9.1	8.2	38.6	9.7 cde	3.3	81.6	22,947
P.A.G. SX 29	120-140	S	10.3	10.5	8.3	9.6	38.7	9.7 cde	3.3	82.5	22,849
DeKalb XL 325	100-119	B	7.9	8.9	11.4	10.4	38.6	9.6 cde	3.3	80.0	20,613
DeKalb 441A	120-140	S	8.0	9.6	10.2	9.6	37.4	9.4 cde	3.2	81.7	22,363
DeKalb XL 361	120-140	S	7.9	9.4	9.7	8.9	35.9	9.0 def	3.1	83.1	23,336
DeKalb 45	80-99	M	9.6	7.8	8.2	9.6	35.2	8.8 ef	3.0	76.5	20,224
DeKalb XL 304	80-99	M	8.7	8.4	8.0	7.9	33.0	8.3 ef	2.8	83.3	24,308
DeKalb XL 308	100-119	B	6.9	8.3	7.8	6.1	29.1	7.3 f	2.5	82.3	20,224

[1] B-Blister; M-Milk; S-Silk
[2] Varieties having common letters are not significant one from another.

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	1.76557	1.14
Varieties	15	24.24832	15.65**
Error	45	1.54968	
Total	63		

$\bar{x}$..... 10.7
S.E.$\bar{x}$..... .62243
C.V.%..... 5.80

Table 2. Yield data arranged by maturity range, from corn nursery grown in Ravalli County in 1964, at the Western Montana Branch Station

Maturity Range	Variety	Yield Tons/Acre[1]	Plant Population Plants/Acre
88- 99	DeKalb 45	8.8 ef[2]	20,224
	DeKalb XL 304	8.3 ef	24,308
$\bar{x}$		8.6	22,266
100-119	Haapala SD-60	17.9a	24,308
	N-K KT 626-5066	11.2 bc	21,294
	N-K KM 567-5053	10.8 bcd	23,919
	DeKalb XL 325	9.6 cde	20,613
	DeKalb XL 308	7.3 f	20,224
$\bar{x}$		11.4	22,072
120-140	N-K KT 652-5076	12.6	23,530
	N-K PX 84-5071	12.4 b	24,891
	P.A.G. 323	12.1 b	21,294
	N-K KT 665-4730	11.9 b	24,308
	DeKalb 633	11.0 bc	20,127
	DeKalb 640	9.7 cde	22,947
	P.A.G. SX 29	9.7 cde	22,849
	DeKalb 441 A	9.4 cde	22,363
	DeKalb XL 361	9.0 def	23,336
$\bar{x}$		10.9	22,738

[1] Adjusted to 70% moisture

[2] Varieties having common letters are not significant one from another.

YEAR: 1964

TITLE: Small Grain Investigations (Spring Barley) 5023

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 the breeding program.

EXPERIMENTAL DESIGN AND PROCEDURES:

Standard nursery procedures are used in the variety testing programs.

RESULTS AND DISCUSSION:

Intrastate Nursery

A dryland and an irrigated intrastate and station yield nursery were grown in 1964. Because of continual rain and the resulting sever lodging, the irrigated nursery was not harvested. In this nursery also, considerable sprouting of grain in the head was noted. Therefore, no data from the irrigated interstate nursery is included.

Trophy was the high yielding variety in the dryland nursery, but not significantly higher than Freja. Yields in total were above average for this rotation because of the above normal rain fall during the growing season. Table 1 shows the agronomic data from this nursery.

Off-Station Nurseries

Three off-station nurseries containing twelve entries were seeded in 1964. They were located in Missoula, Ravalli and Lake Counties. They were grown in single rod row plots, replicated four times.

Missoula County - Yields in this nursery were fair, however, there was considerable unevenness in the study because of soil variation. This no doubt accounts in part for the high C.V. Ingrid is the highest yielding variety in the nursery. See Table 2 for tabulated data.

Ravalli County - In this nursery Ingrid is the highest yielding variety and the highest in test weight, however, the yields were not found to be significant when analyzed statistically. See Table 3.

Lake County - Yields from this nursery were very high. Piroline was high in yield followed by Ingrid, the difference being 3.5 bushels per acre. This was found not to be statistically significant. All test weights were above USDA standards except, Hypana. See Table 4 for tabulated data.

Spring Barley (con't)

Two-six row Isogenic Barley Yield Nursery

This nursery is grown to test the yield merits of two-row type barley against the six-row type barley. This nursery was grown under both dryland and irrigated conditions.

Data obtained from this dryland nursery were yields, heading date, bushel weight, lodging and plump kernels.

As would be expected the six-row types have a lower percent of plump kernels than the two-row types. Test weight for two-row type was 46.5 pounds and 44.5 pounds for the six-row type. The analysis of these data indicated that there is a significant difference due to treatment and to row type. Table 6.

There was no data obtained from the irrig. nursery because of the adverse weather conditions.

Table 6 is a summarization of annual and yearly data of barley yield nurseries for the years 1953-1961 inclusive and 1964. The data indicate that over the long term Freja has been the most productive barley variety.

Table 7 is a summarization of two years work off-station. Betzes is the highest yielding, however, Ingrid is only 1.3 bushels less and is superior to Betzes for other agronomic characteristics. Example, lodging and leaf disease resistance is superior to Betzes.

FUTURE PLANS:

Will continue and perhaps expand the barley research program.

SUMMARY:

1. Irrigated nurseries were not harvested because of adverse weather conditions.

2. Dryland yields were above average because of the above normal rain fall.

3. A ten year summary of Intrastate Nurseries is included, also off-station two year summary.

Table 1. Agronomic data from intrastate and station yield nursery grown at Creston, Montana in 1964. Four row plots, four replications, Field No. Y-1.

Variety or Cross	C.I. or N. No.	Heading Date	Plant Height in Ins.	Yield Bushels per/A	Bushel Weight in Lbs.	Lodging			% Plump Top of 6/64
						Type	Severity	Prevelance	
Trophy	10647	7- 4	33.0	75.9	48.1	18,10,27	6.00	47.50	96.5
Piroline	9558	7- 6	31.3	75.3	50.0	1, 6,18	4.25	50.00	95.3
Trail	9538	7- 4	33.5	72.0	48.5	12, 9,27	5.75	45.00	89.5
Lico x Ogalitsu	56-7570-9	7- 3	30.8	70.0	44.3	18, 6,16	2.75	80.00	97.3
Svalof 02148	11497	7-10	24.5	69.7	49.9	16, 6	4.25	68.75	96.0
Henta	8097	7- 9	28.0	69.6	50.5	1, 6,18	3.75	33.75	98.8
Betzes Erectoides	10871	7- 7	28.8	69.6	48.7	2,18, 6,16	4.50	82.50	96.3
Hypana	11772	7- 4	34.5	69.2	45.5	9, 6,27,16	5.75	70.00	97.0
Freja	7130	7- 8	24.5	67.6	49.4	18, 6,16	6.00	56.00	95.8
C.I.5461,Sel.62-5428	59-7-45MLR	7-10	30.5	66.1	45.7	2, 6,16	6.25	74.50	91.3
Palliser	10860	7- 8	34.2	65.8	46.5	18, 6,16	6.75	88.50	98.0
Isaria		7- 7	26.5	65.7	50.0	6,29	2.75	15.00	97.8
Unitan	10421	7- 3	30.5	65.5	47.3	6,18,16	5.50	58.75	96.3
Hafina	11490	7-10	25.0	65.2	49.4	7, 1,16	2.75	41.25	95.3
Glacier x Manchuria	11346	7- 3	31.8	63.8	46.0	9,27,18	2.50	41.25	95.8
B 125	10968	7- 6	30.5	63.3	47.4	1,23,27,18	4.25	37.50	93.8
Mari	11334	7- 3	20.0	62.8	49.5	6,16,10	5.25	21.25	97.8
Glacier x Manchuria	58-5725	7- 4	32.8	62.7	46.0	5,18, 9, 6	4.50	26.25	93.3
C.I.5461,Sel.62-5963	59-7-72MLR	7- 8	30.0	62.6	45.2	2, 7,16	6.50	73.50	91.8
Keystone	10877	7- 6	33.5	62.5	46.8	1, 6,16	2.75	23.80	96.0
Glacier x Mars	58-6076	7- 7	32.3	62.3	45.2	1,18, 6	5.75	73.75	97.8
Glacier x Mars	58-5926	7- 7	30.5	62.1	45.0	0, 9, 6	4.25	58.75	99.0
Glacier x Manchuria	58-5614	7- 1	26.3	61.8	41.0	12, 2,18, 6	2.00	28.75	94.3
Betzes	6398	7- 7	30.3	61.7	48.3	18,27,16	5.75	84.50	95.3
Compana	5438	7- 5	26.3	57.1	47.5	18,16	6.00	90.50	97.5
DeKap	3351	7- 2	24.3	56.8	46.3	27,16	8.75	78.80	91.5
Glacier x Newal 2 X Husky	11770	7- 3	26.3	55.5	48.0	9,27,12	4.00	23.75	93.5
Larken	10648	7- 3	32.0	52.3*	48.6	9, 6,20,18	4.00	35.00	94.3
Glacier x Mars	58-6350	7- 2	27.5	52.0*	42.9	1, 6,16	4.25	42.50	99.5

Table 1 .(con't)

Variety or Cross	C.I. No. N. No.	Heading Date	Plant Height in Ins.	Yield Bushels per/A	Bushel Weight in Lbs.	Lodging Type	Lodging Severity	Lodging Prevelance	% Plump Top of 6/64
Nupana I	63-3216 to 20	7- 5	27.5	50.1*	55.0	18,16	9.00	99.0	90.8
Domen x Breuns Wisa	62-2983	7- 9	28.7	48.0**	50.5	1, 6	1.50	10.0	98.8
Nupana Bulk	63-7724	7- 4	27.3	46.8**	53.0	18,16	9.00	99.0	89.8

NOTE: Freja is used as a check in this nursery
* Varieties yielding significantly less than the check (.05)
** Varieties yielding significantly less than the check (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	60010.333	9.985**
Varieties	31	14059.354	2.339**
Error	93		
Total	127		

$\bar{x}$..... 62.9
S.E.$\bar{x}$..... 4.84672
L.S.D.(.05) 13.6
L.S.D.(.01) 18.0
C.V.%..... 7.71

Table 2. Agronomic data from irrigated spring barley nursery grown in Missoula County on the Dick Ostergren farm, Missoula, Montana in 1964. Single row plots, four replications.

Date Seeded: April 27, 1964 Date Harvested: Aug. 24, 1964
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Height in Ins.	Gramps per Plot I	II	III	IV	Total Grams	Yield Bu/ A	Bushel Weight
Ingrid	10083	26	414	490	430	485	1819	56.9	53.4
Piroline	9558	26	440	445	365	425	1675	52.4	52.5
Palliser	10860	29	440	430	280	458	1608	50.3	51.0
Hypana	11772	28	306	400	351	530	1587	49.3	48.4
Betzes	6398	28	364	399	405	400	1568	49.0	51.8
Betzes Erectoides	10871	21	290	225	429	510	1454	45.5	51.9
Freja	7130	26	210	370	345	501	1426	44.6	51.9
Unitan	10421	26	385	255	291	421	1352	42.3*	47.4
Larker	10648	30	255	340	205	480	1280	40.0*	49.0
B 125	10968	21	426	200	216	424	1266	39.6*	48.4
Trophy	10647	29	280	185	196	401	1062	33.2*	47.5
Traill	9538	25	256	155	370	264	1045	32.7*	49.2

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

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	38628.9166	6.47**
Varieties	11	14236.75	2.39*
Error	33	5967.03787	
Total	47		

$\bar{x}$..... 44.7
S.E.$\bar{x}$..... 4.82945
L.S.D.(.05) 13.9
C.V.%..... 10.82

Table 3. Agronomic data from irrigated spring barley nursery grown in Ravalli County on the Western Montana Branch Station, Corvallis, Montana in 1964. Single row plots, three replications.

Date Seeded: April 28, 1964 Date Harvested: Aug. 24, 1964
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Height in Ins.	Grams per Plot I	II	III	Total Grams	Yield Bu/A	Bushel Weight
Ingrid	10083	27	644	586	596	1826	76.1	55.0
Palliser	10860	31	631	682	461	1774	73.9	51.9
Larker	10648	26	592	632	498	1722	71.8	50.5
Betzes	6398	26	665	511	522	1698	70.8	53.9
Piroline	9558	28	631	510	490	1631	68.0	54.2
Freja	7130	24	700	461	466	1627	67.8	53.4
Unitan	10421	27	670	440	475	1585	66.1	49.1
Betzes Erectoides	10871	23	595	479	480	1554	64.8	53.0
Glac.xComp. Moc75	11772	29	490	460	581	1531	63.8	49.4
B 125	10968	30	516	413	500	1429	59.6	50.4
Traill	9538	30	555	416	360	1331	55.5	50.5
Trophy	10647	28	579	335	395	1309	54.6	50.8

$\bar{x}$..... 66.1
S.E.$\bar{x}$..... 4.86116
L.S.D..... N.S.
C.V.%..... 7.35

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	54152.58	11.94
Varieties	11	9034.06818	1.99 N.S.
Error	22	4534.22	
Total	35		

Table 4. Agronomic data from irrigated spring barley nursery grown in Lake County on the Lake Brothers farm, Ronan, Montana in 1964. Single row plots, Four replications.

Date Planted: April 27, 1964 Date Harvested: Aug. 25, 1964
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Height in Ins.	Grams per Plot I	II	III	IV	Total Grams	Yield Bu/ A	Bushel Weight
Piroline	9558	36	680	870	780	829	3159	98.8	52.5
Ingrid	10083	34	545	885	835	785	3050	95.3	51.8
Betzes Erectoides	10871	30	600	741	850	770	2961	92.6	51.8
Betzes	6398	36	726	755	704	690	2875	89.9	51.2
Trophy	10647	33	735	460	620	874	2689	84.1	49.5
Freja	7130	32	636	695	616	691	2638	82.5	51.0
Hypana	11772	36	615	704	589	700	2608	81.5	47.6
B 125	10968	37	465	570	726	565	2326	72.7*	48.3
Palliser	10860	38	601	531	530	614	2276	71.1**	48.8
Traill	9538	38	581	520	490	560	2151	67.2**	50.0
Unitan	10421	34	644	445	435	579	2103	65.7**	48.9
Larker	10648	33	529	449	640	355	1973	61.7**	50.0

NOTE: Ingrid is used as a check in this nursery
* Varieties yielding significantly less than the check (.05)
** Varieties yielding significantly less than the check (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	6495.07666	
Varieties	11	39531.97545	3.92**
Error	33	10075.06121	
Total	47		

$\bar{x}$.....	80.3
S.E.$\bar{x}$.....	6.27542
L.S.D.(.05)	18.0
L.S.D.(.01)	24.1
C.V.%.....	7.82

Table 5. Agronomic and yield data from two-six row isogenic nursery grown under dryland conditions at Creston, Montana in 1964. Four row plot, three replications. Field No. A-1c, split plot design, latin square.

Date Seeded: May 8, 1964 Date Harvested: Sept. 11, 1964 Size of Plot: 16 sq. ft.

Variety or Cross	C.I. No.	Heading Date	Height in In.	Grams per Plot I	II	III	Total	Yield Bu/ A	Bushel Weight	% Lodging	% Plump
Glacier x Compana early 2 row	61-10089	7- 2	29	255	430	319	1004	41.8	46.9	15	99
Glacier x Compana early 6 row	61-10088	6-30	25	411	359	359	1129	47.1	47.0	60	89
Glacier x Compana late 2 row	61-10091	7- 7	27	311	650	685	1646	68.6	46.6	95	99
Glacier x Compana late 6 row	61-10090	7- 7	27	626	555	520	1701	70.9	40.8	99	79
Glacier	63-2011-14	7- 1	29	502	530	356	1388	57.9	44.1	85	99
Compana	Cans	7- 6	24	500	445	554	1499	62.5	47.4	99	98
Munsing	63-4965	7- 1	22	404	385	405	1194	49.8	47.5	99	93
Titan	58LR	7- 4	29	395	500	480	1375	57.3	47.6	68	89
Munsing x Titan early 6 row	61-10092	7- 1	25	199	365	344	908	37.8	47.9	92	75
Munsing x Titan early 2 row	61-10093	7- 2	27	226	261	374	861	35.9	47.6	80	99
Munsing x Titan Late 2 row	61-10095	7- 7	27	206	489	470	1165	48.6	48.3	50	97
Munsing x Titan Late 6 row	61-10094	7- 6	22	305	495	684	1484	61.9	44.2	82	75
Glacier x Munsing Late 2 row	61-10087	7- 1	22	215	350	435	1000	41.7	44.2	80	99
Glacier x Munsing Late 6 row	61-10086	6-30	22	320	416	585	1321	55.1	41.5	70	94
Glacier	63-2011-14	6-30	26	355	588	605	1548	64.5	43.6	55	98
Munsing	63-4965	7- 1	22	416	374	390	1180	49.2	47.2	99	91
Glacier x Munsing early 6 row	61-10084	6-28	22	335	340	460	1135	47.3	42.2	70	92
Glacier x Munsing early 2 row	61-10085	6-28	23	240	251	344	835	34.8	42.5	33	99

Analysis of Variance

Source of Variation	D.F.	Mean Square	F.	Source of Variation	D.F.	Mean Square	F.
Col.(C)	2	68492.150	17.937	Error B	10	7810.1500	
Rows (R)	2	16890.150	4.423	Raw type	1	47704.100	5.752
Crosses (CS)	2	34467.950	9.026	CS x RT	2	11761.550	1.418
Error A	2	3818.4500		TrT x RT	2	1082.7500	.130
Col./Col.	2	11.90000	.001	CS x T x RT	4	2325.4500	.280
Trts	2	105009.85	13.445**	Error C	18	8292.5055	
T x Cs	4	10524.500	1.347				

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Table 6. Summary of yields of varieties in the dryland barley yield nursery 1953-1964 at Creston, Montana.

Variety or Selection	C.I. or N. No.	Averge yield in bushels per acre										No. Statim Years	Average of Compana %
		1953	1954	1955	1956	1957	1958	1959	1960	1961	1964		
Betezes	6398	51.4	87.9	95.1	80.9		53.5	43.9	46.1	31.6	61.7	9	118
Betezes Erectoides	10871								51.6	38.0	69.6	3	116
B 125	10968										63.3	1	111
Compana	5438	45.5	81.1	69.1	53.8	60.6	38.9	43.3	45.5	34.9	57.1	10	100
Dekap	3351	47.9	74.7	83.0	63.5	75.9	65.1	38.6	52.8	45.7	56.8	10	114
Domen x Breuns Wisa	62-2983										48.0	1	84
Freja	7130	52.9	100.0	89.5	91.8	77.1	60.9	46.7	46.9	40.2	67.6	10	127
Glacier x Manchuria	11346										63.8	1	112
Glacier x Manchuria	58-5725										62.7	1	110
Clacier x Manchuria	58-5614										61.8	1	108
Glacier x Mars	58-6076										62.3	1	109
Glacier x Mars	58-5926										62.1	1	109
Glacier x Mars	58-6350										52.0	1	91
Glacier x Newal	11770										55.5	1	97
Hafina	11490										65.2	1	114
Herta	8097										69.6	1	122
Hypana	11772									50.2	69.2	2	130
Isaria											65.7	1	115
Keystone	10877										62.5	1	110
Larker	10648										52.3	1	92
Lico x Ogalitsu	56-7570-9										70.0	1	123
Maria	11334										62.8	1	110
Nupana I	63-3216 to 20										50.1	1	88
Nupana Bulk	63-7724										46.8	1	82
Palliser	10860									41.3	65.8	2	116
Piroline	9558						60.6	43.0	46.9	54.1	75.3	5	127
Svalaf 02148	11497										69.7	1	122
Trail	9538				95.7			44.2			72.0	3	137
Trophy	10647										75.9	1	133
Unitan	10421		91.8	72.7	84.2	75.9	74.5	51.9	50.0	37.9	65.5	9	125
C.I. 5461 Sel.62-5428	59-7-45 MLR										66.1	1	116

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Table 7. Summary of off-station irrigated spring barley varieties for 1963 and 1964.

Variety	C.I. No.	Yield in Bushels per Acre						$\bar{x}$
		Missoula County		Lake County		Ravalli County		
		1964	1963	1964	1963	1964	1963	
Ingrid	10083	56.9	47.4	95.3	66.9	76.1	95.3	73.0
Piroline	9558	52.4	45.8	98.8	69.9	68.0	84.6	69.9
Betzes	6398	49.0	54.8	89.9	69.1	70.8	112.2	74.3
Freja	7130	44.6	49.5	82.5	67.3	67.8	92.2	67.3
Hypana	11772	49.3	47.3	81.5	51.0	63.8	69.7	60.4
Unitan	10421	42.3	31.6	65.7	50.7	66.1	89.4	57.6
Palliser	10860	50.3	44.2	71.1	50.9	73.9	89.1	63.3
Betzes Erectoides	10871	45.5	44.7	92.6	59.3	64.8	101.6	68.0
Larker	10648	40.0	46.7	61.7	54.8	71.8	89.9	60.8
B 125	10968	39.6		72.7		59.6		
Trophy	10647	33.2	31.7	84.1	56.1	54.6	93.3	58.8
Traill	9538	32.7	32.3	67.2	71.7	55.5	101.7	60.2
$\bar{x}$		44.7	43.3	80.3	60.7	66.1	92.7	
S.E.$\bar{x}$		4.82945	3.27926	6.27542	5.24405	4.86116	6.5596	
L.S.D.(.05)		13.9	9.5	18.0	15.2	N.S.	18.9	
C.V.%		10.82	7.58	7.82	8.64	7.35	7.08	

YEAR: 1964

TITLE: Small Grain Investigations (Winter Barley) 5023

LOCATION: Northwestern Montana Branch Station, Field No. F-2

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

DURATION: Indefinite

OBJECTIVES:

To obtain the information necessary for making varietal recommendations and evaluation of new varieties and selections.

EXPERIMENTAL DESIGN AND PROCEDURE:

Standard nurseries are used in the varietal testing program.

RESULTS AND DISCUSSION:

The past season was a fairly good one for winter barley. Snow cover was adequate through the winter season, but this resulted in considerable snow mold damage. Going into the winter season stands were very good. Snow mold caused considerable damage in some entries in the nursery. Lodging was quite sever in the nursery and made it difficult to estimate stands, therefore, no stand estimates are included in the data.

Yields were good except in cases where the stand was reduced. These data were found to be non-significant when analyzed statistically. See Table 1.

FUTURE PLANS:

These studies will continue, but more material is needed. A breeding block is planned for seeding in the fall of 1965.

SUMMARY:

Catskill is the highest yielding entry. Olympia is in third place in this study, however these difference are not statistically significant.

Table _____. Agronomic data from dryland winter barley nursery grown at Creston, Montana in 1963-64. Four row plots four replications. Field No. F-2

Date Seeded: September 20, 1963 Date Harvested: August 7, 1964 Size of Plot: 16 Sq.Ft.

Variety	C.I.No.	Heading Date	Height in Ins.	Replications I	II	III	IV	Total	Yield Bu/ A	Bu. Wt. in Lbs.	Lodging %
Catskill -	10899	6-17	40	724	796	611	445	2576	80.5	48.0	38
60-5157-1		6-11	40	455	620	659	735	2469	77.2	46.9	37
Olympia	6107	6-12	46	795	530	600	355	2280	71.3	48.2	87
O.A.C. Strain 4	10096	6-10	35	666	571	535	475	2247	70.2	46.5	72
Alpine	9578	6-20	48	485	535	725	475	2220	69.4	49.6	42
Dutchess	10890	6-17	41	605	651	445	419	2120	66.3	48.0	52
60-5157-13		6-12	38	580	625	503	411	2119	66.2	46.3	38
CCX-55-S		6- 9	45	429	657	455	503	2044	63.9	45.5	98
60-5157-14		6-11	40	560	463	475	505	2003	62.6	46.7	53
Ellis	9529	6-14	42	385	525	630	432	1972	61.7	45.2	90
Svalof 42-7	7187	6-13	46	626	547	431	360	1964	61.4	46.3	88
Carstens	MBIA	6- 8	43	540	525	506	346	1917	59.9	52.0	60
60-5157-6		6-11	35	610	649	195	440	1894	59.2	45.6	28
Mass 6-W-M-3-61	11361	6-13	45	530	485	403	474	1892	59.1	45.6	42
CCX bulk	6623	6-14	45	440	589	526	330	1885	58.9	48.0	92
Winter Club	592	6-22	44	515	508[1]	435	330	1788	55.9	47.4	70
M.O.B. 1300	11355	6- 9	43	540	508	312	224	1584	49.5	47.2	87

[1] Calculated Missing Plot

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	76955.0833	7.07**
Varieties	16	15270.9625	1.40 N.S.
Error	47	10879.8351	
Total	66		

$\bar{x}$.....	64.3
S.E.$\bar{x}$.....	6.52124
L.S.D.....	N.S.
C.V.%.....	10.14

TITLE: Small Grain Investigations (Oats) 5023

LOCATION: Northwestern Montana Branch Station and several Off-Station locations.

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

DURATION: Indefinite

OBJECTIVES:

1. To determine the adaptation of new and introduced oat varieties and selections by comparison with recommended varieties.

EXPERIMENTAL DESIGN AND PROCEDURES:

Standard nursery procedures were used in the variety testing program. The station nursery was grown in four row plots and replicated 3 times. The off-station nurseries were seeded in single row plots and replicated four times. There were 30 entries in the station nursery and 9 entries in the off-station nurseries. There were three off-station nurseries seeded.

RESULTS AND DISCUSSION:

Rain during harvest time delayed the harvest of spring oats. This resulted in lodging of some entries and some shattering of early maturing varieties. In the real early variety regrowth was noted.

Basin is the highest yielding variety in the station dryland nursery. Test weights were fair to poor, but there were not any high test weights as is some times found in oats grown under good moisture conditions in this valley. Table 1 gives the data in tabular form.

Only one of the three oat nurseries seeded was harvested. One in Missoula County was lost to wild oats and the one in Lake County to the birds.

The study in Ravalli County was harvested and yield data is found in Table 2. This nursery was grown under irrigation. C.I.7577 is the highest yielding entry in the nursery, but not significantly different, statistically, from the variety Park.

A summary of oat variety yields are found in Table 3. Under dryland conditions Basin is some what better in yield than Park over a five year period.

FUTURE PLANS:

Will continue variety testing program.

SUMMARY:

1. Basin is the highest yielding variety in this years nursery.

2. Over a five year period, using Park as a check Basin is 106% of it.

Table 1. Agronomic data from dryland uniform regional oat nursery grown at Creston, Montana in 1964. Four row plots, three replications. Field No. Y-2

Date Planted: May 12, 1964 Date Harvested: September 22,1964
Size of Plot: 16 square feet

Variety	C.I.No.	Heading Date	Replications I	II	III	Total	Yield Bu/ A	Bu. Wt. in Lbs.
Basin	5346	7-14	555	750	735	2040	120.7*	35.9
58Ab2777	7591	7-14	400	830	755	1985	116.8	33.9
58Ab2784	7575	7-14	485	539	925	1949	114.2	32.5
Overland	4181	7-10	495	765	575	1835	108.0	34.5
Russell	7557	7-11	510	630	645	1785	105.0	32.9
Mission	2588	7-10	460	745	515	1720	101.2	33.3
Garry	6662	7-12	590	630	485	1705	100.3	33.4
58Ab2773	7588	7-14	525	740	432	1697	99.9	31.9
Ab2787	7578	7-14	265	630	789	1684	99.1	34.0
Clinton	4259	7-12	525	615	510	1650	97.1	34.5
Zanster	7476	7-10	565	577	431	1573	92.6	35.4
58Ab2781	7572	7-14	615	524	409	1548	91.1	31.2
Markton	2053	7- 6	415	555	545	1515	89.1	34.5
Bridger	2611	7-18	470	425	585	1480	87.1	34.0
47Ab2685	7960	7-11	405	485	575	1465	86.2	29.9
Park	6611	7-14	461	500	484	1445	85.0	34.4
59Ab9644		7-10	460	485	489	1434	84.4	26.6
Burnett	6537	7- 8	410	445	570	1425	83.8	34.4
RL2123.10	7955	7-10	365	380	414	1159	79.8	32.7
RL2123.66 $C^6xL^4xV^4xHxB^3x$	7958	7-13	360	445	550	1355	79.7	30.5
V x H^2 x R	7461	7- 7	344	474	490	1308	77.0	32.8
Bannock	2592	7-16	330	426	550	1306	76.8	33.0
Rodney	6661	7-13	190	660	390	1240	73.0	33.8
RL2123.9	7957	7-12	349	375	515	1239	72.9	35.0
Victory	1145	7-17	170	445	452	1067	62.8	33.0
Gopher	2027	7- 8	305	260	220	785	46.2	26.9
Andrew x Mission	50-12-18	7-10	181[1]	260	336	777	45.7	31.2
59Ab9642		7-11	245	180	290	715	42.1	24.3
A x M^5	7969	7- 8	185	285	220	690	40.6	23.8
Havre Side Oats		7-14	105	220	355	680	40.0	30.0

[1] Calculated Missing Plot
NOTE: Park is 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	2	137530.85	12.08
Varieties	29	50490.4068	4.43
Error	58	11380.81034	
Total	89		

$\bar{x}$.....	82.9
S.E.$\bar{x}$.....	10.87226
L.S.D.(.05)	31.4
L.S.D.(.01)	42.4
C.V.%.....	13.11

Table 2 . Agronomic data from irrigated oats nursery grown in Ravalli County on the Western Montana Branch Station, Corvallis, Montana in 1964. Four row plots, four replications.

Date Planted: April 28, 1964 Date Harvested: August 24, 1964
Size of Plot: 16 square feet.

Variety	C.I.No.	Height in Ins.	Replications I	II	III	IV	Total	Yield Bu/ A	Bu. Wt. in Lbs.
58AB2786	7577	37	615	540	445	470	2070	91.3	35.1
58AB2777	7591	36	565	465	460	480	1970	86.9	36.0
Park	6611	36	580	500	473	410	1963	86.6	36.6
Overland	4181	35	560	549	411	404	1924	84.9	37.3
58AB2787	7578	37	630	512	380	389	1911	84.3	36.5
58AB2782	7573	38	555	415	400	435	1805	79.7	36.0
Bridger	2611	43	514	360	385	424	1683	74.3*	36.9
Basin	5346	36	515	515	376	276	1682	74.2*	37.5
Gopher	2027	34	510	429	375	275	1589	70.1*	36.5

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

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	50372.3266	22.93**
Varieties	8	6584.77875	3.13*
Error	24	2105.15708	
Total	35		

$\bar{x}$.....	81.4
S.E.$\bar{x}$.....	4.04954
L.S.D.(.05)	11.8
C.V.%.....	4.98

Table 3. Summary of oat variety yields grown at Creston, Montana under dryland conditions, 1953 to 1960 inclusive and 1962,1964.

Varieties or Cross	C.I. No.	Yields in bushels per acre										No. Station Years	Average % of Park
		1953	1954	1955	1956	1957	1958	1959	1960	1962	1964		
Andrew x Mission	50-12-18								21.3	49.7	45.7	3	61
Andrew x Mission	7969										40.6	1	48
Bannock	2592		145.9	116.1	111.7	63.0	77.1	101.3	16.9	88.5	76.8	9	98
Basin	5346		146.3	144.9	122.7	51.1			15.0	89.5	120.7	7	106
Bridger	2611	77.1			121.9	49.7				91.8	87.1	5	105
Burnett	6537					44.9	55.6	93.2	18.1		83.8	5	95
Clinton 59	4259	74.5		99.7	86.9	32.4	60.1	73.5	13.8	33.2	97.1	9	78
Garry	6662		129.5	121.4	97.0	46.6	54.0	112.2	11.6	87.8	100.3	9	93
Gopher	2027	78.5		110.0	66.5	30.1		49.7	10.6	61.6	46.2	8	67
Havre Side Oats											40.0	1	47
Markton	2053		151.2	105.0	114.3	47.2	52.5	89.7	16.9	74.7	89.1	9	91
Mission	2588	80.2			74.9	56.2	49.3	83.5	14.1	77.2	101.2	8	92
Overland	4181	67.4	166.7	145.2	114.3	68.3	84.8	100.0	14.4	90.9	108.0	10	108
Park	6611	73.2	154.3	149.8	112.1	46.3	63.5	99.4	17.5	89.5	85.0	10	100
Russell	7557									93.2	105.0	2	114
Rodney	6661		149.0	121.0	92.6	30.8	14.1	51.6	15.9	84.8	73.0	9	77
RL. 2123.9	7957									67.2	72.9	2	80
RL. 2123.10	7955									73.5	79.8	2	88
RL. 2123.66	7958										79.7	1	94
Victory	1145		148.1	118.3	123.2	64.8	49.4	92.5	18.1	78.8	62.8	9	93
AB 2787	7578										99.1	1	117
47 AB 2685	7960									92.8	86.2	2	103
58 AB 2773	7588									90.3	99.9	2	109
58 AB 2777	7591								14.7	79.3	116.8	3	110
58 AB 2784	7575								15.3		114.2	2	126
58 AB 2781	7572									87.4	91.1	2	103
59 AB 9642											42.1	1	50
59 AB 9644											84.4	1	99
$C^6xL^4xV^4xHxB^3xVxH^2xR$	7461										77.0	1	91
Zanster	7476										92.6	1	109

YEAR: 1964

TITLE: Small Grain Investigation (Spring Wheat) 5023

LOCATION: Northwestern Montana Branch Station and several off-station locations.

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

DURATION: Indefinite

OBJECTIVES:

1. To determine the adaptation of new and introduced spring wheat varieties and selection by comparison with recommended varieties.
2. To evaluate material from spring wheat breeding program in Montana and other stations.

EXPERIMENTAL DESIGN AND PROCEDURES:

Standard nursery proceedures were used in the variety testing program. The station nurseries were grown four row plots,replicated four times. A randomized block design was used in all nurseries. The off-station nurseries were grown in single row plots, replicated four times.

The advanced yield hard red spring nursery contained 27 entries, the western regional soft white, 26 entries and the off-station, 12 entries.

RESULTS AND DISCUSSION:

Yield in the hard red spring wheat nursery was about average. However, test weights are below average. This was due to the continual rain that fell during the harvest period. The nursery was cut when the grain was high in moisture and was dried before cleaning and weighing. The Durm entries were higher in yield than in past seasons. Using Centana as check only two entries were significantly higher in yield, namely, C.I. 13777 and C.I. 13596. Table 1 gives complete data for this study.

Stripe rust was again a factor in the white wheat nursery. There was a direct relationship between variety yield and the stripe rust and coefficient. The larger the coefficient the lower the yield. See Table 2 for complete data on this study.

Three off-station nurseries were seeded in the spring of 1964. Only two were harvested. The nursery in Missoula County was poor in stand and a large number of wild oats. Therefore, it was not harvested.

Ravalli County

C.I. 13641 was the highest yielding entry in this nursery, with 45.6 bushels per acre. Only three replications were harvested because of Quackgrass infestation in the 4th replication. Test weights were fair in this study. Table 3.

Spring Wheat (con't)

Lake County

Stands were excellent in this nursery. Growing conditions were optimum this season in this location.

Yields are good, but test weight quite low because of the rain during the harvest season. C.I. 13736 and C.I. 13641 are the two top yielding lines in the nursery. Table 4.

Table 5 is a summary of white wheat varieties grown at Creston, Montana, 1956-1964 inclusive. This summary indicates that most lines are superior to Lemhi.

FUTURE PLANS:

Continue in a limited way spring wheat varietal studies.

SUMMARY:

1. Yields were average or above this season. Continuous rain during the harvest season caused a reduction in test weight.

2. Most varieties now being grown are superior to Lemhi because of the stripe rust problem.

Table 1. Agronomic data obtained from the advanced yield nursery grown at Creston, Montana on dryland in 1964. Field No. Y-1

Date Seeded: May 11, 1964 Date Harvested: Sept. 28, 1964
Size of Plot: 16 square feet

Variety	C.I. or Selection	First Headed	Plant Ht.	Lodging Severity	Lodging Prevelance	Test Wt.	Bu./A
R.L. 2520 x Tc^6-K.F.	13777	7-11	43	5	71	59.2	68.9*
51-3549 x II-50-17	13596	7- 9	41	7	95	58.0	62.9*
(Nrn-Bvr x Tc)xB52-91	B61-146	7- 9	45	7	95	57.5	60.5
Lakota (Durum)	13335	7-10	45	5	51	58.0	59.1
Wells (Durum)	13333	7-10	47	6	55	59.5	57.1
Ceres	6900	7-12	46	8	97	58.5	56.6
N2211 x Centana	B60-86	7- 9	42	3	56	58.5	55.0
Sawtana	13304	7-14	44	9	99	57.5	51.0
R.L. 4125 x Tc^6-Sr^6	13775	7- 9	40	4	74	56.2	50.8
II-50-17 x Pilot	B61-95	7-10	45	6	76	59.5	50.6
Justin	13462	7-10	44	4	59	57.6	50.6
(Nrn-Bvr x Cnt) x Cly	B61-138	7- 9	43	3	87	56.0	50.3
Langdon (Durum)	13165	7-10	47	5	74	57.5	49.2
II-50-17 x Rmr	13655	7- 9	45	6	95	59.5	49.1
B50-18 x Rescue	B61-69	7-13	45	5	99	57.1	48.0
Centana	12974	7-12	45	7	89	57.0	47.8
Thatcher	10003	7- 8	41	4	70	57.4	46.7
Chinook	13220	7- 9	47	6	74	57.0	46.7
II-50-17 x Pilot	B61-94	7- 9	45	7	79	60.0	45.0
Mindum (Durum)	5296	7-14	53	7	96	59.6	44.7
II-50-17 x Pilot	B60-82	7-10	43	8	77	58.4	43.1
Crim	13465	7- 8	42	4	79	55.4	43.0
Rescue x II-50-17	B61-23	7-10	45	8	82	55.1	42.4
Rescue	12435	7-12	43	8	79	56.5	42.2
Ftn-Tc^3x II-44-29-Tc^2	13751	7-10	41	6	74	57.2	41.8
II-50-17 x Rmr	13654	7- 9	43	7	92	58.9	41.1
Cypress	13344	7-12	44	9	99	55.5	28.8

NOTE: Centana is 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	42010.000	4.468
Varieties	26	26547.730	2.823*
Error	78	14482.579	
Total	107		

$\bar{x}$.....	49.4
S.E.$\bar{x}$.....	4.84
L.S.D.(.05)	13.64
C.V.%.....	9.47

Table 2. Agronomic data from dryland western regional white spring wheat nursery, grown at Creston, Montana in 1964. Four row plots, four replications. Field No. Y-1.

Date Planted: May 12, 1964 Date Harvested Sept 23, 1964 Size of Plot: 16 sq. ft.

Variety or Cross	C.I.No.	Heading Date	Ht. in In.	Grams per Plot I	II	III	IV	Total	Yield Bu/A	Bu. Wt.	Coded Lodging Type	Sev.	Prev.	Stripe Rust % Sev.	i-4 Type	Coefficient	
Idaed x Burt,Sel.42-5	13722	7-10	38	702	615	725	600	2642	66.1	56.0	23	7	99	5	2	20.0	
Nainari 60	13747	7-11	38	669	670	400	752	2491	62.3	56.2	23	5	71	6	2	2.4	
Lermo Rojo	13651	7- 9	41	606	699	523	540	2368	59.2	58.7	23	6	99	T	3	0.8	
Burt x KF (58-2025)	13736	7-22	37	740	385	717	515	2357	58.9	54.0	23	4	38	0	i	0.0	
No.58-Tc x (Tc-KF,III-52-8) A 613-S	13743	7-14	44	589	515	710	531	2345	58.6	55.7	23	8	94	23	2	9.2	
Burt x KF (58-2479)	13640	7-12	38	480	562	637	640	2319	58.0	55.0	23	6	09	22	2,3	13.2	
Idaed 59	13631	7- 8	37	665	510	496	555	2326	55.7	56.9	23	5	99	11	2,4	6.6	
Idaed x Burt Sel.30-2	13742	7- 9	34	499	565	544	545	2153	53.8	56.2	23	7	35	40	1,2	24.0	
No. 58-Tc x Lee, A 6118-S	13745	7- 9	43	535	511	516	560	2122	53.1	53.1	23	5	10	T	1,2	0.6	
Eureka-Lmh x Idaed[2] (60M3)	13636	7- 9	38	630	400	496	590	2116	52.9	56.5	23	5	73	0	i	0.0	
Premier x Federation[4] (62M47-68)	13733	7-10	41	514	470	440	600	2024	50.6	57.0	23	8	99	25	2,3	15.0	
No. 58-Tc x (Tc-KF, III-52-8), A614-S	13744	7- 9	39	521	518	556	425	2020	50.5	58.5	10	6	99	71	3	56.8	
Svenno x Lee-Winter semidwarf	13730	7- 9	29	460	475	580	500	2015	50.4	54.4	23	6	01	5	2,3	3.0	
Karn x Henry, Sel. 90	13735	7-12	46	569	530	640	270	2009	50.2	58.5	23	8	94	0	i	0.0	
Thatcher	10003	7- 9	41	391	580	422	609	2002	50.1	58.0	10	6	78	2	2	1.2	
Yaqui 54	13218	7- 9	34	555	410	506	480	1951	48.8	56.5	10	2	68	5	2	2.0	
Burt x KF (57-70136)	13641	7-22	50	685	375	506	385	1951	48.8	51.8	23	8	60	0	i	0.0	
Eureka-Lmh x Idaed[2], 52 ab 1281	13746	7- 9	38	340	460	535	595	1930	48.3	58.5	23	5	63	0	i	0.0	
Premier x Federation[5] (62M9-204)	13732	7-11	43	270	544	365	530	1709	42.7	57.5	23	8	99	29	3	23.2	KS
Idaed	11706	7- 9	38	456	425	337	449	1667	41.7*	56.5	23	5	96	14	3,4	8.4	VRS
Onas	6221	7- 8	37	486	270	329	396	1481	37.1**	57.9	10	5	43	3	4	3.0	

Table 2 . (con't)

Variety or Cross	C.I.No.	Heading Date	Ht. in In.	Grams per Plot I	II	III	IV	Total	Yield Bu./A	Bu. Wt.	Coded Lodging Type	Sev.	Prev.	Stripe Rust % Sev.	i-4 Type	Coefficient
Baart	1697	7-13	40	430	285	375	310	1400	35.0**	54.5	23	9	99	74	4	74.0
Federation	4734	7-18	42	300	235	314	331	1180	29.5**	49.9	23	9	91	79	4	79.0
Lemhi 62	13435	7-13	41	245	300	255	365	1165	29.1**	50.6	23	4	91	92	4	92.0
Lemhi 53	13258	7-12	38	251	240	150	215	856	21.4**	49.8	10	9	38	97	4	97.0
Lemhi	11415	7-13	41	162	154	135	135	586	14.7**	--	23	7	85	98	4	98.0

NOTE: Idaed 59 is used as a check in this nursery
* Varieties yielding significantly less than the check (.05)
** Varieties yielding significantly less than the check (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	7423.24	
Variety	25	64265.8868	7.56
Error	75	8495.4404	
Total	103		

$\bar{x}$..... 47.2 bu/A
S.E.$\bar{x}$..... 4.608536
L.S.D.(.05) 13.0 bu/A
L.S.D.(.01) 17.2 bu/A
C.V.%..... 9.76

Table 3. Agronomic data from irrigated off-station spring wheat nursery grown in Ravalli County, on the Western Montana Branch Station, Corvallis, 1964. Single row plots. Three replications.

Date Planted: April 28, 1964 Date Harvested: Sept. 17, 1964
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Height in In.	Grams per Plot I	II	III	Total Grams	Yield Bu/A	Bushel Weight
Burt x Kenya Farmer	13641	46	405	482	481	1368	45.6	58.2
II-50-17 x Pilot	13586	44	470	430	445	1345	44.8	59.0
Centana	12974	41	480	405	385	1270	42.3	58.9
II-50-17 x Pilot	B60-82	42	355	431	477	1263	42.1	58.4
Burt x Kenya Farmer	13736	36	331	425	440	1196	39.9	57.5
Eureka-Lmh x Idaed[2]	13636	36	310	460	393	1163	38.8	56.9
Mindum	5296	51	398	320	365	1083	36.1	62.0
Crim	13465	41	335	384	345	1064	35.5	56.6
Ceres	6900	44	275	380	385	1040	34.7	58.4
Thatcher	10003	38	399	231	294	924	30.8*	56.6
Langdon	13165	44	274	374	270	918	30.6*	58.5
Idaed 59	13631	34	360	305	244	909	30.3*	56.5

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

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	2	1156.3615	
Varieties	11	8983.78545	2.69*
Error	22	3340.69441	
Total	35		

$\bar{x}$.....	37.6 bu/a
S.E.$\bar{x}$.....	3.337013
L.S.D.(.05).....	9.8
C.V.%.....	8.87

Table 4. Agronomic data from irrigated off-station spring wheat nursery grown in Lake County on the Lake Brothers farm, Ronan, Montana in 1964. Single row plots, four replications.

Date Planted: April 27, 1964 Date Harvested: Sept. 18, 1964
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Grams per Plot I	II	III	IV	Total	Yield Bu/ A	Bushel Weight
Burt x Kenya Farmer	13736	542	685	642	680	2549	63.7**	55.1
Burt x Kenya Farmer	13641	610	741	652	505	2508	62.7*	55.5
II-50-17 x Pilot	13586	586	430	526	619	2161	54.0	57.9
Eureka-Lmh x Idaed^2	13636	455	551	513	510	2029	50.7	55.5
II-50-17 x Pilot	B60-82	440	614	370	570	1994	49.9	56.9
Crim	13465	470	510	530	471	1981	49.5	55.6
Thatcher	10003	520	445	490	501	1956	48.9	55.4
Centana	12974	410	510	505	413	1838	46.0	55.3
Ceres	6900	430	305	430	626	1791	44.8	55.0
Idaed 59	13631	541	560	350	270	1721	43.0	56.0
Mindum	5296	365	475	420	220	1480	37.0	58.5
Langdon	13165	165	220	270	225	880	22.0	55.5

NOTE: Centana used as a check in this nursery
* Variety yielding significantly more than the check (.05)
** Variety yielding significantly more than the check (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	4262.22333	
Varieties	11	49047.28818	6.14
Error	33	7983.69181	
Total	47		

$\bar{x}$..... 47.7
S.E.$\bar{x}$..... 4.467575
L.S.D.(.05).. 12.8
L.S.D.(.01).. 17.1
C.V.%..... 9.37

Table 5. Summary of dryland white spring wheat yield, Creston, Montana from 1956-1964.

Variety or Cross	C.I. or N. No.	Yield in bushels per acre										No. Station Years	Average of Lemhi %
		1955	1956	1957	1958	1959	1960	1961	1962	1963	1964		
Baart	1697	70.9	52.2	59.5	48.1	41.8	29.1	25.5	41.8	21.8	35.0	10	111
Federation	4734	59.4	49.2	40.9	40.5	43.2	30.6	24.9	44.1	21.2	29.5	10	100
Onas	6221	61.7	57.2	47.4	45.6	52.2	31.3	21.7	54.6	33.6	37.1	10	115
Thatcher	10003	58.4	45.6	53.5	37.0	45.2	25.5	30.0	50.3	35.2	50.1	10	112
Lemhi	11415	69.0	56.7	56.0	54.6	38.7	17.8	18.3	52.4	6.2	14.7	10	100
Idaed	11706	55.8	46.3	51.6	39.0	37.0	27.4	27.3	59.2	27.2	41.7	10	107
Yaqui 54	13218										48.8	1	329
Lemhi 53	13258		57.7	59.1	46.0	40.7	27.9	18.1	49.0	8.1	21.4	9	104
Lemhi 62	13435				41.5	51.7	28.4	24.4	50.3	15.4	29.1	7	119
Idaed-59	13631						31.8		52.1	29.1	55.7	4	185
Eureka-Lmh x Idaed^2(60M3)	13636							32.3	49.8	41.2	52.9	4	192
Burt x KF (58-2479)	13640							31.0	49.7	34.5	58.0	4	189
Burt x KF (57-70136)	13641							35.5	51.7	45.8	48.8	4	198
Lermo Rojo	13651										59.2	1	403
Idaed x Burt Sel. 42-5	13722							49.9	52.2	26.8	66.1	4	213
Svenno x Lee-Winter Semidwarf	13730									38.4	50.4	2	424
Preimer x Federation^5 (62M9-204)	13732									32.3	42.7	2	359
Preimer x Federation^4 (62M47-68)	13733									29.0	50.6	2	381
Karn x Henry, sel. 90	13735									37.8	50.2	2	421
Burt x KF (58-2025)	13736									40.7	58.9	2	477
Idaed x Burt Sel. 30-2	13742										53.8	1	366
No.58-Tc x (Tc-KF, III-52-8) A6135	13743										58.6	1	398
No.58-Tc x (Tc-KF, III-52-8) A6145	13744										50.5	1	344
No.58-Tc x Lee A6118-S	13745										53.1	1	361
Eureka x Lmh x Idaed^2 52 ab 1281	13746										48.3	1	329
Nainari 60	13747										62.3	1	423

KS VRS

YEAR: 1964

TITLE: Small Grain Investigations (Winter Wheat) 5023

LOCATION: Northwestern Montana Branch Station, Field No. E-2 and several off-station locations.

DURATION: Indefinite

OBJECTIVES:

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

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

3. To determine the effect of seeding date, seeding depth and variety on the incidence of dwarf smut.

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 randomized block. Discription of a particular study and the procedures of each will be included in the results and discussion section.

RESULTS AND DISCUSSION:

Each nursery will be discussed separately in this report.

Intrastate Hard Red

Several commercial varieties and five Bunt x P.I. 178383 selections were included in this nursery. All the entries were superior to Westmont in yield. The Burt x P.I.178383 selections were quite late in maturity. The entire nursery with the exception of Gaines was lodged severly.

Stripe rust infections were quite sever in the susceptible varieties. Dwarf smut readings were not made but was evident in all entries except, C62-4 and C62-44. See Table 1, for complete results of this study.

Western Regional Hard Red

The hard red regional nursery was grown in two locations in 1963-1964. One in the dwarf bunt area Northwest of Kalispell on the Claridge farm and the other on the station. These nurseries contained thirty entries.

In the nursery on the Claridge farm, dwarf bunt was very sever with many of the susceptible varieties being over 50% smutted. Four of the five Burt x P.I.178383 selections were apparently immuned to dwarf bunt. These were also the highest yielding lines in the nursery. See Table 2 for complete data on this study.

Winter Wheat (con't)

The station nursery was grown in single row plots. It appeared from this nursery that Gaines could not stand the competition from the closely growing hard red entries. In the area of higher yield levels the Burt x P.I. 178383 selections did not preform as well. Delmar is second in yield in this study which is used as a check. Sever lodging was present throughout the nursery. No attempt was made to record plant diseases. See Table 3 for agronomic data.

Western Regional White

Gaines was the out-standing variety in the western regional white wheat nursery. Lodging was quite sever in the nursery except the Semi dwarf selections. Stripe rust, dwarf bunt and mildew were all abundant in this study. There was very little real resistant material to stripe rust in this nursery. However, Gaines does show moderate resistance as a mature plant. See Table 4 for complete results.

Off-Station

Growing conditions, results and other information about each nursery will be discussed under the individual county heading. A total of six nurseries were seeded in the fall of 1963. Each nursery contained fourteen entries.

Missoula County - Excellent growing conditions existed for this study. Stripe rust was heavy, but it did not reduce yields because of the stage of growth when infection took place, namely after the wheat had headed. Thus Westmont is the highest yielding variety in the nursery, and being significantly higher than 12 other entries. Yields were above average for this area in 1964. See Table 5 for complete data.

Ravalli County - Growing conditions in this area were excellent and a fairly high yield level was obtained. Tripplet and Westmont are top yielders. When analyzed statistically these data were found to be non-significant. Table 6.

Sanders County - Emergence was poor in this nursery. This was due to poor moisture conditions at seeding time. Thus only two replications were harvested. Data from this study are found in Table 7.

Mineral County - This nursery was "stubble in". Emergence was fair in the fall. Stands at harvest time were above 60 percent in all varieties. Considerable dwarf smut was found in Warrior and Winalta. Omar and Gaines are the highest yield, a trend never before noted in this area in the soft white wheats. See Table 8 for complete data.

Lake County - Emergence was good, however, heavy snow cover resulted in snow mold. This caused poor stands and the study was abandoned.

Protein determinations were made of all entries of the off-station nurseries. These data are made a part of this report. Table 9.

The summary of off-station work including Creston is found in Table 10. Cheyenne is the highest yielding hard red entry and 14 x 53 Sel. 101, is the highest yielding soft wheat entry. Table 10.

Summary of selected varieties grown in Northwestern Montana is found in

Winter Wheat (con't)

Table 11. For the ten year period Cheyenne is the highest in yield. For the period 1962-1964 (3 year) Delmar leads with 59.5 bushels per acre.

Breeding Materials

Thirty entries made up an advance study of lines selected by the author and E. R. Hehn. These were evaluated for stripe rust resistance and dwarf bunt resistance. Those lines showing resistance to these two diseases were further evaluated for yield and other agronomic characteristics. The entries are found in Table 12.

Entry C63-6 is the highest in yield but was late in maturity which may in part caused the low test weight. It was resistant to both stripe rust and dwarf bunt.

Short Straw Selections

There were 58 entries in the Short Straw Nursery. These were evaluated for stripe rust, dwarf bunt and lodging. These data are made a part of this report for a permanent record. Table 13.

Idaho Stripe Rust Resistant Selections

Thirty-five entries were included in this study. This material was furnished by Dr. W. K. Pope of Moscow, Idaho. Readings taken on this material are included for a permanent record. Table 14. Because of the low stripe rust incidence no rust readings were made.

Selection Nursery

A total of 1300 entries were planted in the large breeding nursery for critical evaluation. Those lines which showed promise have been included in the 1965 studies. No record is made of these entries or selections in this report.

Cultural Study

This study was designed to determine the effect seeding dates and seeding depths have on the incidence of dwarf smut. Earlier work by Hoffman has shown that seeding date and seeding depth are factors in dwarf bunt infection.

Four commercial varieties were used in the study and five dates of seeding, however only four of the dates were harvested.

Plots were 18 feet long, four rows and replicated four times. Thirty two square feet of row were harvested for yield.

Emergence in the fall was excellent except for the October 1 and October 17 seeding. The plots were covered with snow most of the winter providing good protection.

Following emergence particularly on the August 15 and September 1 seeding, stripe rust was very sever. A four type infection and 100% severty. The rust was the most serious on the variety Westmont. Rust was also noted on the other three entries. This apparently had no adverse effect in the spring in that, the highest yield was obtained from the seeding made August 15.

Winter Wheat (con't)

The snow cover caused sever damage to some plots, because of the resulting snow mold. This reduced stands of wheat in many of the plots.

In analyzing these data it was found that dates of seeding were the only variable that was statistically significant. Cheyenne is the highest yielding variety, but not significantly so. The interaction of dates and depths of seeding was statistically significant.

A study of the smut reading show that Westmont smutted the most, with Gaines and Delmar being about equal. More smut was found in the shallow seeding, 1 to 2 inches than in the 2 to 4 inch seeding. The later planting date also had higher smut readings. See Tables 15 and 16.

FUTURE PLANS:

Plans for 1964-1965 will be in general like the past years research program.

SUMMARY:

On station, Gaines again was very high in yield in 1964 as it was in 1963. Ninteen-sixty-four is the first year that the white wheats in western Montana have been higher in yield than the hard red varieties.

Stripe rust infections were lower this season, but dwarf bunt in the area northwest of Kalispell was quite sever. The August 15 date of seeding resulted in the highest yields in 1964. The later the date of the seeding the more the increase in smut. Shallow seeding also resulted in a higher incidence of dwarf smut.

Table 1. Agronomic data from dryland intrastate nursery grown at Creston, Montana in 1963-1964. Four row plots, four replications. Field No. E 2.

Date Seeded: September 17, 1963 Date Harvested: September 5, 1964
Size of Plot: 16 square feet.

Variety or Cross	C.I. No.	Heading Date	Plant Height in Ins.	Yield Bu/A	Test Weight #/acre	Lodging Sev.	Lodging Prev.	Stripe Rust Type i-4	Stripe Rust % Sev.	Stripe Rust Coeffi-cent
Gaines	13448	6-17	32	68.0**	55.3	2	24	2,3	3	1.8
Tendoy	13426	6-18	50	58.1**	56.4	9	99	i,2	1	.6
Cheyenne	8885	6-18	47	57.5*	56.0	9	99	i,2	T	.6
Winalta		6-17	48	54.4*	56.5	7	97	i,2	1	.6
Itana Sel. W-1	13846	6-20	47	54.1*	55.8	9	99	i	0	0
Delmar	13442	6-21	47	51.4	55.5	8	97	1,2	5	.6
Rego	13181	6-17	49	49.9	54.5	9	99	i	0	0
Burt x P.I. 178383	C62-44	6-21	47	48.1	52.3	9	87	i	0	0
Tendoy-61(Rex-Rio x Chn^5)	13675	6-19	48	47.4	56.6	9	99	-	-	-
Itana	12933	6-19	50	46.8	53.0	7	47	4	97	97
Burt x P.I.178383	C62-9	6-17	44	46.7	49.0	9	99	i	0	0
Burt x P.I.178383	C62-4	6-17	44	45.9	45.6	9	99	i,3	3	.6
Warrior		6-17	45	45.8	54.2	7	61	4	68	68
Burt x P.I.178383 (C61-9)	13837	6-21	47	44.4	50.5	9	99	i,3	T	.6
Burt x P.I.178383	C62-31	6-19	47	44.1	50.8	9	99	i	0	0
Westmont	12930	6-16	47	41.5	52.3	9	99	4	94	94

NOTE: Westmont is used as a check in this nursery
* Varieties yielding significantly more than the check (.05)
** Varieties yielding significantly more than the check (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	5036.6666	.706
Variety	15	18315.4000	2.569**
Error	45	7128.2000	
Total	63		

$\bar{x}$.....	50.2
S.E.$\bar{x}$.....	4.221433
L.S.D.(.05)	12.0
L.S.D.(.01)	16.1
C.V.%.....	8.40

Table 2. Agronomic data obtained from dryland western regional hard red winter wheat nursery grown on the Lance Claridge farm, Northwest of Kalispell in 1963-1964. Three row plots, three replications.

Date Seeded: September 17, 1963 Date Harvested: August 20, 1964 Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Heading Date	Height in Inches	Grams Per Plot I	II	III	Total Grams	Yield Bu/ A	Bushel Weight	% Dwarf Bunt
Burt x P.I. 178383	C62-44	6-28	29	411	289	140	840	28.0	57.6	0
Burt x P.I. 178383	C61--9	6-25	29	302	235	264	801	26.7	57.5	0
Burt x P.I. 178383	C62-31	6-25	29	320	280	170	770	25.7	58.0	0
Burt x P.I. 178383	C62- 4	6-23	28	248	255	235	738	24.6	58.2	0
Burt x P.I. 178383	C62- 7	6-23	29	315	190	224	729	24.3	58.5	T
Delmar	13442	6-24	33	274	285	151	710	23.7	59.4	28
Burt x Itana,Sel.42	13845	6-24	31	255	251	200	706	23.5	58.5	52
Rego	13181	6-23	34	270	284	150	704	23.5	58.4	8
Nrn10-Brevor 14XBurt^5, Sel.-11	13739	6-24	24	260	245	169	674	22.5	58.4	12
Yogo x Rescue)Marmin-1065	13544	6-25	37	314	185	165	664	22.0	59.4	22
Burt x Itana, Sel. 34	13844	6-24	32	240	225	170	635	21.1	58.6	23
Burt x Itana, Sel.215 W.C.	13841	6-25	30	245	220	139	604	20.1	58.5	30
Gaines	13448	6-25	29	295	200	108	603	20.0	58.9	18
Rex-Rio x Chey^5(Tendoy-61)	13675	6-23	32	301	151	140	592	19.8	59.0	37
Burt x Itana, Sel.125 W.C.	13842	6-24	29	135	215	70	420	19.5	58.6	43
Kharkof	1442	6-23	34	260	200	120	580	19.3	58.9	40
Itana x Kharkof 17, Sel. 1-26-1	13692	6-24	32	229	226	115	570	19.0	59.6	32
Burt x Itana Sel. 50	13843	6-25	31	176	226	160	562	18.7	59.0	37
Wasatch x Kharkof-17 Sel. 8-5	13691	6-25	37	210	220	125	555	18.5	60.5	23
Colorow	12865	6-23	35	230	174	135	539	18.0	58.5	42
Tendoy	13426	6-19	31	280	120	135	535	17.8	59.1	23
Cheyenne	8885	6-24	29	235	170	130	535	17.8	58.2	47
Col. x Utah 75A-53, Sel. 275-40-2-2	13840	6-24	29	115	174	240	529	17.6	58.9	43
Columbia	12928	6-23	31	225	125	170	520	17.3	60.2	52

Table 2 . (con't)

Variety or Cross	C.I.No.	Heading Date	Height in Inches	Grams per Plot I	II	III	Total Grams	Yield Bu/ A	Bushel Weight	% Dwarf Bunt
Rio	10061	6-24	32	259	95	105	459	15.3*	59.2	42
Itana Sel. W 1	13846	6-25	30	135	210	105	450	15.0*	59.6	63
Burt x Itana, Sel.7	13693	6-25	30	204	154	85	443	14.8*	58.4	63
Columbia x Utah 75-A-53, Sel. 275-40-3-1	13839	6-24	29	130	155	130	415	13.8*	58.2	52
Burt x Itana, Sel.160	13694	6-25	31	118	130	140	388	12.9*	58.5	62
Itana	12933	6-24	32	100	125	120	345	11.5**	58.9	35

NOTE: Delmar is used as a check in this nursery
* Varieties yielding significantly less than the check (.05)
** Varieties yielding significantly less than the check (.01)

$\bar{x}$..... 19.6
S.E.$\bar{x}$..... 2.8169
L.S.D.(.05).. 8.0
L.S.D.(.01).. 10.6
C.V.%..... 14.39

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	56019.4800	23.53**
Varieties	29	54561.8586	22.92**
Error	58	2380.47775	
Total	89		

Table 3. Agronomic data obtained from the western regional hard red winter wheat nursery grown at Creston, Montana in 1963-1964. Single row plots, four replications. Field No. F-2

Date Seeded: Sept. 30, 1963 Date Harvested: Sept. 9, 1964
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Height in Ins.	Grams per Plot I	II	III	IV	Total Grams	Yield Bu/ A	Bushel Weight
Burt x Itana, Sel. 125 W.C.	13842	45	835	739	765	630	2969	74.2	54.8
Delmar (Yogo Rescue)	13442	49	585	735	860	770	2950	73.8	53.4
Marmin-1065	13544	51	750	729	685	691	2855	71.4	57.0
Itana x Kharkof 17, Sel. 1-26-1	13692	51	619	690	860	679	2848	71.2	55.5
Burt x Itana Sel.34	13844	48	860	680	665	615	2820	70.5	52.5
Rego	13181	51	670	654	725	755	2804	70.1	55.6
Columbia x Utah 75A-53,Sel.275-40-3-1	13839	55	694	567	881	561	2703	67.6	54.6
Burt x P.I.178383	C62-4	46	539	592	725	820	2676	66.9	51.5
Colorow	12865	50	795	635	655	515	2600	65.0	55.4
Cheyenne	8885	52	510	740	560	740	2550	63.8	54.7
Itana Sel. W-1	13846	49	659	506	615	685	2465	61.6	55.5
Kharkof	1442	54	461	565	640	775	2441	61.0	55.5
Burt x Itana Sel. 50	13843	48	655	639	640	465	2399	60.0	54.5
Burt x Itana Sel. 215 W.C.	13841	46	505	655	650	585	2395	59.9	54.7
Burt x P.I.178383	C62-44	51	784	601	543	421	2349	58.7*	52.9
Rio	10061	53	511	589	615	624	2339	58.5*	54.5
Rex-Rio x Chey^5 (Tendoy-61)	13675	52	505	560	674	600	2339	58.5*	55.5
Burt x Itana Sel.42	13845	48	575	535	519	649	2278	57.0*	52.8
Tendoy	13426	50	489	465	595	725	2274	56.9*	55.0
Col x Utah 75A-53, Sel.275-40-2-2	13840	47	585	472	655	505	2217	55.4**	55.5
Wasatch x Kharkof-17, Sel. 8-5	13691	52	516	656	490	451	2113	52.8**	55.4
Burt x P.I.178383	C61-9	50	635	427	611	430	2103	52.6**	52.9
Burt Itana Sel.7	13693	47	445	690	499	422	2056	51.4**	49.6
Burt x P.I.178383	C62-31	50	521	521	578	405	2025	50.6**	50.9
Burt x P.I.178383	C62-7	45	523	496	424	399	1842	46.1**	49.9
Burt Itana Sel.160	13694	46	360	419	388	534	1701	42.5**	50.7
Nrnl0-Brevor 14 x Burt^5, Sel. 11	13739	30	565	518	300	290	1673	41.8**	47.9
Itana	12933	52	340	379	376	391	1486	37.2**	49.2
Columbia	12928	48	230	390	395	514	1529	38.2**	50.6
Gaines	13448	33	576	422	493	325	1816	25.4**	51.9

NOTE: Delmar used as a check in this nursery
* Varieties yielding significantly less than the check (.05)
** Varieties yielding significantly less than the check (.01)

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Table 3. (con't)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	7514.34333	
Varieties	29	44722.7010	4.44**
Error	87	10071.20885	
Total	119		

$\bar{x}$.....	58.0
S.E.x.....	5.01777
L.S.D.(.05)	14.1
L.S.D.(.01)	18.7
C.V.%.....	8.65

Table 4. Agronomic data from dryland western regional white wheat nursery grown at Creston, Montana, 1963-1964
Four row plots, four replications. Field No. E-2

Date Seeded: Sept. 17, 1963 Date Harvested: Aug. 18, 1964 Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Heading Date	Ht. in In.	Grams per Plot I	II	III	IV	Total Grams	Bushel Per Acre	Bu. Wt.	Lodging type	Lodging Sev.	Lodging Prev.	Stripe Rust i-4	Stripe Rust %	Smut	Mildew %	Mildew 0-9
Gaines	13448	6-18	34	780	900	745	694	3119	78.0	61.5	1	2	23	3	5	3	8	6
Sel. 101 (27-15xRio-Rex,53)	13438	6-17	36	766	695	801	720	2982	74.6	60.5	0	0	0	i-2	T	T	40	7
x Elgin II	13725	6-18	44	650	729	814	666	2859	71.5	59.5	2	1	71	2	8	T	50	8
Brevor (27-15xRio-Rex,53)	12385	6-19	45	625	603	580	901	2709	67.7	59.5	8	9	96	i-3	T	T	85	9
x Elgin 4	13726	6-18	44	676	646	659	559	2540	63.5**	58.1	9	5	93	3	5	3	70	8
Omar Mutant	13727	6-20	47	565	515	510	799	2389	59.7**	58.5	14	4	47	4	80	T	5	6
Alba Sel. (Roedel Sel.)	13737	6-26	47	535	570	565	630	2300	57.5**	56.5	6	8	99	i-3	T	T	T	6
Elgin	11755	6-20	47	545	535	580	630	2290	57.3**	59.5	4	6	96	4	72	5	15	5
~~(Elgin19xElmar)-III~~ x 1813, Sel. 4	13645	6-19	43	550	503	605	606	2264	56.6**	55.0	3	9	99	3	5	3	90	9
White Coin (Elg.19xElmar)-III x 1813, Sel.6	13729	6-19	48	545	532	560	600	2237	55.9**	58.5	1	9	99	i	0	T	7	2
Burt	13738	6-18	41	460	465	605	680	2210	55.3**	54.5	1	9	76	3	T	T	93	9
Burt Mutant	12696	6-17	44	645	484	545	510	2184	54.6**	60.5	3	6	67	3	13	T	85	8
Burt x Kenya Farmer 57-70136	13728	6-18	38	505	507	570	579	2161	54.0**	60.2	0	0	0	3	5	1	43	7
Itana Sel. W-1	13641	6-14	47	649	535	515	355	2054	51.4**	60.3	6	4	73	3	15	T	T	3
Omar	13846	6-19	48	516	490	531	515	2052	51.3**	60.9	14	8	90	i	0	5	8	4
Tripplet	13072	6-20	47	479	575	474	520	2048	51.2**	58.0	3	9	96	4	75	T	28	8
P.I.178383xOmar^2 Sel.172	5408	6-18	48	570	450	449	575	2044	51.1**	61.5	8	7	91	4	5	4	30	7
Kharkof	13740	6-19	48	514	505	435	550	2004	50.1**	55.0	1	9	99	i-1	T	0	20	6
(Fr.41MxGln^4)x(Rio x Gln^4) Sel.B-59	1442	6-18	53	535	514	435	485	1969	49.2**	61.3	12	9	98	2	5	T	2	4
P.I.178383xOmar^2 Sel. 197	13648	6-19	45	495	480	425	484	1884	47.1**	58.1	6	9	96	3	10	T	3	5
Golden	13741	6-20	43	371	480	482	495	1828	45.7**	57.5	1	9	99	1	T	0	5	6
	10063	6-20	47	439	425	472	355	1691	42.3**	58.4	3	9	99	4	30	3	3	4

NOTE: Gaines was used as a check in this nursery
** Varieties yielding significantly less than the check (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	4801.54	
Varieties	21	34697.28095	6.45
Error	63	5371.79968	
Total	87		

$\bar{x}$.....	56.6 bu/a
S.E.$\bar{x}$.....	3.664528
L.S.D.(.05).....	10.3 bu/a
L.S.D.(.01).....	13.7 bu/a
C.V.%.....	6.47

Table 5. Agronomic data from dryland off-station winter wheat nursery grown in Missoula County on the Al Goodan farm, Missoula, Montana in 1963-1964. Single Row Plots, four replications.

Date Planted: Sept. 18, 1963 Date Harvested: Aug. 11, 1964 Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Height in In.	Grams per Plot I	II	III	IV	Total Grams	Yield Bu/ A	Bushel Weight	Stripe Rust i-4	%
Westmont	12930	38	518	465	385	435	1803	45.1	58.2	4	90.0
14 X 53 Sel. 101	13438	30	515	425	370	435	1745	43.6	58.9	i-1	2.5
Burt & P.I.178383 (C61-9)	13837	38	420	415	326	365	1526	38.2*	57.9	i	--
Omar	13072	38	385	374	335	420	1514	37.9*	58.0	4	55.0
Wanalta		39	380	410	305	391	1486	37.2*	59.5	1	5.0
Cheyenne	8885	41	355	320	420	355	1450	36.3**	58.5	i	--
Rego	13181	41	370	385	290	320	1365	34.1**	59.8	1-3	3.0
Delmar	13442	41	370	326	400	265	1361	34.0**	59.5	2-3	15.0
Warrior		41	355	375	269	350	1349	33.7**	58.2	2-3	7.5
Tripplet	5408	40	376	365	285	310	1336	33.4**	61.5	2	8.0
Brevor	12385	34	354[1]	330	365	275	1324	33.1**	58.1	0	2.5
Gaines	13448	28	299	305	405	306	1315	32.9**	59.5	i-0	2.5
Wasatch	11925	42	286	285	290	345	1206	30.2**	60.2	1-2	15.0
Burt	12696	37	330	310	251	299	1190	29.8**	58.4	1-4	7.5

[1] Calculated missing plot
* Varieties yielding significantly less than Westmont (.05)
** Varieties yielding significantly less than Westmont (.01)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	5116.69000	2.67
Varieties	13	7973.14307	4.16**
Error	38	1915.80079	
Total	54		

$\bar{x}$.....	35.7 bu/a
S.E.$\bar{x}$.....	2.188493
L.S.D.(.05).....	6.3 bu/a
L.S.D.(.01).....	8.4 bu/a
C.V.%.....	6.14

Table 6. Agronomic data from dryland off-station winter wheat nursery grown in Ravalli County on the L. S. Clark farm, Stevensville, Montana in 1963-1964. Single row plots. Four replications.

Date Planted: Sept. 18, 1963 Date Harvested: Aug. 11, 1964
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Height in In.	Grams per Plot I	II	III	IV	Total Grams	Yield Bu/A	Bushel Weight
Tripplet	5408	35	430	349	335	460	1574	39.4	62.0
Westmont	12930	32	424	390	370	380	1564	39.1	61.9
Rego	13181	34	435	364	350	415	1564	39.1	61.0
Omar	13072	31	290	410	405	445	1550	38.8	61.0
Burt & P.I.178383 (C61-9)	13837	32	431	370	360	374	1535	38.4	59.2
Delmar	13442	32	360	395	360	415	1530	38.3	60.0
14 X 53 Sel. 101	13438	26	430	325	365	410	1530	38.3	61.0
Wanalta		33	403	342	324	415	1484	37.1	62.0
Burt	12696	29	311	360	395	405	1471	36.8	61.2
Warrior		34	381	295	315	471	1462	36.6	61.5
Wasatch	11925	34	265	340	365	440	1410	35.3	62.9
Cheyenne	8885	31	355	270	350	350	1325	33.1	62.8
Gaines	13448	24	240	350	320	405	1315	32.9	60.5
Brevor	12385	30	334	308	305	345	1292	32.3	60.4

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	11261.83333	5.79
Varieties	13	2439.61000	1.25NS
Error	39	1944.34615	
Total	55		

$\bar{x}$..... 36.8
S.E.$\bar{x}$..... 2.204737
L.S.D..... N.S.
C.V.%..... 5.99

Table 7. Agronomic data from dryland off-station winter wheat nursery grown in Sanders County on the Sidney Cross farm, Camas Praire, Montana in 1964. Single row plots. Two replications harvested.

Date Planted: Sept. 18, 1963 Date Harvested: Aug. 26, 1964
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Height in In.	Stand	Grams per Plot II	Grams per Plot III	Total Grams	Yield Bu/A
Omar	13072	19	82	300	361	661	33.1
Burt & P.I.178383 (C61-9)	13837	22	70	295	280	575	28.8
14 X 53 Sel. 101	13438	20	48	288	275	563	28.2
Burt	12696	22	70	349	202	551	27.6
Cheyenne	8885	22	75	315	202	517	25.9
Wasatch	11925	26	90	300	209	509	25.5
Brevor	12385	24	43	305	160	465	23.3
Warrior		26	73	190	230	420	21.0
Delmar	13442	27	50	189	211	400	20.0
Gaines	13448	18	68	271	110	381	19.1
Westmont	12930	21	42	105	250	355	17.8
Wanalta		20	70	145	209	354	17.7
Rego	13181	25	43	105	190	295	14.8
Tripplet	5408	20	43	115	160	275	13.8

Table 8. Agronomic data from dryland off-station winter wheat nursery grown in Mineral County on the Charles Frey farm, Superior, Montana. Single row plots. Three Replications.

Date Seeded: Sept. 18, 1963 Date Harvested: Aug. 24, 1964
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Height in In.	Stand	Grams per Plot II	III	IV	Total Grams	Yield Bu/ A	Dwarf Bunt %
Omar	13072	27	73	295	195	306	796	26.5*	--
Gaines	13448	23	75	233	152	230	615	20.5	T
Delmar	13442	27	83	195	230	189	614	20.5	6
Westmont	12930	27	82	156	140	250	546	18.2	4
14 X 53 Sel. 101	13438	21	60	90	148	245	483	16.1	--
Burt & P.I.178383 (C61-9)	13837	26	67	124	155	200	479	16.0	--
Cheyenne	8885	26	65	115	80	280	475	15.8	9
Burt	12696	24	72	135	100	236	471	15.7	T
Brevor	12385	25	67	130	160	150	440	14.7	--
Wasatch	11925	29	68	125	125	185	435	14.5	3
Vanalta		26	58	95	105	220	420	14.0	20
Rego	13181	28	68	136	60	205	401	13.4	9
Warrior		25	82	138	105	140	383	12.8	18
Tripplet	5408	27	77	130	100	150	380	12.7	45

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

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	25333.881	15.63**
Varieties	13	4358.70331	2.69*
Error	26	1620.36815	
Total	41		

$\bar{x}$..... 16.5
S.E.$\bar{x}$..... 2.32405
L.S.D.(.05) 6.8
C.V.%..... 14.06

Table 9. Protein data from off-station nurseries harvested in 1964.

Variety or Cross	C.I. or N. No.	Protein in % Location by County				$\bar{x}$
		Missoula	Ravalli	Sanders	Mineral	
Westmont	12930	7.2	10.4	15.8	10.3	10.9
Warrior		8.4	11.5	16.0	12.3	12.1
Wanalta		8.5	11.1	15.9	11.8	11.8
Delmar	13442	8.0	10.6	14.8	10.6	11.0
Cheyenne	8885	7.7	11.1	15.2	10.1	11.0
Rego	13181	8.0	11.4	14.6	10.5	11.1
Burt x P.I.178383 C61-9	13837	7.3	9.8	13.3	10.2	10.2
Wasatch	11925	8.3	10.7	15.7	12.9	11.9
Burt	12696	7.5	9.5	14.1	10.7	10.5
Omar	13072	7.3	9.4	13.8	8.6	9.8
Brevor	12385	7.5	10.0	13.3	10.2	10.3
Gaines	13448	7.0	10.5	13.8	9.5	10.2
Tripplet	5408	8.6	11.0	15.1	11.3	11.5
14 x 53 Sel. 101	13438	7.0	9.0	13.8	9.7	9.9

Table 10. Summary of off-station varieties including Creston. Yields, 1963-1964

Variety or Cross	C.I. or N. No.	Yields in Bushels per Acre — Locations: Creston	Missoula County	Ravalli County	Sanders County	Mineral County	$\bar{x}$
Westmont	12930	41.5	45.1	39.1	17.8	18.2	32.3
Warrior		45.8	33.7	36.6	21.0	12.8	30.0
Wanalta		54.4	37.2	37.1	17.7	14.0	32.1
Delmar	13442	51.4	34.0	38.3	20.0	20.5	32.8
Cheyenne	8885	57.5	36.3	33.1	25.9	15.8	33.7
Rego	13181	49.9	34.1	39.1	14.8	13.4	30.3
Burt x P.I.178383 C61-9	13837	44.4	38.2	38.4	28.8	16.0	33.2
Wasatch	11925		30.2	35.3	25.5	14.5	26.4
Burt	12696	54.6	29.8	36.8	27.6	15.7	32.9
Omar	13072	51.2	37.9	38.8	33.1	26.5	37.5
Brevor	12385	67.7	33.1	32.3	23.3	14.7	34.2
Gaines	13448	68.0	32.9	32.9	19.1	20.5	34.7
Tripplet	5408	51.1	33.4	39.4	13.8	12.7	30.1
14 x 53 Sel. 101	13438	74.6	43.6	38.3	28.2	16.1	40.2

Table 11 . Summary of selected winter wheat data from varieties grown at the Northwestern Montana Branch Station, including 1955-1964.

Variety or Cross	C.I. or N. No.	Yield in Bushels per Acre 1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	$\bar{x}$	No. Years	Long Term % of Westmont	3 year Average Bu/acre	10 year Average Bu/acre
Cheyenne	8885	59.8	71.0	59.3	49.0	51.8	41.4	49.5	55.5	61.9	57.5	55.7	10	103	58.3	55.7
Westmont	12930	62.7	68.6	60.7	64.9	53.3	34.3	51.1	57.2	45.6	41.5	54.0	10	100	48.1	54.0
Itana	12933	55.6	73.0	58.1	55.6	50.5	32.6	48.0	50.3	54.5	46.8	52.5	10	97	50.5	52.5
Rego	13181		66.7	50.0	59.8	55.6	35.5	46.7	60.6	60.2	49.9	53.9	9	102	56.9	
Tendoy	13426				54.0	52.4	38.6	47.8	54.2	62.2	58.1	52.5	7	106	58.2	
Delmar	13442								55.3	71.8	51.4	59.5	3	124	59.5	
Gaines	13448									91.7	68.0	79.9	2	183		
Tendoy 61	13675										47.4	47.4	1	114		
Itana Sel. W-1	13846									76.6	54.1	65.3	2	150		
Burt x P.I.178383 (C61-9)	13837										44.4	44.4	1	107		
Warrior											45.8	45.8	1	110		
Winalta											54.4	54.4	1	131		
Burt x P.I.178383	C62-4										45.9	45.9	1	110		
Burt x P.I.178383	C62-9										46.7	46.7	1	113		
Burt x P.I.178383	C62-31										44.1	44.1	1	106		
Burt x P.I.178383	C62-44										48.1	48.1	1	116		

Table 12. Agronomic data from the 1963 to 1964 stripe rust and dwarf bunt resistant nursery. Northwestern Montana Branch Station. Feild No. E-2, single row plots, four replications.

Date Planted: September 17, 1963 Date Harvested: August 18, 1964 Size of Plot: 16 sq. feet.

Variety or Cross	Creston # or C.I. #	Grams per Plot I	II	III	IV	Total	Average Yield Bu/Acre	Bushel Weight in Lbs.	Stripe Rust 1-4	%	% Dwarf Bunt
IM462-N10 x It684(15)/P.I.178383 #90 AV25	C63- 6	780[1]	865	615	850	3110	77.7**	55.5	i	0	0
Gaines	13448	885	715	780	659	3039	76.0**	61.0	2-3	7.5	1.3
IM462-N10 x It684(15)/P.I.178383 #90 AV25	C63- 9	720	748	706	734	2908	72.7**	57.8	i	0	0
IM462-N10 x It684(15)/P.I.178383 #90 AV25	C63- 1	535	781	839	640	2795	69.9**	58.0	i	0	T
IM462-N10 X It684(15)/P.I.178383 #90 AV25	C63-10	708	635	635	749	2727	68.2**	56.4	i-1	T	0
IM462-N10 x It684(15)/P.I.178383 #90 AV25	C63- 4	627	700	705	655	2687	67.2**	53.9	i-3	1.3	T
Burt	12696	829	550	637	564	2580	64.5**	60.2	3-4	10	1.3
IM462-N10-It68A x/P.I.178383-5 x OAV25	C62-69	530	579	512	740	2361	59.0**	58.5	i-3	T	T
Burt x P.I. 178383	C62- 8	594[1]	475	421	650	2140	53.5*	60.5	i-1	T	T
Itana	12933	424[1]	405	440	415	1684	42.1	59.8	4	86	12.5
IM462 N10 x P.I.178383	C63-16	390	436	342	403	1571	39.3	55.8	i	0	0
Westmont	12930	265	410	295	445	1415	35.4	61.0	4	91	3.8

NOTE: Westmont used as a check in this nursery.
* Entries yielding significantly more than the check (.05)
** Entries yielding significantly more than the check (.01)

$\bar{x}$.....	60.5
S.E.$\bar{x}$.....	4.64723
L.S.D.(.05)..	13.4
L.S.D.(.01)..	18.1
C.V.%.....	7.68

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	4792.85333	
Entries	11	85989.23818	9.95**
Error	31	8638.69967	
Total	45		

Table 13. Great plains short straw selection nursery grown at the Northwestern Montana Branch Station in 1964. Field No. E-2.

Variety	C.I. or Id. No.	Dwarf Smut %	Stripe Rust i,0-4	Stripe Rust % Sev.	Lodging %
Westmont	12930	5	4	70	0
SS-C.I. 12500-Pn x Tmp.	63140	10	3	70	0
Wrn 16-C.I.12500 x Kaw	62136	T	3	30	0
Bison x Qui	63174	2	1	5	0
SS-C.I.12500 x Cnn^2	63207	5	4	90	0
SS-C.I.12500 x Cnn^2	63209	10	4	90	0
SS-C.I.12500 x Cnn^2	63210	5	4	75	0
SS-C.I.12500-Rch Pn x Cnn	63212	20	3	50	0
SS-C.I.12500-Rch Pn x Cnn	63213	5	i	0	0
SS-C.I.12500-Rch Pn x Cnn	63214	0	i	0	0
SS-C.I.12500-Rch Pn x Cnn	63215	T	4	70	0
SS-C.I.12500-Rch Pn x Cnn	63216	5	4	5	0
SS-C.I.12500-Rch Pn x Cnn	63217	5	i	0	0
SS-C.I.12500-Rch Pn x Cnn	63218	T	i	0	0
SS-C.I.12500-Rch Pn x Cnn	63224	20	3	5	0
SS-C.I.12500-Rch Pn x Cnn	63225	10	3	5	0
SS-C.I.12500-Rch Pn x Cnn	63226	15	2	5	0
SS-C.I.12500-Rch Pn x Cnn	63227	10	2	5	0
SS-C.I.12500-Rch Pn x Cnn	63228	5	3	10	0
SS-C.I.12500-Rch Pn x Cnn	63229	5	3	5	0
Westmont	12930	5	4	95	30
SS-C.I.12500-Rch Pn x Cnn	63233	5	2	10	0
SS-C.I.12500-Rch Pn x Cnn	63236	10	4	90	0
SS-C.I.12500-Rch Pn x Cnn	63237	10	4	95	0
SS-C.I.12500-Rch Pn x Cnn	63238	20	4	75	0
SS-C.I.12500-Rch Pn x Cnn	63239	5	4	75	0
SS-C.I.12500-Rch Pn x Cnn	63240	15	4	50	0
SS-C.I.12500-Rch Pn x Cnn	63242	10	4	85	0
SS-C.I.12500-Rch Pn x Cnn	63245	45	3	60	15
SS-C.I.12500-Rch Pn x Cnn	63246	30	4	80	15
SS-C.I.12500-Rch Pn x Cnn	63247	5	4	60	0
SS-C.I.12500-Rch Pn x Cnn	63248	15	4	85	0
SS-C.I.12500-Rch Pn x Cnn	63249	20	4	70	0
SS-C.I.12500-Rch Pn x Cnn	63250	10	3	35	0
SS-C.I.12500-Rch Pn x Cnn	63251	5	4	80	0
SS-C.I.12500-Rch Pn x Cnn	63253	10	3	20	0
SS-C.I.12500-Rch Pn x Cnn	63254	5	4	30	0
SS-C.I.12500-Rch Pn x Cnn	63255	20	4	20	0
SS-C.I.12500-Rch Pn x Cnn	63256	20	4	80	0
SS-C.I.12500-Rch Pn x Cnn	63257	10	X	X	0
Westmont	12930	15	4	80	0
SS-C.I.12500-Rch Pn x Cnn	63258	5	4	65	0
SS-C.I.12500-Rch Pn x Cnn	63259	5	3	30	0
SS-C.I.12500-Rch Pn x Cnn	63263	2	2	20	0
SS-C.I.12500-Rch Pn x Cnn	63264	5	4	20	0
SS-C.I.12500-Rch Pn x Cnn	63265	T	i	0	0
SS-C.I.12500-Rch Pn x Cnn	63266	20	3	30	0
SS-C.I.12500-Rch Pn x Cnn	63267	20	3	30	0

Table 13 . (con't)

Variety	C.I. or Id. No.	Dwarf Smut %	Stripe Rust i,0-4	Stripe Rust % Sev.	Lodging %
SS-C.I.12500-Rch Pn x Cnn	63269	30	3	10	0
SS-C.I.12500-Rch Pn x Cnn	63270	25	3	25	0
SS-C.I.12500-Rch Pn x Cnn	63271	20	3	5	0
SS-C.I.12500-Rch Pn x Cnn	63272	20	3	20	0
SS-C.I.12500-Rch Pn x Cnn	63275	15	i	0	0
SS-C.I.12500-Rch Pn x Cnn	63278	T	i	0	10
SS-C.I.12500-Rch Pn x Cnn	63281	25	4	70	0
SS-C.I.12500-Rch Pn x Cnn	63283	40	3	20	0
SS-C.I.12500-Rch Pn x Cnn	63284	20	1	5	0
Westmont	12930	20	4	75	0

Table 14 . Dwarf Smut readings from Idaho Stripe rust resistant selections grown on the Claridge farm, Kalispell, Montana in 1963-1964.

Description or Variety	Identification Number	Dwarf Smut in Per cent
P 80 x Comanche^3	-5-5	35
P 80 x Comanche^3	12-2	10
P 80 x Comanche^3	12-3	10
P 80 x Comanche^3	31-1	20
P 80 x Comanche^3	31-2	15
P 80 x Comanche^3	31-4	20
P 80 x Comanche^3	31-5	25
P 80 x Comanche^3	10-4	10
P 80 x Comanche^3	10-5	10
P 80 x Comanche^3	10-6	5
Westmont	12930	55
H-H-T^3 x Cheyenne	-1-2	5
H-H-T^3 x Cheyenne	-1-6	T
H-H-T^3 x Cheyenne	-3-1	0
H-H-T^3 x Cheyenne	-3-2	0
H-H-T^3 x Cheyenne	-8-6	15
Hussar x Cheyenne^3	-6-1	10
Hussar x Cheyenne^3	-6-2	15
Hussar x Cheyenne^3	-7-2	0
Hussar x Cheyenne^3	-7-3	0
Westmont	12930	5
Hussar x Cheyenne^3	-7-5	T
Hussar x Cheyenne^3	-7-6	0
Hussar x Cheyenne^3	-9-1	0
Hussar x Cheyenne^3	-9-2	0
Hussar x Cheyenne^3	-9-4	0
Hussar x Cheyenne^3	-9-5	--
(R x R) Cheyenne^2) Com^3	-5-3	T
(R x R) Cheyenne^2) Com^3	-5-4	20
Westmont	12930	10
(R x R) Cheyenne^2) Com^3	-5-5	5

Table 14. (con't)

Description or Variety	Identification Number	Dwarf Smut in Per Cent
(R x R) Cheyenne[2]) x Com[3]	-5-6	5
Hussar x Cheyenne	10-2	T
Hussar x Cheyenne	10-3	15

Table 15. Agronomic data from date of seeding study on the Lance Claridge farm, Route 3, Kalispell, Montana in 1964. Four replications, four row plots. Size of Plot: 32 square feet.

Seeding Dates	Variety	Depth	Plot Yields in Grams I	II	III	IV	Total	Yield Bu/A	Bu.Wt. in Lbs.	Dwarf Smut %
Aug. 15	Westmont	D_1	416	377	419	481	1693	42.3	59.0	.70
		D_2	565	506	431	595	2097	52.4	59.6	.70
	Gaines	D_1	430	519	330	446	1725	43.1	58.5	.25
		D_2	590	740	706	345	2381	59.5	59.0	T
	Delmar	D_1	375	330	360	516	1581	39.5	59.0	T
		D_2	430	441	315	475	1661	41.5	59.5	.25
	Cheyenne	D_1	440	479	342	514	1775	44.4	58.5	1.25
		D_2	591	524	405	530	2050	51.3	58.9	1.25
Sept. 1	Westmont	D_1	244	381	385	370	1380	34.5	58.4	6.00
		D_2	340	471	452	326	1589	39.7	59.0	2.50
	Gaines	D_1	170	355	355	165	1045	26.1	57.9	2.00
		D_2	315	445	410	175[1]	1345	33.6	58.3	.00
	Delmar	D_1	190	360	350	300	1200	30.0	58.5	3.33
		D_2	300	380	396	360	1436	35.9	59.0	.25
	Cheyenne	D_1	305	462	395	240	1402	35.1	58.0	8.33
		D_2	324	400	500	310	1534	38.6	58.4	1.50
Sept.19	Westmont	D_1	415	265	200	85	965	24.1	59.9	10.00
		D_2	371	180	416	90	1057	26.4	60.2	7.50
	Gaines	D_1	405	198	324	90	1017	25.4	59.5	5.0
		D_2	375	125	155	50	705	17.6	--	T
	Delmar	D_1	348	225	315	190	1078	27.0	58.8	2.00
		D_2	375	177	221	210	983	24.6	58.5	T
	Cheyenne	D_1	500	375	260	330	1465	36.6	--	7.25
		D_2	375	30	165	350[1]	920	23.0	--	8.00
Oct. 1	Westmont	D_1	285	285	210	124[1]	904	22.6	--	41.67
		D_2	342	152	454	88[1]	1036	25.9	58.5	30.00
	Gaines	D_1	189	235	415	189	1028	25.7	58.0	7.00
		D_2	405	160	295	80	940	23.5	56.4	2.33
	Delmar	D_1	256	390	395	188	1229	30.7	58.0	6.67
		D_2	415	285	400	231	1331	33.3	58.4	5.67
	Cheyenne	D_1	261	175	340	342[1]	1118	28.0	--	23.33
		D_2	265	480	256	366	1367	34.2	57.5	14.50
Total			11607	10907	11372	9151	43037			
								$\bar{x}$ 33.6		

[1] Plot yield estimated.

Table 16. Summary of data from seeding study grown on Claridges in 1964.

Variety	Yield in Bushels per Acre — Date Planted: Aug.15	Sept.1	Sept.15	Oct.1	$\bar{x}$ for Varieties	Smut % for Varieties
Westmont	47.4	37.1	25.3	24.2	33.5	12.38
Gaines	51.3	29.9	21.5	24.6	31.8	2.07
Delmar	40.5	33.0	25.8	32.0	32.8	2.27
Cheyenne	47.8	36.7	29.8	31.1	36.4	8.20
$\bar{x}$ for Dates	46.8	34.2	25.6	28.0	)33.6 - $\bar{x}$	
Smut % for Dates	.58	2.99	4.99	16.40		

Variety	Seeding Depth D_1	D_2	$\bar{x}$ for Varieties
Westmont	30.9	36.1	33.5
Gaines	30.1	33.6	31.8
Delmar	31.8	33.8	32.8
Cheyenne	36.0	36.7	36.4
$\bar{x}$ for Seeding Depth	32.2	35.1	)33.6 - $\bar{x}$
Smut % for Depth	7.80	4.67	

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	38567.09	3.68*
Dates	3	287131.21	27.36**
Varieties	3	12059.96	1.15
Depth	1	26077.57	2.49
D x V	9	12129.06	1.16
D x Depth	3	29505.18	2.81*
V x Depth	3	3040.34	
D x V x Depth	9	5584.67	
Error	93	10493.40	
Total	127		

YEAR: 1964

TITLE: Oil Crops Investigations 5028

LOCATION: Northwestern Montana Branch Station
Western Montana Branch Station

PERSONNEL: Leader - Vern R. Stewart
Cooperators - Don Merkley, R. F. Eslick

DURATION: Indefinite

OBJECTIVES:

1. To determine the agronomic adaptability and oil potential of several plant species.
2. To determine the Canary grass variety best adapted for western Montana conditions.
3. By natural selection find a strain of safflower that will mature and produce seed in western Montana.

EXPERIMENTAL DESIGN AND PROCEDURES:

Plot work was conducted in a manner similar to that used for ceral research.

RESULTS AND DISCUSSION:

New Crops Nursery

Three new crops nurseries were seeded in 1964. Two irrigated, one at the Northwest Station and one at Western. The third and dryland was grown at Northwestern. A mistake was made when the seed was packaged and live winter wheat seed was used as a carrier. This resulted in such competition for the smaller seed crops, that poor stands and growth were obtained. Because of this condition the two nurseries at Northwestern were abandoned.

Yields were very poor at Corvallis when a comparison is made to last years yields. Barley is the highest yielding entry. See Table 1.

Safflower

Safflower yields in the Regional Nursery were poor because of the cool, wet and short growing season. Several of the entries did not even mature. Thus the material harvested was very immature seed. This material has been sent to Utah for Oil Analysis, but had not been received at this writing. See Table 2 for complete details.

The breeding block was continued. One each were located at Western and Northwestern. These were harvested and new seeding will be planted in 1965. The only selection pressure was that of the environment.

Oil Crops (con't)

1964 Report

Canary Grass

Two canary grass nurseries were seeded, one at each of the stations. These were harvested and seed taken to Bozeman for analysis. At this writing this material has not been received. Therefore, it is not made a part of this report.

FUTURE PLANS:

Continue the work on winter rapes and the safflower breeding block.

SUMMARY:

Very poor year for these type crops.

Table 1. Agronomic data from intrastate new crops nursery, grown in Ravalli County at the Western Montana Branch Station in 1964. Four row plots, four replications.

Date Planted: May 20, 1964 Date Harvested: September 17, 1964
Size of Plot: 16 square feet

Crop & Variety	Grams per Plot I	II	III	IV	Total Grams	Yield Lbs/A
Barley, Unitan	747	476	365	485	2073	3111
Flax, Redwood	316	220	315	276	1127	1691**
Crambe	110	70	225	95	500	750**
Mustard,Oriental Yellow Com.	80	80	100	76	336	504**
Mustard,Oriental Yellow 63-994	41	70	35	40	186	279**
Mustard,Oriental Yellow 62-1504	65	55	48	65	233	350**
Mustard, Yellow Commercial	124	90	110	134	458	687**
Mustard, Yellow 63-995	95	95	65	55	310	465**

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

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	4363.86466	
Species	7	104112.0312	24.41*
Error	21	4265.12648	
Total	31		

$\bar{x}$..... 980
S.E.$\bar{x}$..... 196.00872
L.S.D.(.05) 577
L.S.D.(.01) 785
C.V.%..... 20.06

Table 2. Agronomic data from the regional safflower nursery grown at Corvallis, Montana in 1964. Four row plots, four replications.

Date Planted: April 27, 1964 Date Harvested: November 6, 1964
Size of Plot: 16 square feet

Entry	Replication I	II	III	IV	Mean	Pounds per acre
U. S. 10	165	130	130	105	133	798
Gila	230	110	115	130	146	876
U. 5	130	145	75	155	126	756
U. 15	230	70	50	100	113	678
A 0104	180	92	69	155	124	744
12417	130	30	40	60	65	390[1]
A 1049	110	26	60	49	61	366[1]
River Road	90	55	40	50	59	354

[1] Immature seeds. Brown in color.

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	11768.20833	12.99**
Varieties	7	5118.25000	5.65**
Error	21	905.64286	
Total	31		

$\bar{x}$.....	620
S.E.$\bar{x}$.....	92.817
L.S.D.(.05)	266
L.S.D.(.01)	361
C.V.%.....	14.56