ACTIVITIES

In 1965 the staff assisted with and attended the list of activities that follow:

Date 1965	Activity	Subject	Staff	Place
Jan. 8	T.A.P.	Soils Research	Stewart	Kalispell
Jan. 13	Sugar Beet Research Conf.	Weed Control in Sugar Beets	Stewart	Billings
Jan. 15	T.A.P.	Government Agencies	Stewart	Kalispell
Jan. 27	Advisory Council	Station Report	Stewart	Polson
Feb. 3	Crop Quality Council	New Wheat Varieties	Stewart	Great Falls
Feb. 5-11	Hard Red Winter Wheat Workers Conference	Advance in Wheat Research	Stewart	Ft.Collins, Colorado
Feb.16-17	District Agts. School	Forages	Stewart	Missoula
Mar. 1- 5	Planning Conference	Research Planning	Stewart	Bozeman
Mar. 9	Cub Scout Outing	Lambs	Roath	Station
Mar. 15	Sugar Beet Growers School	Weed Control in Sugar Beets	Stewart	Corvallis
Mar. 16	" " " "	" " " "	Stewart	Charlo
Mar. 16	" " " "	" " " "	Stewart	Missoula
Mar. 17	" " " "	" " " "	Stewart	Townsend
Mar. 23	Television Program	People in Research	Stewart	Missoula
Mar. 25	" "	Areas of Research	Stewart	Missoula
Apr. 8	" "	Forages	Roath	Missoula
Apr. 13	Ag. Council		Roath	Kalispell
Apr. 30	Pocket Gopher Machine used on 20 acres		Roath	Station
May 4	33 Lutheran Pupils	Farm Tour	Roath	Station
May 11	Ag. Council	Report	Roath	Kalispell
May 19	Television School		Roath Stewart	Missoula
May 20	Potato Seedlings from Bozeman		Roath	Bozeman
June 18	Television Program	Forage Program	Roath	Missoula
June20-26	Western Crop Science Society	Stripe Rust in Wheat	Stewart	Corvallis, Oregon
	Western Wheat Breeders	Dwarf Bunt in Winter Wheat	Stewart	Corvallis, Oregon
July 6-10	Summer Staff Conference	Annual Meeting	Roath Stewart	Sidney
July 19	Chamber Ag. Committee		Roath	Kalispell
July 22	Television Program	Research Machinery	Stewart	Missoula
July 28	Field Day - Western Mont. Branch Station	Cereal & Forage Research	Roath Stewart	Corvallis
Aug. 3	Wool Lab. Staff	Measured lamb fleeces	Roath	Station
Aug. 3- 6	Appraised Sainfoin seedlings	Sainfoin	Roath	5 Co. area
Aug. 10	Field Day	Station Tour	Roath Stewart	Station Station
Aug. 12	Lake Co. Fair	Judging	Roath	Ronan
Aug. 19	Television Program	Sainfoin	Roath	Missoula
Aug. 25	Missoula County Fair	Judging	Roath	Missoula
Sept. 4	Sanders County Fair	Judging	Roath	Plains
Nov. 1- 5	Annual Staff Conference		Stewart	Bozeman
Nov. 9	Ag Council Meeting	Our Heritage	Stewart	Kalispell
Nov.15-19	State Weed Conference	Weed Control	Stewart	Sidney
Dec. 14	Television Program	Weed Control	Stewart	Missoula

October, November, December - Quarter Leave for Travel - Roath

The following individuals visited the station in 1965:

Date	Name	Representing	Address
Jan. 8	Don Graham	Western Montana Branch Station	Corvallis, Montana
March 8	Ed Albke	Pittsburg Glass Company	Portland, Oregon
March 8	Dick Klockman	" " "	" "
April 5	Owen Hockstetler	Farmer	Kalispell, Montana
April 6	Donald Schnaidt	Mutual Fund Sales	" "
April 6	Ben Gordon	Retired Farmer	" "
April 28	Jim Hoffmann	Western Regional Cereal Disease Control Lab.	Pullman, Washington
April 29	Herb Leighty	Comico Products	Spokane, Washington
April 29	Phil Donnelly	" "	Missoula, Montana
June 30- July 1	Harry McNeal	Montana State University	Bozeman, Montana
" "	Jim Welsh	" " "	" "
" "	Gene Sharp	" " "	" "
" "	Bob Pool	" " "	" "
July 21	Phil Donnelly	Comico Products	Missoula, Montana
July 21	Ben Gordon	Retired Farmer	Kalispell, Montana
July 29	Ray Volin	M. S. U. (Student)	Bozeman, Montana
July 29	Noble Dean	Extension Service	Kalispell, Montana
July 29	Allen Nelson	" "	" "
Aug. 4	L. E. Warren	Dow Chemical	Davis, California
Aug. 5	Don Beardsley	Pure Food & Drug	San Francisco, Calif.
Aug. 5	Lee Tower	Phillips 66	Billings, Montana
Aug. 5	Donald Schnaidt	Mutual Fund Sales	Kalispell, Montana
Aug. 5	Homer Metcalf	Montana State University	Bozeman, Montana
Aug. 19	Bob Eslick	" " "	" "
Aug. 26	Loren Wisener	" " "	" "
Aug. 31	Jim Edminston	Farmer-Banker	Kalispell, Montana
Sept. 6	L. O. Baker	Montana State University	Bozeman, Montana
Aug. 31	Clay B. Knodt	A. O. Smith (Harvestor)	Arlington Heights, Illinois
Sept. 8	Gordon Harris	U. S. Borax	Anaheim, California
Sept. 8	Jim Hoffmann	Cereal Disease Control Lab.	Pullman, Washington
Sept. 8	Jack Watters	" " " "	" "
Oct. 21	Gordon Gier	Farmer	Kalispell, Montana
Oct. 29	Don Graham	Western Mont. Branch Station	Corvallis, Montana
Nov. 12	Ross McAlpine	Farmer	Polson, Montana
Nov. 29	Russell Marsh	Weed Supervisor	Kalispell, Montana
Nov. 29	Allen Nelson	Extension Service	" "
Nov. 30	Bill Ward	Pacific Power & Light	Bigfork, Montana
Dec. 9	Eugene Jaquette	Farmer	Kalispell, Montana
Dec. 17	Ben Gordon	Retired Farmer	" "

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WEATHER DATA

The crop year of 1964-65 began in a high moisture situation when 2.27 inches of moisture fell during the month of September 1964, which is approximately one inch above the average of 1949-65. Considerably above normal precipitation was obtained during the months of December, January, April and August.

The total for the crop year was 23.04 inches of precipitation. The average is 19.23 inches of precipitation. During the months of May through August a total of 9 inches of precipitation fell compared to the average 7.84 for the same months. Continual rain during the months of August and September made harvest very difficult for cereals as well as forages.

Temperatures were average for the year compared to the long term average. The frost free period was 91 days compared to the 15 year average of 106 days.

A weather summary for temperature and precipitation is found in Table 1. Table 2, is a calendar year average of climatic conditions in Western Montana for the years, 1964, 1965 and the averages for 1950-1965.

Table 1. Summary of climatic data by months for the 1964-1965 crop year (September to August) and averages for the period 1949 - 1965 at the Agricultural Experiment Station, Route 4, Kalispell, Montana.

	Month												Total or Average
	Sept. 1964	Oct. 1964	Nov. 1964	Dec. 1964	Jan. 1965	Feb. 1965	Mar. 1965	Apr. 1965	May 1965	June 1965	July 1965	Aug. 1965	Growing Season
Precipitation (inches)													
Current year	2.27	.85	1.62	3.62	2.25	.64	.24	2.55	.81	2.30	1.15	4.74	23.04
Ave. 1949 to 1964-65	1.39	1.55	1.52	1.70	1.62	1.21	1.04	1.36	2.10	2.73	1.30	1.71	19.23
Mean temperature (°F)													
Current year	51.2	43.7	33.7	22.1	30.2	28.7	28.6	45.2	50.6	57.6	64.6	63.6	43.3
Ave. 1949 to 1964-65	54.0	44.0	32.9	26.5	21.7	27.6	31.9	43.3	51.7	58.5	64.3	64.5	43.4

Last killing frost in spring*
1965- June 7 (30°)

Ave. 1949-1965- May 29

First killing frost in fall*
1965- Sept. 6 (31°)

Ave. 1949-1965- Sept. 12

Frost free period
1965- 91 days

Ave. 1949-1965- 106 days

Maximum summer temperature- - - - - - - - - - - - - - - - - 89° on July 31, 1965

Minimum winter temperature- - - - - - - - - - - - - - - - - -28° on Dec. 17, 1964

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

Table 2. Comparisons of monthly average of weather data for 1964-1965 and 1950-1965 for the Northwestern Montana Branch Station, Route 4, Kalispell, Montana.

	Air Temperature (Fahrenheit)									Precipitation		
	Average 1964			Average 1965			Average 1950-1965			Average		
Month	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	1964	1965	1950-1965
January	28.5	35.1	21.8	30.2	35.1	25.3	21.7	29.1	14.3	1.46	2.25	1.62
February	28.3	37.7	18.9	28.7	36.9	20.4	27.6	36.0	19.1	.41	.64	1.21
March	30.6	39.7	21.4	28.6	41.0	16.2	31.9	41.8	22.0	1.57	.24	1.04
April	42.8	53.3	32.2	45.2	57.6	32.7	43.3	55.2	31.3	.87	2.55	1.36
May	51.1	63.5	38.6	50.6	64.3	36.9	51.7	65.3	38.0	3.33	.81	2.10
June	58.7	71.4	46.0	57.6	71.4	43.8	58.5	72.3	44.6	3.86	2.30	2.73
July	64.3	80.3	48.3	64.6	80.8	48.4	64.3	81.3	47.4	3.01	1.15	1.30
August	58.9	72.9	44.9	63.6	77.1	50.0	64.5	78.9	46.3	1.64	4.74	1.71
September	51.2	63.9	38.4	46.4	57.5	35.2	53.6	68.5	38.6	2.27	1.72	1.44
October	43.7	55.0	32.3	47.6	61.1	34.0	44.4	56.3	33.0	.85	.21	1.50
November	33.7	41.0	26.4	35.0	42.6	27.4	32.6	39.8	25.0	1.62	1.31	1.50
December	22.1	28.9	15.3	28.5	35.4	21.7	26.8	33.0	20.5	3.62	.55	1.68
Total	513.9	642.7	384.5	526.6	660.8	392.0	520.9	675.5	380.1	24.51	18.47	19.19
Average	42.8	53.6	32.0	43.9	55.1	32.7	43.4	54.8	31.7			

Frost-free Period		
1964	1965	1950-1965
109 days	91 days	106 days

KS

PART I

1965

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 Montana Soils Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Ten years

OBJECTIVES:

(a) To determine the effect of the annual use of nine fertilizer treatments on the yield of three pasture mixtures.

(b) To compare the relative life, yield and production of three legumes when grown in association with orchard grass.

REASONS FOR STUDY:

To secure accurate information upon which to base pasture management decisions.

EXPERIMENTAL DESIGN & PROCEEDURE:

Four randomized replicates of each pasture mixture are used for each fertilizer treatment. Yields are based on harvested samples from each plot taken prior to grazing with sheep. Sufficient numbers of sheep are used to utilize the forage quickly to allow a maximum amount of time for regrowth.

RESULTS & DISCUSSION:

1965 annual yield data for each pasture mixture is tabulated. Three rates of nitrogen and three of phosphorous comprise the annual fertilizer treatments. These are applied in early spring. Three acre inches of water is applied by sprinkler after each harvest unless the amount is reduced by heavy rainfall.

Orchard-Ladino: Four harvests were made. All fertilizer treatments were higher than the check in yield at the 5% level, eight of the nine at the 1% level. Actual seasons yield varied from 1.62 tons per acre for the check to 4.54 for highest amount of fertilizer used and was somewhat in relation to the amount used with 50-80-0 and 100-40-0 being practically equal and practically equal to 100-80-0. Cost analysis shows a forage value increase of $18.10 per acre from use of 50 pounds of N, $40.30 per acre where 50N and 80 P_2O_5 was used, with 12% moisture forage valued at $20.00 per ton.

Orchard-Trefoil: Check yields were much higher for this mixture this year than from Orchard-Ladino making the increase over the check much less. All the same all treatments provided more net value over check and fertilizer cost than the untreated checks. Yields are significantly greater than the check for seven treatments by analysis of variance.

Orchard-Alfalfa: Five treatments show yield increase that are significantly above checks. Cost analysis shows the value of forage to be greater than that of untreated checks for all treatments.

Mixture Comparisons: Mean yields for all treatments was less for the Orchard-Alfalfa mixture than the others this season. Treatment yields varied somewhat by mixtures, however small single plant food applications were generally the least effective. Gross 12% moisture yields above four tons per acre were secured by all mixtures with one or more treatments.

FUTURE PLANS: Continue until definite superiority of some mixture or treatment is established.

Table 1. Irrigated pasture fertilizers in 1965. Nine square feet. Orchard-Ladino

Treatments N	Treatments P_2O_5	Cutting	Replications 1	2	3	4	Total	Average	Season
50	40	1	1.44	1.61	1.44	1.44	5.93	1.48	
		2	.68	.93	.68	.85	3.14	.79	
		3	1.10	1.10	.93	.85	3.98	.99	3.26
		4	.68	.85	.64	.89	3.06	.76	4.02**
		Season	3.90	4.49	3.69	4.03	16.11		
100	40	1	2.03	2.03	2.20	1.78	8.04	2.01	
		2	.51	.68	.85	.68	2.72	.68	
		3	.76	1.19	.97	.76	3.68	.92	3.61
		4	.85	1.02	.76	.72	3.35	.84	4.45**
		Season	4.15	4.92	4.78	3.94	17.79		
0	40	1	.76	.59	.93	1.19	3.47	.87	
		2	.76	.68	.59	.51	2.54	.64	
		3	.93	.68	1.02	1.02	3.65	.91	2.42
		4	.93	.55	1.06	.51	3.05	.76	3.18**
		Season	3.38	2.50	3.60	3.23	12.71		
100	0	1	1.52	1.61	1.95	.51	5.59	1.40	
		2	.76	.68	1.02	.42	2.88	.72	
		3	.85	.85	1.02	.34	3.06	.77	2.89
		4	.59	.80	1.02	.38	2.79	.70	3.59**
		Season	3.72	3.94	5.01	1.65	14.32		
0	80	1	.85	1.10	1.44	1.02	4.41	1.10	
		2	.59	1.02	.76	.68	3.05	.76	
		3	.68	1.10	.85	.85	3.48	.87	2.73
		4	.59	1.36	.93	.89	3.77	.94	3.67**
		Season	2.71	4.58	3.98	3.44	14.71		
100	80	1	1.69	2.20	2.12	1.61	7.62	1.91	
		2	.76	.85	.85	.68	3.14	.79	
		3	.85	1.02	.93	.97	3.77	.94	3.64
		4	.80	.85	1.36	.59	3.60	.90	4.54**
		Season	4.10	4.92	5.26	3.85	18.13		
50	80	1	1.86	1.95	1.86	1.36	7.03	1.76	
		2	.51	1.19	.68	.76	3.14	.79	
		3	.97	1.19	.97	.85	3.98	.99	3.54
		4	.59	1.44	.72	.72	3.47	.87	4.41**
		Season	3.93	5.77	4.23	3.69	17.62		

Table 1. (con't)

Treatments N	Treatments P_2O_5	Cutting	Replications 1	2	3	4	Total	Average	Season
50	0	1	.42	1.36	1.61	.76	4.15	1.04	
		2	.34	.76	.51	.42	2.03	.51	
		3	.68	1.02	.76	.42	2.88	.72	2.27
		4	.25	1.36	.72	.17	2.50	.63	2.90*
	Season		1.69	4.50	3.60	1.77	11.56		
0	0	1	.17	.85	.34	.25	1.61	.40	
		2	.25	.51	.42	.34	1.52	.38	
		3	.34	.76	.34	.34	1.78	.45	1.23
		4	.38	.55	.47	.17	1.57	.39	1.62
	Season		1.14	2.67	1.57	1.10	6.48		

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

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	3.39776	7.63**
Varieties	8	3.5139	7.89**
Error	24	.44536	
Total	35		

$\bar{x}$.....	3.60
S.E.$\bar{x}$.....	.33368
L.S.D.(.01)	1.32
L.S.D.(.05)	.97
C.V.%.....	9.28

Table 2. Irrigated pastures fertilization in 1965. Nine square feet. Orchard-Trefoil

Treatments N	Treatments P_2O_5	Cutting	Replications 1	2	3	4	Total	Average	Season
50	40	1	1.27	1.44	1.69	1.27	5.67	1.42	
		2	.42	.85	.68	.68	2.63	.66	
		3	.85	1.19	.85	.42	3.31	.83	2.91
		4	.55	1.19	.76	.51	3.01	.75	3.66*
		Season	3.09	4.67	3.98	2.88	14.62		
100	40	1	1.69	2.03	1.52	1.27	6.51	1.63	
		2	.85	.85	.76	.51	2.97	.74	
		3	1.19	1.19	1.02	.55	3.95	.99	3.36
		4	.42	.93	1.02	.51	2.88	.72	4.08*
		Season	4.15	5.00	4.32	2.84	16.31		
0	40	1	1.02	.47	.93	1.19	3.61	.90	
		2	.76	.85	.51	.59	2.71	.68	
		3	.93	1.02	.93	.80	3.68	.92	2.50
		4	.64	.64	.72	.93	2.93	.73	3.23
		Season	3.35	2.98	3.09	3.51	12.93		
100	0	1	1.78	1.36	1.99	1.27	6.40	1.60	
		2	.76	.68	1.27	.59	3.30	.83	
		3	1.19	1.27	.68	.51	3.65	.91	3.34
		4	.59	.64	.85	.85	2.93	.73	4.07*
		Season	4.32	3.95	4.79	3.22	16.28		
0	80	1	1.02	1.57	1.69	1.19	5.47	1.37	
		2	.85	.85	.68	.59	2.97	.74	
		3	.93	1.02	.93	.68	3.56	.89	3.00
		4	.76	.59	1.02	.51	2.88	.72	3.72*
		Season	3.56	4.03	4.32	2.97	14.88		
100	80	1	1.36	1.74	1.86	1.86	6.82	1.71	
		2	.68	.93	.42	.76	2.79	.70	
		3	.76	1.36	.93	.76	3.81	.95	3.36
		4	.59	.89	.76	.51	2.75	.69	4.05*
		Season	3.39	4.92	3.97	3.89	16.17		
50	80	1	1.27	1.44	1.69	1.61	6.01	1.50	
		2	.85	.76	.59	.85	3.05	.76	
		3	.93	1.27	.68	.68	3.56	.89	3.15
		4	.51	.68	.64	.85	2.68	.67	3.82*
		Season	3.56	4.15	3.60	3.99	15.30		

Table 2. (con't)

Treatments N	Treatments P_2O_5	Cutting	Replications 1	2	3	4	Total	Average	Season
50	0	1	.68	1.78	1.69	1.36	5.51	1.38	
		2	.59	.59	.76	1.02	2.96	.74	
		3	.89	1.36	1.19	.80	4.24	1.06	3.18
		4	.42	.68	.42	.72	2.24	.56	3.74*
	Season		2.58	4.41	4.06	3.90	14.95		
0	0	1	.25	.85	.59	.85	2.54	.64	
		2	.34	.68	.59	.51	2.12	.53	
		3	.68	1.02	.76	.76	3.22	.81	1.98
		4	.42	.97	.85	.59	2.83	.71	2.69
	Season		1.69	3.52	2.79	2.71	10.71		

* Treatments yielding significantly more than check (.05)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	1.6897	5.74**
Varieties	8	.83628	2.84*
Error	24	.29464	
Total	35		

$\bar{x}$.....	3.67
S.E.$\bar{x}$.....	.27136
L.S.D.(.05)	.79
C.V.%.....	7.39

Table 3. Irrigated pasture fertilizers in 1965. Nine square feet. Orchard-Alfalfa

Treatments N	Treatments P_2O_5	Cutting	Replications 1	2	3	4	Total	Average	Season
50	40	1	1.61	1.52	1.61	1.52	6.26	1.57	
		2	.68	.51	.93	.93	3.05	.76	
		3	.85	.59	.68	.93	3.05	.76	3.09
		4	.38	.42	.59	.59	1.98	.50	3.59**
		Season	3.52	3.04	3.81	3.97	14.34		
100	40	1	1.61	1.44	1.86	1.95	6.86	1.72	
		2	.76	1.02	.68	.51	2.97	.74	
		3	.59	.59	.68	.59	2.45	.61	3.07
		4	.55	.68	.38	.38	1.99	.50	3.57**
		Season	3.51	3.73	3.60	3.43	14.27		
0	40	1	.76	.42	.85	.76	2.79	.70	
		2	.76	.51	.42	.59	2.28	.57	
		3	.68	.42	.51	.51	2.12	.53	1.80
		4	.55	.51	.25	.59	1.90	.48	2.28
		Season	2.75	1.86	2.03	2.45	9.09		
100	0	1	1.61	.76	1.27	.25	3.89	.97	
		2	.76	.51	.68	.25	2.20	.55	
		3	.68	.68	.76	.17	2.29	.57	2.09
		4	.64	.42	.51	.08	1.65	.41	2.50*
		Season	3.69	2.37	3.22	.75	10.03		
0	80	1	.68	1.19	1.10	1.02	3.99	1.00	
		2	.76	.68	1.02	.59	3.05	.76	
		3	.68	.68	.68	.59	2.63	.66	2.42
		4	.76	.64	.51	1.19	3.10	.78	3.20**
		Season	2.88	3.19	3.31	3.39	12.77		
100	80	1	1.78	1.61	2.03	2.37	7.79	1.95	
		2	.93	.85	.59	.59	2.96	.74	
		3	.68	.93	.93	.51	3.05	.76	3.45
		4	.64	.51	.59	.68	2.42	.61	4.06**
		Season	4.03	3.90	4.14	4.15	16.22		
50	80	1	1.36	1.27	1.36	1.95	5.94	1.49	
		2	.59	.85	.85	.42	2.71	.68	
		3	.59	.68	1.02	.59	2.88	.72	2.89
		4	.59	.89	.76	.55	2.79	.70	3.59**
		Season	3.13	3.69	3.99	3.51	14.32		

Table 3 .(con't)

Treatments N	Treatments P_2O_5	Cutting	Replications 1	2	3	4	Total	Average	Season
50	0	1	.68	1.19	.68	.42	2.97	.74	
		2	.51	1.19	.51	.42	2.63	.66	
		3	.59	.80	.59	.17	2.15	.54	1.94
		4	.42	.89	.59	.17	2.07	.52	2.46*
		Season	2.20	4.07	2.37	1.18	9.82		
0	0	1	.21	.59	.42	.42	1.64	.41	
		2	.42	.51	.34	.34	1.61	.40	
		3	.25	.59	.17	.17	1.18	.29	1.10
		4	.34	.80	.13	.25	1.52	.38	1.48
		Season	1.22	2.49	1.06	1.18	5.95		

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

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.39509	
Varieties	8	2.74871	5.94**
Error	24	.46273	
Total	35		

$\bar{x}$.....	2.97
S.E.$\bar{x}$.....	.34012
L.S.D.(.01)	1.35
L.S.D.(.05)	.99
C.V.%.....	11.46

Table 4 . Cost Analysis of Fertilizer Used on Pastures

Treatment	Cost/A	Orchard-Ladino Value	Orchard-Ladino Income over Check	Orchard-Trefoil Value	Orchard-Trefoil Income over Check	Orchard-Alf. Value	Orchard-Alf. Income over Check	3 Mix, Average Value	3 Mix, Average Income over Check
50-40-0	11.50	80.40	36.50	73.20	7.90	71.80	30.70	75.13	25.03
100-40-0	19.00	89.00	37.60	81.60	8.80	71.40	22.80	80.67	23.07
0-40-0	4.00	63.60	27.20	64.60	6.80	45.60	12.00	57.93	15.33
100- 0-0	15.00	71.80	24.40	81.40	12.60	50.00	5.40	67.73	14.13
0-80-0	8.00	73.40	33.00	74.40	12.60	64.00	26.40	70.60	24.00
100-80-0	23.00	90.80	35.40	81.08	4.20	81.20	28.60	84.33	22.73
50-80-0	15.50	88.20	40.30	76.40	7.10	71.80	26.70	78.80	24.70
50- 0-0	7.50	58.00	18.10	74.80	13.50	49.20	12.10	60.66	12.23
0- 0-0		32.40		53.80		29.60		38.60	

TITLE: Comparative Response of Alfalfa and Sainfoin to Commercial Fertilizer

PROJECT: Fertilizer Investigations 5020

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

LOCATION: Northwestern Montana Branch Station

DURATION: Undetermined

OBJECTIVES:

Determine effective fertilizer practice for Sainfoin and how this differs from best alfalfa fertilization.

EXPERIMENTAL DESIGN and PROCEEDURE:

Paired plots of Vernal Alfalfa and Eski Sainfoin were seeded May 12, 1965 and treatments containing potash, sulphur, four rates of phosphorous and an untreated check were randomly applied to the uniformly seeded plots. Stand notes and a fall cutting yield were obtained.

RESULTS:

From data collected by Roath, Graham made the following determination. "In the no fertilizer situation, yields of alfalfa and sainfoin appeared identical. Neither crop responded to potash. Alfalfa seemed to show a slight response to sulphur while sainfoin did not. Alfalfa yields with various rates of phosphorous were higher than sainfoin, indicating possibly greater need for phosphorous by alfalfa. High rates of banded phosphorous, not in direct contact with the seed, resulted in reduced stands."

The seedling year yield is tabulated.

FUTURE PLANS:

Continue the study until comparative response of the crops to the various plant foods is clear.

Table 4. Seedling Year Response of Alfalfa and Sainfoin to Fertilizers in 1965. Tons per acre @ 12% mosture. Cut August 30, 1965.

Treatment	Crop	Replications 1	2	3	4	Total
Potash	Sainfoin	1.26	1.26	1.51	1.31	5.34
	Alfalfa	1.37	1.28	1.61	1.31	5.57
Sulphur	Sainfoin	1.39	1.30	1.19	1.13	5.01
	Alfalfa	1.52	2.03	1.70	1.41	6.66
Check	Sainfoin	1.31	1.45	1.46	1.24	5.46
	Alfalfa	1.22	1.56	1.39	1.22	5.39
25 P	Sainfoin	1.31	.89	1.11	1.21	4.52
	Alfalfa	1.45	1.30	1.57	1.58	5.90
50 P	Sainfoin	1.79	1.67	1.21	1.15	5.82
	Alfalfa	1.93	1.52	1.46	1.31	6.22
100 P	Sainfoin	1.89	1.20	1.11	1.44	5.64
	Alfalfa	1.65	2.05	1.35	1.39	6.44
150 P	Sainfoin	1.34	1.22	1.68	.93	5.17
	Alfalfa	1.46	1.36	1.68	1.24	5.74

	T	Plot
Sainfoin Average	5.28	1.32
Alfalfa Average	6.00	1.50

NOTE: Stands appear to have been reduced by heavier P applications thus minimizing growth response.

SAINFOIN

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.08832	1.74
Varieties	6	.04665	
Error	18	.05084	
Total	27		

$\bar{x}$..... 1.32
S.E.$\bar{x}$..... .11273
L.S.D.(.05) NS
C.V.%..... 8.54

ALFALFA

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.07226	1.57
Varieties	6	.05463	1.18
Error	18	.04600	
Total	27		

$\bar{x}$..... 1.50
S.E.$\bar{x}$..... .023
C.V.%..... 1.54

TITLE: Date of Last Cutting Alfalfa

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath and Forage Research Committee

DURATION: Three years

LOCATION: Northwestern Montana Branch Station

OBJECTIVES:

Objectives, design and proceedures as outlined by the research committee.

RESULTS AND DISCUSSION:

Variations in proceedure in 1964 had little effect on survival and productive stands remained in all plots. Because of this the process was repeated in 1965. The first cutting harvest of all plots on a single date shows no difference due to 1964 harvest and Flandria above Vernal in yield.

Second cutting yields at 10 day intervals, August 16 to freeze down show the total yield going neither up nor down during the period. Quality analysis would doubtless show great variation in value however due to leaf drop and increase in fibre content.

About all that could be said as a result of this seasons work is that no yield increase would off-set loss of quality of later harvested forage.

PLANS:

Determine effect on survival, if any, of the stage of last harvest in 1966.

Table 1. Date of Last Cutting Alfalfas - First Cutting 1965.

Variety	Harvest	Date	Replications 1	2	3	4	5	Total	Average
Vernal	1st	6-23	1.89	2.77	2.71	2.63	2.89	12.89	2.58
Flandria	1st	6-23	3.00	3.47	3.49	2.40	3.08	15.44	3.09
Vernal	2nd	6-23	2.44	2.48	2.30	3.03	2.57	12.82	2.56
Flandria	2nd	6-23	3.06	2.59	3.02	3.47	2.68	14.82	2.96
Vernal	3rd	6-23	2.45	2.88	2.55	2.48	2.92	13.28	2.66
Flandria	3rd	6-23	3.28	3.30	2.95	2.74	3.13	15.40	3.08
Vernal	4th	6-23	2.86	2.56	2.11	2.93	3.18	13.64	2.73
Flandria	4th	6-23	3.21	3.13	3.10	3.14	3.30	15.88	3.18
Vernal	5th	6-23	2.55	3.08	2.67	2.34	2.06	12.70	2.54
Flandria	5th	6-23	3.45	3.46	3.26	3.13	3.06	16.36	3.27

$\bar{x}$..... 2.86
S.E.$\bar{x}$..... .14671
L.S.D.(.01) .56
L.S.D.(.05) .42
C.V.%..... 5.12

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	4	.04436	
Varieties	9	.39398	3.66**
Error	36	.10763	
Total	49		

Table 2. Date of Last Cutting Alfalfas - Second Cutting - Yield at 12% moisture

Variety	Date	Replications 1	2	3	4	5	Total	Average
Vernal	8-16	1.83	2.20	2.44	2.40	2.11	10.98	2.20
Flandria	8-16	2.73	2.92	3.00	2.40	2.54	13.59	2.72
Vernal	8-27	2.07	1.66	2.29	1.90	2.47	10.39	2.08
Flandria	8-27	2.19	2.82	2.28	2.64	2.19	12.12	2.42
Vernal	9- 7	2.00	1.95	2.04	1.95	2.30	10.24	2.05
Flandria	9- 7	2.62	2.60	2.50	2.29	2.20	12.21	2.44
Vernal	9-17	2.04	1.91	2.04	2.00	2.17	10.16	2.03
Flandria	9.17	2.66	2.55	2.13	2.29	2.51	12.14	2.41

Vernal Average - 2.09
Flandria Average - 2.50

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	4	.01554	
Varieties	7	.30138	5.22*
Error	28	.05776	
Total	39		

$\bar{x}$..... 2.30
S.E.$\bar{x}$..... .10747
L.S.D.(01). .42
L.S.D.(05). .31
C.V.%..... 4.68

TITLE: Irrigated White Clover Varieties

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: Determined by the Forage Research Committee

OBJECTIVES:

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

RESULTS & DISCUSSION:

Harvest in four cuttings approximately one month apart shows little yield difference between the three large whites or between Holland and common white clover.

Survival, the chief reason for the study, was apparently not affected by variety, but all of the fifth replication was so slow coming out, so nearly winter killed, that only four replications were harvested. By the end of the season all varieties had fully recovered in the fifth replication.

PLANS:

Continue observations and harvest in 1966.

Table 3. White Clover yields when cut as pasture in 1965.
Four replications, tons per acre at 12% moisture.

Variety	Date Cut	Replications 1	2	3	4	Total	Average	Season
Pilgrim	6- 8	1.19	1.03	.93	.66	3.81	.95	
	7-13	.82	1.02	1.01	.86	3.71	.93	1.88
	8-11	.87	1.19	.81	.77	3.64	.91	2.51
	9- 7	.55	.36	.50	.48	1.89	.47	2.98**
Season		3.43	3.60	3.25	2.77	13.05		
Merit	6- 8	1.04	1.02	.94	.56	3.56	.89	
	7-13	.89	.98	.89	.91	3.67	.92	1.81
	8-11	1.07	.89	.94	.90	3.80	.95	2.76
	9- 7	.47	.50	.55	.44	1.96	.49	3.25**
Season		3.47	3.39	3.32	2.81	12.99		
Common Ladino	6- 8	1.00	.95	1.02	.80	3.77	.94	
	7-13	.75	.94	1.02	.84	3.55	.89	1.83
	8-11	.81	.84	1.07	.95	3.67	.92	2.75
	9- 7	.50	.52	.43	.43	1.88	.47	3.22**
Season		3.06	3.25	3.54	3.02	12.87		
Common White	6- 8	1.12	.89	.88	.55	3.44	.86	
	7-13	.66	.99	.60	.65	2.90	.73	1.59
	8-11	.75	.65	.82	.63	2.85	.71	2.30
	9- 7	.29	.30	.34	.23	1.16	.29	2.59
Season		2.82	2.83	2.64	2.06	10.35		
Holland White	6- 8	1.09	1.09	1.13	.58	3.89	.97	
	7-13	.75	.78	.70	.69	2.92	.73	1.70
	8-11	.78	.94	.72	.74	3.18	.79	2.49
	9- 7	.27	.34	.41	.23	1.25	.31	2.80
Season		2.89	3.15	2.96	2.24	11.24		

NOTE: Common white is used as a check in this nursery.
**: Significantly more than check (.05)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	.45259	16.69**
Varieties	4	.38060	14.03**
Error	12	.02712	
Total	19		

$\bar{x}$.....	3.025
S.E.$\bar{x}$.....	.08234
L.S.D.(.01)	.36
L.S.D.(.05)	.25
C.V.%.....	2.72

TITLE: One Cutting Hay Mixtures

PROJECT: Forage Investigations 5022

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

LOCATION: Irrigated at Northwestern Montana Branch and Western Montana Branch, dryland at Libby.

DURATION: Indefinite

OBJECTIVES:

Compare mixtures composed of various grasses and legumes for production of hay and these with alfalfa when mixtures are harvested once and alfalfa twice. Determine adaptation to Northwest Montana area.

RESULTS AND DISCUSSION:

Identical studies grown in three locations were harvested, each comparing alfalfa and sainfoin to mixtures containing five grasses and two clovers.

Irrigated location on Northwestern Branch Station yields in one late cutting from sainfoin and mixtures used were generally lower than from alfalfa harvested in two cuttings, and in some cases significantly so when .6 tons is required for significance at the 5% level. However when credited with the ton or more regrowth available for fall grazing as determined by harvest on September 7, the 3 4/10 tons of hay plus 1 3/10 tons of regrowth is not unatractive.

Comparison of the grasses, each with two clovers, shows little difference except that one selection of tall wheatgrass is low in yield. Comparison of common mamoth clover with altasweede red clover shows little hay yield difference and generally a slight additional fall regrowth for altasweede.

Chemical analysis of grass- altasweede mixtures and sainfoin based on three samples of the late cut hay shows tall wheat and clover to be highest in protein content with 12.3% followed intermediate and clover with 11.6%, sainfoin with 10.2%, and brome and timothy mixtures following with 9.7% and 9.0%. In phosphorous percentage, sainfoin was highest with .193% and brome and clover low with .143%.

Irrigated location two on Western Branch Station. Hail just prior to the second cutting harvest of alfalfa limited information to one cutting only. One cutting yields of three mixtures were fully equal to alfalfa, those of sainfoin and one mixture significantly lower at 5% by analysis of variance. At this location brome and timothy mixtures were above wheatgrass mixtures in yield and altasweede mixture yields above those of mammoth mixtures on the average.

Libby dryland location. All entries were harvested June 30th at this loaction because it was thought that lack of moisture would restrict furthur growth. Therefore, direct comparison of all entries at a given harvest date can be made. Sainfoin is doing very poorly at this location and producing less than alfalfa with significance at the 1% level. Some mixtures are higher and two slightly lower than alfalfa, although these differences are not significant statistically. Best of the grasses at this location is intermediate wheatgrass followed by timothy. Best of the clovers is altasweede by a small amount on the average.

SUMMARY:

Tall wheatgrass, 98526, was somewhat more productive than A-12465 tall wheatgrass in three locations. Altasweede red clover was fully equal to common mammoth in hay production and produced more regrowth. Eski sainfoin produced more hay in one cutting than vernal alfalfa in one irrigated location and less in another. It was very poor in the Libby location where doubtless an acid soil situation exhists.

PLANS:

The three location one cutting hay yield of 3.6 tons per acre for a timothy-altasweede clover mixture for example, plus the indicated regrowth of 1.4 tons per acre for fall grazing and with an indicated protein content of 9% with a minimum of expense because of only one harvest, seems to recommend furthur exploration into this kind of forage enterprise.

Table 4. One cutting hay in Flathead County in 1965. Tons per acre at 12% moisture.

Variety	Date Cut	Replication 1	2	3	4	Total	Average
Vernal	6-22	2.37	2.52	3.21	2.51	10.61	2.65
	8-26	1.61	1.58	1.59	1.46	6.24	1.56
Season		3.98	4.10	4.80	3.97	16.85	4.21
Brome & Altasweede	7-16	3.57	3.44	4.18	3.44	14.63	3.66
Brome & Mammoth	7-16	3.15	3.29	4.13	3.53	14.10	3.53
Tall(1) & Altasweede	7-16	3.17	3.13	3.33	3.13	12.76	3.19
Tall(1) & Mammoth	7-16	2.88	3.39	2.72	2.98	11.97	2.99
Tall(2) & Altasweede	7-16	3.96	3.45	3.47	2.88	13.76	3.44
Tall(2) & Mammoth	7-16	4.05	3.92	3.22	2.62	13.81	3.45
Sainfoin	7-16	4.43	3.31	3.46	3.24	14.44	3.61
Timothy & Altasweede	7-16	3.18	3.53	3.78	3.42	13.91	3.48
Timothy & Mammoth	7-16	3.74	3.58	4.62	3.26	15.20	3.80
Intermediate & Altasweede	7-16	3.62	3.12	3.35	3.46	13.55	3.39
Intermediate & Mammoth	7-16	3.06	4.49	3.62	3.29	14.46	3.62

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	.43275	2.50NS
Varieties	11	.36737	2.11*
Error	33	.17348	
Total	47		

$\bar{x}$.....	3.53
S.E.$\bar{x}$.....	.20825
L.S.D.(.05)	.60
C.V.%.....	5.90

Table 5. Regrowth for fall pasture of one cutting mixtures. Flathead County 1965. In tons per acre of clipped forage @ 12% moisture. Clipped, September 7, 1965

Variety	Replications 1	2	3	4	Total	Average
Brome & Altasweede	1.30	1.24	1.23	1.73	5.50	1.38
Brome & Mammoth	1.50	1.18	1.44	1.30	5.42	1.36
Tall(1) & Altasweede	1.46	1.34	1.25	1.17	5.22	1.31
Tall(1) & Mammoth	1.15	1.07	1.05	1.22	4.49	1.12
Tall(2) & Altasweede	.91	1.43	1.34	1.10	4.78	1.20
Tall(2) & Altasweede	.96	1.20	1.27	.99	4.42	1.11
Sainfoin	1.60	1.88	1.77	1.14	6.39	1.60
Timothy & Altasweede	1.49	1.37	1.64	1.10	5.60	1.40
Timothy & Mammoth	1.24	1.46	1.44	1.30	5.44	1.34
Intermediate & Altasweede	1.22	1.53	1.17	1.21	5.13	1.28
Intermediate & Mammoth	1.09	1.33	1.34	.97	4.73	1.18

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	.06758	
Varieties	10	.08216	
Error	30	.64900	
Total	43		

$\bar{x}$..... 1.30
S.E.$\bar{x}$..... .40281
L.S.D.(.05) NS
C.V.%..... 31.02

Table 6. Chemical Analysis of July, 1965 cut hays.

Variety	% Nitrogen Replication 1	2	3	Total	Average	% Phosphorous Replication 1	2	3	Total	Average
Intermediate&Clover	10.8	11.9	12.0	34.7	11.57	.13	.16	.17	.46	.1533
Brome & Clover	11.1	10.5	7.6	29.2	9.7	.15	.15	.13	.43	.1433
Timothy & Clover	8.2	9.2	9.6	27.0	9.0	.12	.16	.15	.43	.1433
Tall wheat &Clover	13.4	11.6	11.9	36.9	12.3	.18	.16	.15	.49	.1633
Sainfoin	10.1	10.7	9.7	30.5	10.17	.19	.22	.17	.58	.1933

Table 7. Hay yields from one cutting mixtures, Ravalli County in 1965. Tons per acre @ 12% moisture.

Variety	Date Cut	Replications 1	2	3	4	Total	Average
Vernal		3.30	3.96	3.23	3.39	13.88	3.47
Brome & Altasweede	7-14	3.30	3.49	5.29	2.73	14.81	3.70
Brome & Mammoth	7-14	4.02	3.09	2.83	3.66	13.60	3.40
Tall(1) & Altasweede	7-14	2.71	2.73	2.98	2.39	10.81	2.70
Tall(1) & Mammoth	7-14	3.99	2.48	2.56	2.17	11.20	2.80
Tall(2) & Altasweede	7-14	2.91	2.51	3.49	2.98	11.89	2.97
Tall(2) & Mammoth	7-14	2.51	2.46	2.14	2.86	9.97	2.49
Sainfoin	7-14	2.28	2.37	2.67	2.64	9.96	2.49
Timothy & Altasweede	7-14	3.35	4.29	4.89	3.20	15.73	3.93
Timothy & Mammoth	7-14	2.54	2.42	3.34	4.21	12.51	3.13
Intermediate & Altasweede	7-14	3.64	3.77	2.98	2.28	12.67	3.17
Intermediate & Mammoth	7-14	3.45	3.45	3.12	4.21	14.23	3.56

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	.13256	
Varieties	11	.89872	2.19*
Error	33	.40976	
Total	47		

$\bar{x}$..... 3.15
S.E.$\bar{x}$..... .32007
L.S.D(.05). .92
C.V.%.....10.16

Table 8. One cut hay mixtures, Lincoln County in 1965. Tons per acre at 12% moisture. Cut, June 30, 1965.

Variety	REPLICATIONS 1	2	3	4	Total	Average
Vernal Alfalfa	2.70	2.65	3.05	2.96	11.36	2.84
Brome & Altasweede	2.92	3.03	2.26	4.24	12.45	3.11
Brome & Mammoth	1.98	3.48	2.38	2.65	10.49	2.62
Tall(1) & Altasweede	2.66	2.33	3.07	2.57	10.63	2.66
Tall(1) & Mammoth	2.68	3.72	2.83	2.54	11.77	2.94
Tall(2) & Altasweede	3.54	3.25	2.87	2.46	12.12	3.03
Tall(2) & Mammoth	3.06	2.52	2.89	2.85	11.32	2.83
Sainfoin	1.27	.91	.58	1.52	4.28	1.07[1]
Timothy & Altasweede	2.84	3.75	4.00	3.33	13.92	3.48
Timothy & Mammoth	2.49	3.85	3.32	3.29	12.95	3.24
Intermediate & Altasweede	3.32	3.37	4.98	2.70	14.37	3.59
Intermediate & Mammoth	4.06	2.28	4.18	3.35	13.87	3.47

[1] Nearly all weeds.

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	.12318	
Varieties	11	1.74852	4.69**
Error	33	.37256	
Total	47		

$\bar{x}$.....	2.91
S.E.$\bar{x}$.....	.305188
L.S.D.(.01)	1.18
L.S.D.(.05)	.88
C.V.%.....	10.49

TITLE: Seed Source Legume Study

PROJECT: Forage Investigations 5022

PERSONNEL: C. W. Roath and Forage Research Committee

LOCATION: Northwestern Montana Branch Station

OBJECTIVES:

Objectives and proceedures as outlined by the Forage Research Committee.

RESULTS AND DISCUSSION:

A dry and an irrigated nursery, both located on the station were harvested. Both had sainfoin from two sources and cicer milkvetch as entries to be compared with ladak alfalfa.

Irrigated Nursery:

This nursery fared rather badly because of an unusually high water table this spring where it was situated. Forage was yellow and slow coming on, alfalfa more so than sainfoin, and yields were under three tons for the season. This condition may have favored the milkvetch.

Sainfoin from the Bozeman source and ladak alfalfa were similar in seasons yield with cicer less and very largely the winter wheat with which it was seeded and sainfoin from Hall the least. This selection was earlier and shorter than Eski.

Dryland Nursery:

Stands and growth vary considerably from plot to plot in this nursery, but growth was more rapid and yields greater here than in the irrigated nursery. In this case also ladak alfalfa and sainfoin from Bozeman are equal in yield. Sainfoin from Bridger, like that from Hall is much earlier and smaller than that from Bozeman. No cicer was available at the time of the first harvest but by the time of the second harvest an average of .46 tons per acre was secured.

PLANS:

Continue and perhaps explore grazing potential of the earlier sainfoins.

Table 9. Irrigated Sanfoin Alfalfa Vetch in 1965. Tons per acre @ 12%.

Entry	Date Cut	Replications 1	2	3	4	Total	Average	Season
Sanfoin, Bozeman	6-21	1.73	1.66	1.46	1.13	5.98	1.50	
	8-11	1.23	1.31	1.54	1.67	5.75	1.44	2.94
Season		2.96	2.97	3.00	2.80	11.73		
Sanfoin, Hall	6-21	1.23	1.27	1.11	.93	4.54	1.14	
	8-11	1.09	.97	1.12	1.19	4.37	1.09	2.23
Season		2.32	2.24	2.23	2.12	8.91		
Milkvetch Cicer	6-21	1.75	2.15	.96	1.98	6.84	1.71[1]	
	8-11	.72	.83	1.04	.65	3.24	.81	2.52
Season		2.47	2.98	2.00	2.63	10.08		
Alfalfa Ladak	6-21	1.69	1.86	2.00	1.48	7.03	1.76[2]	
	8-11	.92	.98	1.40	1.24	4.54	1.14	2.90
Season		2.61	2.84	3.40	2.72	11.57		

[1] First cut of Cicer 90% winter wheat
[2] First cut of Ladak 50% winter wheat

$\bar{x}$..... 2.64
S.E.$\bar{x}$..... .15126
L.S.D.(05)... .48
C.V.%..... 5.72

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.02910	
Varieties	3	.44510	4.86*
Error	9	.09152	
Total	15		

Table 10 . Dryland Sanfoin Alfalfa Vetch in 1965. Tons per Acre @ 12%.

Entry	Date Cut	Replication 1	2	3	4	Total	Average	Season
Sanfoin, Bozeman	6-21	1.43	2.29	1.65	2.28	7.65	1.91	
	8-13	1.04	1.75	1.34	1.94	6.07	1.52	3.43
Season		2.47	4.04	2.99	4.22	13.72		
Sanfoin, Bridger	6-21	.97	1.39	1.38	1.72	5.46	1.37	
	8-13	.99	.92	1.23	1.11	4.25	1.06	2.43
Season		1.96	2.31	2.61	2.83	9.71		
Milkvetch Cicero	6-21	--	--	--	--	--	(1)	
	8-13	.11 (2)	.38	.52	.84	1.85	.46	.46
Season		.11	.38	.52	.84	1.85		
Alfalfa Ladak	6-21	1.98	2.81	1.33	1.37	7.49	1.87	
	8-13	1.85	2.44	.85	1.23	6.37	1.59	3.46
Season		3.83	5.25	2.18	2.60	13.86		

(1) Too little Milkvetch growth for harvest. Winter wheat seeded with vetch cut off.

(2) Calculated missing plot.

$\bar{x}$..... 2.45
S.E.$\bar{x}$..... .41346
L.S.D.(.05).. 1.32
L.S.D.(.01).. 1.90
C.V.%.....16.90

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	.79354	
Treatments	3	7.92165	11.59**
Error	9	.68379	
Total	15		

TITLE: Sainfoin Production and Evaluation

PROJECT: Forage Investigations 5022

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

LOCATION: Northwestern Montana

DURATION: Five years

OBJECTIVES:

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

PROCEEDURES:

Seed was harvested in 1964 from a dryland field seeded for hay in 1962, and twenty pound lots were distributed to applicants in a five county area.

A tour of inspection was made in early August to see as many of the established fields as possible.

RESULTS:

Accompanied by Don Graham who took soil samples and notes on soil conditions, guided by county agents or local farmers, and joined on occasion by up to 40 interested persons a four day tour was made and twenty-one fields visited in five counties. Nearly every condition of soil and moisture to be found in the area was selected by someone as the place where it was desirable to grow the crop, and all seeding methods used. It would appear that anyone who by some method puts sainfoin seed into contact with soil in the spring of the year in Northwestern Montana will get a stand, provided weed or other plant competition is not too great. Good stands were seen in bone dry immature soils, mostly granite; in poorly drained peat; in highly alkaline tight clays; in sandy dryland and well irrigated medium textured soil. The one failure was on the best soil situation visited so far as fertility and moisture goes, but where an extremely heavy growth of annual weeds flourished.

PLANS:

Follow up to determine life and yield under various conditions.

TITLE: 1965 Interstate 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:

Objectives, design and proceedures as determined by forage research committee.

RESULTS AND DISCUSSION:

Randomized and replicated plots containing Cicer Milkvetch, Ladak Alfalfa, Eski Sainfoin, and four crown vetches were drilled in a well prepared moist seedbed on May 14, 1965. By June 8, 1965 all alfalfa and sainfoin lots were up to good stands and were carefully wheel hoed to eliminate weed competition from between rows. Neither cicer nor any of the crown vetch entries produced stands during the seeding year.

PLANS:

Allow an additional year if needed for stand establishment.

TITLE: Rotation Effects on 1965 Yields of Potatoes

PROJECT: Potato Production 5027

LOCATION: Northwestern Montana Branch Station

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

DURATION: Indefinite

OBJECTIVES:

Determine the effect of use of various crops in rotations on potato yields when grown one year in six.

PROCEEDURE:

Soybeans, sweet clover, cereals, red clover and alfalfa are used as prior crops on single irrigated plots and effect measured one year in six. All plots received 175 pounds per acre of 14-48-0 banded with the potato seed in 1965.

RESULTS AND DISCUSSION:

1965 is the first year in which potatoes were grown on all plots to measure effects of previous crops. Netted gems for late harvest was the main crop, however a few rows of a scab susceptible variety were observed for possible scab difference.

Preceeding crops, Plot 1: Growth of soy beans to plow down has been light most years even though stands have generally been good.

Plot 2: Sweet clover stands have been poor and growth light.

Plot 3: Barn yard manure used instead of a green manure.

Plot 4: Excellent growth of medium red clover.

Plot 5: Good stand but poor growth of alfalfa obviously needing phosphorous fertilization.

1965 Potato Crop: Vines were obviously heavier on Plots three and four than on other plots. When plot three, treated with barnyard manure is considered the check on green manure plots, plot one using soybeans as a green namure crop alone had significantly lesser yield. This was also true for sorted yields. Red clover and alfalfa plots produced 23.6 and 26 cwt per acre more sorted tubers than the barnyard manure check, less required for statistical significance.

Moderately susceptible to scab. Norland potatoes were no more free of scab in one plot than in another.

PLANS:

Continue through another six year cycle and use sufficient phosphorous fertilizer to produce optimum crop growth.

Table 1. Per Acre Yield in Cwt of Rotation Potatoes.

Rotation	Field Run cwt/acre 1	2	3	4	Total	Average
1	200.4	185.1	204.7	274.4	864.6	216.2
2	291.9	257.0	265.7	287.5	1102.1	275.5
3	331.1	296.2	261.4	296.2	1184.9	296.2
4	344.1	335.4	287.5	302.7	1269.7	317.4
5	283.1	309.3	322.3	304.9	1219.6	304.9

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	677.214	
Varieties	4	6359.82925	8.55**
Error	12	744.11092	
Total	19		

$\bar{x}$.....	282.045
S.E.$\bar{x}$.....	13.63920
L.S.D.(.01)	58.8
L.S.D.(.05)	42.1
C.V.%.....	4.84

Table 2.

Rotation	Sorted Yield cwt/acre 1	2	3	4	Total	Average
1	126.3	124.1	130.7	163.3	544.4	136.1
2	169.9	152.5	135.0	204.7	662.1	165.5
3	187.3	156.8	152.5	200.4	697.0	176.8
4	222.2	217.8	174.2	187.3	801.5	200.4
5	165.5	196.0	209.1	200.4	771.0	192.8

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	841.516	
Varieties	4	2555.30125	
Error	12	457.20392	
Total	19		

$\bar{x}$.....	173.80
S.E.x.....	10.69117
L.S.D.(.01)	46.11
L.S.D.(.05)	32.96
C.V.%.....	6.16

TITLE: Evaluation of Potato Seedlings

PROJECT: Potato Production 5027

PERSONNEL: C. W. Roath and Homer Metcalf and Orville McCarver

LOCATION: Northwestern Montana Branch Station

DURATION: Twelve years

OBJECTIVES:

Determine which of ninty-six potato seedlings are disease free and adapted to use in Montana.

PROCEEDURES:

Using seed of ninty-six Montana seedlings and selections from other stations supplied by Metcalf. Single row plots containing from as few as eight to as many as fifty-nine hills depending on seed supply. Thirty-six selections with sufficient seed available were planted in a duplicate 150 ft. row planting. Rather extensive notes were taken of vine characteristics, disease symptoms and at digging time of tuber character. Assistance with field observations was given by both Metcalf and McCarver and plot samples were taken to Bozeman for scab readings and specific gravity determination.

RESULTS:

Seedling characteristics have been tabulated and data from this location together with that from trials at Bozeman should be useful in determining which to keep for further test. For one thing weather conditions were such that a number of selections previously thought to be disease free exhibited mosaic symptoms this season and marked differences in blight susceptibility were noted. The yield potential exhibited in this trial varied from nine to forty-five tons per acre.

PLANS:

One bushel samples of ten promising selections were stored in the cellar at Western Branch for further testing and distribution to other workers. Additional selections will be screened at this location as requested by Metcalf.

Table 3. Potato Selections Characteristics for 1965.

Variety or Selection	Vine Size 7/15	Bloom Color	Disease Notes				Maturity	
			Blight	Phizoe	Mosaic	Other	Aug. 26	When Dug
5939-8	large	blue	x				good	
35904-A	large	cream					good	
35939-9	med.	lt.blue			x		good	
35904A-15	med.	(buds)				rugose leaf	fair	
35939-5-A	large	pink			x	haywire	good	
36024-1	large	cream	x				poor	
35904A-1	large	pink	x	x			good	
36024-10	large	cream		x	x		poor	
35939-5	large	blue					fair	v. good
36024-4	large	cream					good	
35904A-17	large	(buds)				fusarium	good	
M 6024	small	cream	x	x		fusarium	v. good	
36053-13	med.	lt. blue	x	x			good	
36075-8	large	lt. blue					fair	
36053-6	med.	(buds)					good	
Platte	large	cream					fair	
36086-1	large	purple					poor	
35939-1	large	lt. blue	x		x			
36053-15	large	purple					poor	
A 610-19	med.	(buds)					good	
36053-1	large	purple					fair	
A 5943-1	med.	white		x			good	
36075-2	large	blue					fair	peels
M 5978-3	small	cream			x	leaf roll	v. good	
36024-9	large	blue	x					
35904A-6	large	lt. blue	x				fair	
35904A-2	large	cream	x	x			fair	firm
35904A-3	med.	(buds)	x	x			good	
35904A-14	large	white		x			fair	
36086-2	large	purple					fair	
36075-23	large	blue		x			good	
36053-5	large	blue					good	
35904A-10	large	lt. blue					fair	firm
36053-14	large	(buds)				black leg	good	
36024-11	large	cream	x			scab	good	
36075-10	large	blue					v. good	firm
A-589-65	med.	white					good	early
36053-3	large	blue		x				
A-595-15	med.	pink					good	
36053-4	large	purple		x			good	
39.52-1	med.	blue					fair	
6206-3R	med.	lt. blue			x	leaf roll	good	
Hi. Plains	large	cream					good	
5782-1R	med.	(buds)				fusarium	fair	skins
93.55.16	large	cream		x			poor	
6509-7R	med.	blue				scab	fair	
16.55-1	large	pink					good	good
M6102-7	small	(buds)			x	leaf roll	good	

Table 3 .(con't)

Variety or Selection	Vine Size 7/15	Bloom Color	Disease Notes				Maturity	
			Blight	Phizoe	Mosaic	Other	Aug. 26	When Dug
26070	small	purple			x	giant hill	good	
36053-9	large	purple		x			fair	
360266-7	large	cream		x		scab	fair	
36053-10	large	lt. blue					good	
M26016-6	med.	(buds)			x	leaf roll	good	
36053-16	large	blue					fair	
M26016-4	large	(buds)	x				fair	
36053-12	large	blue		x			good	
360266-1	large	lt. blue	x				poor	
M 5943	small	(buds)			x		good	
A-483-6	med.	(buds)	rough & hollow		x	leaf roll	good	
M-6192-27	small	(buds)					fair	peels
5778-2R	large	lt. blue					fair	peels
36086-4	large	blue					fair	
5862-2R	large	blue					poor	
260103	large	lt. blue				fusarium	poor	
6125-4R	large	pink					good	
M 6083	large	cream		x			good	
36053-18	large	blue	x	x			good	
35908-1	med.	(buds)	x				good	
4524-4R	large	blue					fair	
A-483-13	large	(buds)					good	mature
5896-13R	large	(buds)					fair	
M 6130	med.	lt. blue					good	good
M 5962-7	med.	(buds)					fair	
M 5959-3	med.	(buds)					fair	
M 5903-4	large	lt. blue		x			good	
M 6127-18	med.	(buds)					fair	
M 6020-1	large	(buds)	x				fair	
M 6120-8	med.	white					fair	peels
B 1639	large	blue	x				good	
M 5979-1	small	cream			x	leaf roll	v. good	
M 6192-27	med.	pink					fair	
M 6012-1	large	pink	x	x		fusarium	fair	
Norland	large	pink	x			black leg	good	mature
M 6191-18	med.	cream					good	
M 6152-15	small	purple					poor	
26016-11	med.	(buds)		x		fusarium	fair	
26016-4	large	lt. blue	x				fair	
A 483-13	med.	(buds)					good	
Neb143-50-2	med.	(buds)		x			fair	
Bounty	large	lt. blue					good	
M 5922	large	purple					good	
M 6120-8	large	cream	x			fusarium	fair	
M 6031	med.	(buds)	x				good	
M 5908-1	large	cream					fair	
M 6053	med.	(buds)			x	leaf roll	good	
B 1639	large	purple	x	x			fair	
Blanca	large	pink					fair	mature

Table 4. Potato Selection, Tuber Character and Yield for 1965.

Variety or Selection	Tuber Color	Lbs. per Hill	Tuber per Hill	Average Size Ounces	Tuber Faults	Tons per Acre Lb/Hx5.6
5939-8	red	3.6	8.0	7.1	scab & yellow flesh	20.6
35904-A	white	4.0	11.8	5.4		22.4
35939-9	red	2.9	8.1	5.7	hollow	16.2
35904A-15	white	3.1	10.9	4.6		17.4
35939-5-A	red	2.4	3.6	10.5	hollow	13.4
36024-1	white	2.8	6.8	6.5		15.7
35904A-1	white	4.6	10.9	6.8		25.8
36024-10	white	4.5	10.8	6.7		25.2
35939-5	red	4.2	12.2	5.5		23.5
36024-4	white	3.5	11.7	4.8		19.6
35904A-17	red	5.7	14.0	6.5		31.9
M 6024	white	0.9	3.7	4.0		5.0
36053-13	red	3.7	6.3	9.4		20.7
36075-8	white	4.3	12.8	5.3	small & pointed	24.1
36053-6	red	3.7	9.8	6.0		20.7
Platte	white	5.6	9.8	9.2		31.4
36086-1	red	4.9	11.2	7.0	pointed & off type	27.4
35939-1	no data obtained, dug early because of disease					
36053-15	red	5.6	9.7	9.3		31.4
A 610-19	white	4.2	9.2	7.3	rough & hollow	23.5
36053-1	red	6.2	16.0	6.2	hollow & checks	34.7
A-5943	white	3.4	5.5	9.9	hollow & rough	19.0
36075-2	red	7.2	14.2	8.1		40.3
M 5978-3	white	1.6	3.6	7.0	hollow & purple flesh	9.0
36024-9	no data, dug early for disease					
35904A-6	red	4.7	13.2	5.8	small	26.3
35904A-2	white	4.6	11.5	6.4		25.8
35904A-3	red	3.8	15.0	4.0	off-white flesh	21.3
35904A-14	white	4.9	15.8	5.0	hollow	27.4
36086-2	red	6.4	13.4	7.6	hollow-rough	35.8
36075-23	red	5.8	12.2	7.6	some rough	32.5
36053-5	red	7.6	10.7	11.4	hollow	42.6
35904A-10	red	5.0	15.3	5.2	some small	28.0
36053-14	red	4.2	13.0	5.3	hollow	23.5
36024-11	red	2.6	8.8	4.8	small yellow flesh	14.6
36075-10	red	8.1	13.9	9.4	checks	45.4
A-589-65	white	3.4	8.0	6.9	a few hollow	19.0
36053-3	red	6.9	13.6	8.2	some rough	38.6
A-595-15	white	3.7	7.2	8.3	rough hollow checks, yel. meat	20.7
36053-4	red	5.1	13.1	6.2		28.6
39.52-1	white	6.0	9.0	10.5	hollow	33.6
6206-3R	red	4.3	8.2	8.3	hollow	24.1
Hi Plains	white	7.7	12.4	8.2	few rough & hollow	43.1
5782-1R	red	5.2	14.2	5.9	rough	29.1
93.55-16	white	5.9	11.2	8.4	50% hollow	25.7
6509-7R	red	5.3	9.5	9.0		23.1
16.55-1	white	5.0	9.4	8.5		21.8
M 6102-7	white	1.5	5.8	4.2	small	6.5

Table 4. (con't)

Variety or Selection	Tuber Color	Lbs. per Hill	Tuber per Hill	Average Size Ounces	Tuber Faults	Tons per Acre Lb/Hx5.6
M 26070	white	2.1	5.7	6.0	small	9.1
36053-9	red	5.4	8.9	9.8	small % rough	23.5
360266-7	white	6.8	10.9	10.0	hollow	29.6
36053-10	red	5.4	9.4	8.6	60% hollow	23.5
M 26016-6	white	2.6	7.1	5.8	small-hollow	11.3
36053-16	red	5.9	9.4	10.0	hollow	25.7
M 26016-4	white	3.4	10.9	5.0	small	14.8
36053-12	red	4.9	16.3	4.8	small	21.3
360266-1	white	5.8	8.2	11.3	50% hollow	25.3
M 5943	red	1.7	5.0	5.3	red flesh	7.4
A 483-6	white	3.8	7.5	8.1	rough & hollow	16.6
M-6192-27	pink	2.9	7.3	6.3	hollow	12.6
5778-2R	red	5.7	8.4	10.8		24.8
36086-4	pink	4.4	5.5	12.7	the extra large, hollow	19.2
5862-2R	red	4.4	9.7	7.3	some hollow & off-type	19.2
260103	red	4.4	8.8	8.0	hollow	19.2
6125-4R	red	4.0	6.1	10.4	one hollow	17.4
M 6083	white	4.6	10.4	7.1		20.0
36053-18	red	5.9	10.7	8.9	the very large,hollow	25.7
35908-1	white	2.2	5.8	6.1	hollow	9.6
4524-4R	red	5.9	8.0	11.7		25.7
A-483-13	white	5.4	8.8	9.8		23.5
5896-13R	red	7.8	8.8	14.2	rough & hollow	34.0
M 6130	white	3.8	8.0	7.6		16.6
M 5962-7	red	5.4	9.3	9.4	rough	23.5
M 5959-3	white	3.2	5.4	9.5	hollow	13.9
M 5903-4	red	2.6	6.9	6.1	hollow	11.3
M 6127-18	white	3.8	9.2	6.7	hollow	16.6
M 6020-1	red	5.2	8.4	9.9	rough, checks & hollow	22.7
M 6120-8	white	4.7	10.3	7.3	rough	20.5
B-1639	red	3.9	12.0	5.3	small	17.0
M 5979-1	white	1.9	4.9	6.1	hollow	8.3
M 6192-27	white	3.6	8.5	6.9	hollow	15.7
m-6102-1	red	4.4	9.3	7.7	hollow	19.2
Norland	red	5.3	9.5	8.8		23.1
M 6191-18	white	3.1	4.1	12.3	rough & hollow	13.5
M 6152-15	white	1.5	2.8	8.6	rough	6.5
26016-11	white	3.9	6.3	10.0	hollow & checks	17.0
26016-4	white	3.5	8.3	6.7		15.2
A-483-13	white	4.1	7.1	9.2		17.9
Neb.143-50-2	red	5.5	9.2	9.5	hollow & rough	24.0
Bounty	red	6.4	9.6	10.5		27.9
M 5922	red	4.1	10.1	6.6	cooks to mush, hollow	17.9
M-6120-8	white	7.0	20.2	5.5	small, hollow	30.5
M-6031	white	2.0	6.9	4.6	yellow flesh	8.7
M-5908-1	white	4.8	16.8	4.6	small & hollow	20.9
M-6053	white	2.5	7.3	5.5	checks	10.5
B-1639	red	1.5	5.8	4.0	yellow flesh	6.5
Blanca	white	4.0	11.6	5.7		17.4

TITLE: Farm Flock Investigations, 1965

PROJECT: Farm Flock 5029

LOCATION: Northwestern Montana Branch Station

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

OBJECTIVES:

(a) Improve Columbia flock. (b) Compare onebreed with two and three breed crosses. (c) Determine desirability of self feeding early weaned lambs.

RESULTS:

(a) Columbia Flock Improvement.

Since 1951 an attempt has been made to improve a small Columbia Farm Flock by breeding, culling, and selection, and to guide the process as well as measure its results with carefull production records. Progress has been slow and at times in reverse. Rams used have been carefully selected and yet such things as horns, coarse, hairy, or open fleeces, covered faces, and less than desirable body type persist. Exceptionally productive ewes even though bred to registered rams may not produce female decendents of equal value or production capability.

There is reason for optimism however for we currently have several records in which for three or more generations all ewes have produced so as to earn a wool equivalent index of 28 or better which we consider very acceptable. The average index for registered ewes old enough to have a three year production history is now 30.1.

(b) Comparison of one breed with two breed crosses.

Straight bred Columbia lambs and two breed crosses, lambs from Dorcet Columbia ewes bred back to Columbia, were weaned early and placed on a self-fed grain ration for finishing. Ten Columbia lambs gained from 5.3 to 19.7 pounds in the 36 day period for an average 13.18 pounds. Ten one-quarter Dorcet lambs gained from 10.6 to 21.6 pounds during the same period for an average of 16.63 pounds. Daily gains of the Columbia lambs varied from .15 pounds to .55 and averaged .366 pounds. Daily gains for the quarter Dorcets varied from .29 to .60 and averaged .462. (Two half Dorcet lambs had .41 lb. daily gain each. Two Dorcet Columbia Suffolk lambs had .25 and .55 daily gains, proving nothing except that we have great variation in lambs.) Columbias averaged 93.6 pounds and quarter Dorcets 98.9 pounds at the close of the feeding period.

(c) Self-feeding, 1965

Twenty-five lambs and one ewe lamb were placed on a self-fed ration of equal parts by weight of dry beet pulp, whole barley and whole oats, on August 3rd. They also received about 6/10 pound of alfalfa hay per head per day plus salt, water and shade. None were off-feed andnone lost. A statistical summary follows:

Number on feed	26
Days on feed	36
Total lamb days	936
Pounds grain ration	2637
Grain consumed per lamb per day	2.82
Hay fed	561 pounds
Per lamb per day	.60
Total Feed cost:	$74.45

Prices:

Hay	$20.00 Ton
Pulp	3.50 cwt.
Oats	2.25 cwt.
Barley	2.00 cwt.
Gain per lamb per day (Ave.)	.42 pound
Feed cost per lb. of gain	.19¢
Gain per lamb	15.05 pounds
Total pounds lamb gain	391.3

Gain that cost .19 per pound sold at .2235, providing an additional fifty cents per lamb over feed cost. This sounds good. However, ewe lambs weaned at the same time and placed on pasture for the same period grained an average of 7.6 pounds. Had the wetters also gained 7.6 pounds on grass and sold for $18.80 instead of the $20.45 received (each) the net would have been 1.21 per lamb more on grass, provided grass was free and abundant.

A reasonable price for pulp, say $2.50 when barley is $2.00 would have reduced the cost of gain to 16.8 cents.

PLANS:

Even though the target average three year wool equivalent index of 30 has been reached with the Registered Columbia Flock, undesirable traits persist, and breeding for uniform high quality along with high production will continue.

Sufficient work has been done to show that use of meat breed sires to produce cross bred lambs puts a thicker fleshed quicker gaining lamb in the feed lot. This line of work will be discontinued.

Use of two breed cross ewes to produce both lambs and wool might become popular and increase production beyond levels current in some one breed flocks. Two such crosses have been used in our flock, one extensively and one to a limited degree. Use of a Polled Dorcet ram on Columbia ewes produces a meaty cross-bred productive ewe with no black fibres in the fleeces. Some selection for fleece length and pure white color would be desirable. Six Columbia Suffold ewes with pure white faces were secured form another breeder that are large, active, thrifty and productive. A breeder attempting to provide these

for sale as replacements would likely find that not all Columbia rams would get the pure white faces.

It would seem that in whatever direction a breeder might wish to go the greatest possible assistance to his plans would be a source of breeding stock with known dependability intransmitting certain traits.

Table 1. Lambs on Feed in 1965. August 3 - September 8 = 36 days.

Number	Breed	In-4%	Out-4%	Lbs. Gain	Daily Gain
5- 9	½ D	96.5	111.42	14.9	.41
5- 4	¼ D	72	82.6	10.6	.29
5- 5	¼ D	83.5	95.0	11.5	.32
5- 6	½ D	74.4	89.3	14.9	.41
5- 8	C	102	118.1	16.1	.45
5-10	C	87.8	93.1	5.3	.15
5-12	DCS	78.2	87.4	9.2	.25
5-13	DCS	71.5	91.2	19.7	.55
5-17	C	90.7	105.6	14.9	.41
5-18	¼ D	72	90.2	18.2	.50
5-20	¼ D	89.8	104.6	14.8	.41
5-26	Cf.	77.8	83.5	5.7	.16
5-27	C	76.3	81.6	5.3	.15
5-28	C	86.4	99.8	13.4	.37
5-30	¼ D	91.7	106.6	14.9	.41
5-33	C	91.7	111.4	19.7	.55
5-39	C	58.6	69.1	10.5	.29
5-41	C	54.2	63.4	9.2	.25
5-42	¼ D	84.5	104.6	20.1	.56
5-43	¼ D	51.4	69.1	17.7	.49
5-44	¼ D	91.2	111.4	20.2	.56
5-46	¼ D	103.2	124.8	21.6	.60
5-50	C	90.7	108.5	17.8	.49
5-52	¼ D	82.1	99.8	17.7	.49
5-53	C	65.8	85.4	19.6	.55
5-54	C	57.6	85.4	27.8	.77
			Total	391.3	
			Average	15.05	.418

PART II

1965

Annual Research Report

Northwestern Montana Branch

of the

Montana Agricultural Experiment Station

Kalispell, Montana

by

Vern R. Stewart

Associate Agronomist

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YEAR: 1965

TITLE: Fertilizer Investigations

LOCATION: Northwestern Montana Branch Station
Field Nos. R 1-8

PERSONNEL: Leader - Vern R. Stewart

DURATION: Indefinite

OBJECTIVES:

To determine the effect of N and P on the yield of small grains and other winter annuals.

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.

RESULTS AND DISCUSSION:

Yields of all winter annuals in the fertilizer study were much below average and considerably below last years yields.

Some of the factors which contributed to this yield reduction follow in this report. Winter kill of winter wheat occured in early March of 1965 when the snow "went off" followed by sub-zero temperatures. Following this, wire worms caused severe damage to the remaining stand. Winter barley was complete killed by snow mold. Park oats was seeded in the winter barley field. In field R 2a, Freja barley was seeded in the spring to replace Delmar wheat. Yields of Freja were low on the south end of the field due to extensive wire worm damage.

Fertilizer evaluations are difficult to make because of the many variations that were introduced in the original plan. The highest yields were obtained in field R 8a, where 193#/acre of 16-20-0 and 6 tons of manure per acre (approximately) were applied prior to fallow. See details of study in Table 1.

FUTURE PLAN:

Research on fertilizer rates and applications will be continued in cooperation with Mr. Don Graham. Field fertilizers will be continued in the same manner as presented here.

SUMMARY:

Yields were below normal because of winter injury to most fields. Only one field had near normal yields. On this field 193#/acre of 16-20-0 was applied before starting the fallow operation.

Table 1. Yield of field crops in rotation R.

Field Number	Number Acres	Fertilizer Type	Rate per Acre	N	P	K	Crop	Variety	Yield per Acre
R-1a	2.4	0- 0- 0	0	0	0	0	Wheat	Delmar	39.6
R-2a	2.82	24-20- 0	200 #	48	17.6	0	Barley	Freja[1]	34.1 bu
R-3a	3.3	24-20- 0	200 #	48	17.6	0	Wheat	Gaines	33.3 bu
R-4a	3.3	24-20- 0	200 #	48	17.6	0	Wheat	Westmont types Delmar	23.6 bu
R-5a	3.3	16-48- 0	100 #	16	21.0	0	Wheat	Delmar	26.6 bu
R-6a	3.3	23-23- 0	193.9	45	19.4	0	Oats	Park[2]	48.0 bu
R-7a	3.3	16-20- 0	218 #/a	35	19.2	0	Rape	Dwarf Essex	470 lbs
R-8a[4]	3.3	16-20- 0	193.9 # per acre[3]	31	17.1	0	Wheat	Delmar	45.1 bu

1 Delmar wheat winter killed and was reseeded to Freja barley in the spring.
2 Winter barley winter killed and was reseeded to Park oats in the spring.
3 Applied before starting summer fallow.
4 Heavy application of barnyard manure.

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YEAR: 1965

TITLE: Weed Investigations 5021

LOCATION: Northwestern Montana Branch Station. Field No. R-6, R-8, Kirscher farm, Stevensville, Montana, Hubbard farm, Rt.4, Kalispell, Montana

PERSONNEL: Leader - Vern R. Stewart
Members of the Weed Research Committee

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.
3. Determine the economical rate of Picloram (Tordon) for control of field bindweed.

EXPERIMENTAL DESIGN AND PROCEDURES:

Seven herbicides were used alone and some in combinations, to find an effective means of control of broadleaf weeds in a new legume seeding(sainfoin). Two herbicides were applied pre-plant and incorporated, one immediately following planting; three post emergence, when the sainfoin was in the three to five leaf stage. Plot size was 10 x 20 feet. Applications were made with a research sprayer. Fifty-four gallons of water per acre were used in all applications of herbicides. Weed and sainfoin counts were made July 12, 1965. Eight counts were made in each plot.

Two sugar beet studies were conducted on the Glen Kirscher farm, Stevensville, Montana in 1965. A demonstration type study consisting of two herbicides in two types of formulations. Liquid formulations were applied with the research sprayer in 54.4 gallons of water per acre. Granular materials were applied with an "Eversman" planter and incorporator. Seeding and incorporation of liquid formulations was accomplished with the Eversman. Rows were 1530 feet long. Visual observations were made and recorded. No plant counts were made. Twenty-nine chemical treatments, plus the check were used in the research study. Plot size was 10 x 60 or 600 square feet. All material was applied with the research sprayer, using 54.4 gallons of water per acre. Incorporation of herbicides and seeding of sugar beets was done with an "Eversman" in one operation. Eight counts in each plot in a quadrant, 3 x 48 inches, were made June 28,1965.

Control of field gromwell in winter wheat was studied in constant rate and logarithmic plots. Constant rate plots were 12 feet by 20 feet. Grain rows were spaced, one foot and two center rows harvested for yield. Fall and spring applications were made. A field seeding of wheat was used for the log plots. The half distance rate was 20 feet. All treatments were post emergence.

Three herbicides were used in establishment of field bindweed study on the George Hubbard farm, Kalispell, Montana, August 4, 1964. The purpose was to determine how to obtain economical and effective control with picloram. Observations were made in 1965.

Two herbicides, dymid and prometryene were used for control of broad leaf weeds in potatoes. Three rates of each were included. Yield determination and weed scores were obtained.

RESULTS & DISCUSSION:

Chemical control of broad leaf weeds in a new seeding of sainfoin.

The data from this study shows no reduction in sainfoin stand as a result of treatments. The differences that exist are due to chance and are not statistically significant. Trifluralin caused some injury to sainfoin but did not reduce the stand. This was also true of 2,4-DB in combination with Avadex.

Weeds were controlled with ACP 63-57, leaving a weed population of .6, based on an average of 24 counts in a quadrant 3" x 48", at 32 ounces per acre. This treatment had a weed score of 9.3 on a 0-10 scale. There was no evidence of injury from ACP 63-252 or ACP 63-57.

Following in tabular form is information for climatic and soil conditions at time of application.

Date Applied:	Post emergence	June 10, 1965
	Post plant	June 4, 1965
	Pre-plant	May 26,1965
Volume of H_2O/ acre:		54.4 gallons
Nozzle Size:		Tejet 8004
Air Temperature:	June 10	80°F
	June 4	52°F
	May 26	55°F
Relative humidity:	June 10	35%
	June 4	58%
	May 26	70%
Wind volicity:	June 10	0-3 miles/hr.
	June 4	0
	May 26	0-5 miles/hr.
Soil type:		Creston silt loam
Soil moisture:		Excellent

The data presented herein would indicate that adaquate weed control on broad leaf weeds in sainfoin can be achieved with the use of either ACP 63-252 or ACP 63-57. Tabular results of this study are found in tables, 1,2,3 & 4.

Sugar Beets Trial I

Formulations used in the demonstration were pyramin 80% wetable powder; pyramin 50% wetable powder; pyramin 10% granular; avadex liquid (4#gal) and avadex 10% granular.

WEED CONTROL SUGAR BEET DEMONSTRATION

LOCATION: W. Glenn Kirscher, Stevensville, Montana
DATE APPLIED: April 26, 1965
TEMPERATURE: 60°F
WIND VOLICITY: Gusty

Herbicide	Formulation	Rate/acre active material
Pyramin	Wetable 80%	4
Pyramin	Wetable 50%	4
Avadex	Liquid	4
Pyramin	Granules 10%	4
Avadex	Granules 10%	4

Cool temperatures and crusting delayed emergence of the beets. More weed control was obtained with pyramin as a wetable powder and as a granular than either avadex formulations. Avadex in the liquid (4#gal) form caused severe stunting and loss of beet stand. Less weed control was obtained with avadex granular than the liquid formulation. Pyramin was superior to avadex in this demonstration.

Sugar Beets Trial II

Measurements of weed control in the research studies were made June 28, 1965. Table 7 presents a summary of the data. Tillam alone ranged from 9.01 to 54.4% control. R 2063 was somewhat better than tillam ranging from 58.2 to 74.5% control. Pyramin 3 to 4 pounds per acre gave more control than tillam or R 2063. TD 282 controlled 73% of the weeds and TD 283 67.9%. Avadex gave 48.3% control. CP 45592 at 5 pounds, gave effective control of the weed population. The combination of avadex and CP 45592 was effective in the control of weeds, as was tillam plus avadex at all rates. R 2063 plus avadex controlled 40.8% of the weeds. Three pounds of pyramin plus two pounds tillam was the most effective combination for control of weeds in sugar beets. Pyramin plus R 2063 gave good control. Pyramin plus TD 282 gave 58.4% control. Pyramin plus CP 45592 was excellent in weed control. Table 5.

Tillam caused some beet injury. R 2063 appeared to have little or no effect on the beets, however at the higher rate some injury was noted. Pyramin had no adverse effect on beets. TD 282 and TD 283 both caused some beet injury. CP 45592 caused considerable injury to beets, reducing the stand 50%. CP 31393 was similar in its effects. Avadex plus CP45592 caused serious damage to sugar beets. Table 6 gives a complete resume of the herbicides used and their effects on sugar beets.

A complete tabulation of all data is found in Tables 5,6,7 & 8.

Chemical control of Field Gromwell (Lithospernium arvense) in winter wheat I

Only yield data was obtained in 1965. The population of gromwell was not consistant throughout the plot, therefore evaluation for weed control were not made. There was little difference between fall and spring applications. The

average of all spring treatments was 46.5 bushels per acre and 44.8 bushels per acre for fall treatments. The highest yield was obtained from hand weeded check plot, or 60.6 bushels per acre. This difference was not significantly different from several ioxynil treatments and lower rates of dicamba. Tables 9 & 10. These data indicate that some herbicides have an adverse effect on grain yields and perhaps indicate the need for early (in the fall) removal of weeds from winter grain. Table 9

Winter wheat II

Herbicides in the logrithmic plots were applied when the gromwell was 16 inches tall and in bloom. Seven herbicides were used. ACP 65-15B gave good control to a distance of 30 feet, and a degree of control the remaining 30 feet in the plot. Dicamba, 2,4-DLV and picloram were completely in-effective in the study. Table 11.

Field Bindweed

A plan of the study on the Hubbard farm is made a part of this record.

Herbicide	Rate/acre in pounds	Plot Number	
Picloram	.5	1	14
Picloram	1	2	13
Picloram	1.5	3	11
Picloram	20	4	8
TBA	10	5	9
2,4-D	4	6	12
TBA + 2,4-D	10 + 1	7	10

This study was established August 4, 1964, with results to be recorded in 1964-1965. However, before the author could record the data the plots were tilled making it impossible to obtain accurate results. (1964) In 1965 an early frost hindered an accurate reading. Observation of the plots indicate that the lower rate of picloram was quite effective in controling field bindweed. Observations will be made in 1966.

Potatoes

The herbicide study on potatoes contained two products, each at three rates, plus a check and hand weeded check. A visual weed score and yield data were obtained. No significant difference in yield were found due to treatment, however the hand weeded check was the highest in yield. Prometryne at 4 pounds per acre was very effective in control of broad leaf weeds, however this was not too great a difference from the 1 and 2 pound rates. Dymid was ineffective in weed control. Table 12.

FUTURE PLANS:

Continue work in sugar beets, winter wheat (field gromwell), new legume seedings and field bindweed.

Table 7. Summary of data from herbicide on sugar beets grown on the W. Glenn Kirscher farm, Stevensville, Montana in 1965

[1] Quadrant= 3"x4' - 1 square foot, 8 counts per plot

Herbicide	Rate/acre in pounds	Beet stand in % of check	Average number of weeds per quadrant in sample[1] 1	2	3	Total	% Weed control	Remarks
Tillam	2	98	57.5	--	9.8	67.3	0.0	Some beet injury
Tillam	3	100	38.6	8.5	16.1	63.2	45.4	Limited control of lambsquarter, leaves kochia and mustard
Tillam	4	84	23.0	18.8	52.8	17.6	54.4	Lambsquarter,kochia and mustard not controlled
R 2063	2	123	28.9	11.1	8.4	48.4	58.2	No effect on mustard and kochia
R 2063	3	117	14.8	7.0	1.6	23.4	79.8	Good on pigweed, leaves mustard
R 2063	4	96	12.4	--	1.1	13.5	74.5	Some beet injury, no control of mustard and kochia
Pyramin	3	111	18.4	5.3	2.1	25.8	77.7	Some control of kochia
Pyramin	4	96	21.0	--	10.6	31.6	40.2	Fair control of kochia
TD 282	3	106	22.1	7.6	1.6	31.3	73.0	Some beet injury,no control of mustard or kochia, weak on lambsquarter, some control of nightshade
TD 283	3	104	27.8	4.3	5.1	37.2	67.9	Some beet injury, good on pigweed, poor on lambsquarter and sow thistle
Avadex	2	101	31.0	19.8	9.1	59.9	48.3	Little visual evidence of any control
CP 45592	1.5	112	17.2	--	10.0	27.2	48.5	Beet injury, no control of mustard
CP 45592	3	69	4.5	4.1	4.5	13.1	88.7	Severe beet injury, no control of Kochia

Table 7 . (con't)

[1] Quadrant= 3"x4' - 1 square foot, 8 counts per plot

Herbicide	Rate/acre in pounds	Beet stand in % of check	Average number of weeds per quadrant in sample[1] 1	2	3	Total	% Weed control	Remarks
CP 31393	3	78	20.4	--	14.3	34.7	34.4	Some control of nightshade, some beet injury
CP 31393	5	69	8.9	11.0	7.6	27.5	76.3	Beet injury, no control of mustard
Avadex + CP 45592	1.5 +1	48	20.8	9.4	1.4	31.6	72.7	Severe beet injury
Tillam + Avadex	2.75+1.25	107	22.9	7.0	9.3	39.2	66.1	Beet injury, no control of kochia, mustard and nightshade
Tillam + Avadex	3.00+1.5	89	11.1	5.1	3.5	19.7	83.0	Beet injury, no control of mustard, weak on pigweed
Tillam + Avadex	3.25+1.75	95	8.0	3.8	2.8	14.6	87.4	Beet injury, no control of kochia
R 2063 + Avadex	3.00+1.5	109	36.1	21.5	10.9	68.5	40.8	Left some mustard
Pyramin + 64-296B	3.00+1	110	20.1	10.6	5.6	36.3	68.7	No control of kochia, canada thistle and mustard
Pyramin + Tillam	3.00+2	97	2.9	2.5	.1	5.5	95.3	Left kochia
Pyramin + R 2063	3.00+2	112	10.5	4.0	2.8	17.3	85.1	Weak on kochia & mustard, left pigweed
Pyramin + TD 282	3.00+2	111	20.0	--	2.0	22.0	58.4	Weak on lambsquarter, good on nightshade
Pyramin + CP 45592	3.00+1	88	1.2	10.6	.3	12.1	89.6	Severe beet injury, no control of mustard and nightshade
Pyramin + Avadex	3.00+1.5	106	7.6	7.8	10.2	25.6	77.9	Beet injury, no control of mustard and sow thistle
Check	0	100	28.5	62.8	24.5	115.8	0.0	

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Table 8. Summary broadleaf data by species in sugar beet herbicide study in Ravalli, County grown on the Glenn Kirscher farm, Stevensville, Montana in 1965

Herbicide	Rate/acre in pounds	LAMBSQUARTER 2	3	Total	% Weed Control	PIGWEED 2	3	Total	% Weed Control	OTHER(nightshade) 2	3	Total	% of Check
Tillam	2	--	1.0	1.0	37.5	--	.2	.2	50.0	—	8.8	8.8	53.9
Tillam	3	4.4	4.6	9.0	55.2	1.5	3.5	5.0	80.3	2.6	8.0	10.6	65.2
Tillam	4	6.5	2.4	8.9	55.7	10.3	.8	11.1	56.3	8.2	6.4	14.6	52.1
R 2063	2	3.2	1.9	5.1	74.6	8.0	1.1	9.1	64.2	3.7	5.4	9.1	70.2
R 2063	3	3.8	.4	4.2	79.1	1.5	0.0	1.5	94.1	1.8	1.3	3.1	89.8
R 2063	4	--	.6	.6	62.5	--	.2	.2	50.0	--	.4	.4	98.2
Pyramin	3	1.5	1.3	2.8	86.1	1.6	.6	2.2	91.3	2.1	.8	2.9	90.5
Pyramin	4	--	5.0	5.0	0.0	--	3.0	3.0	0.0	—	2.6	2.6	188.4
TD 282	3	3.1	.6	3.7	81.6	1.0	.2	1.2	95.3	3.5	.6	4.1	86.6
TD 283	3	4.8	4.4	9.2	54.2	1.8	.0	1.8	92.9	3.0	.8	3.8	87.5
Avadex	2	5.2	1.4	6.6	67.2	10.5	2.0	12.5	50.8	10.5	5.8	16.3	46.6
CP 45592	1.5	--	2.5	2.5	0.0	--	.4	.4	0.0	--	7.1	7.1	68.4
CP 45592	3	1.5	1.0	2.5	87.6	.8	0.0	8.0	68.5	1.9	2.9	4.8	84.3
CP 31393	3	--	4.9	4.9	0.0	--	2.8	2.8	0.0	—	6.4	6.4	71.6
CP 31393	5	2.8	.6	3.4	83.1	4.2	2.5	6.7	73.6	7.7	4.5	12.2	60.0
Avadex+CP45592	1.5 +1	4.4	.0	4.4	78.1	2.2	.0	2.2	91.3	2.8	1.1	3.9	87.2
Tillam + Avadex	2.75+1.25	1.7	1.1	2.8	86.1	3.0	3.4	6.4	74.8	4.7	4.8	9.5	68.9
Tillam + Avadex	3 +1.5	1.0	.8	1.8	91.0	2.5	.3	2.8	89.0	3.2	3.0	6.2	79.7
Tillam + Avadex	3.25+1.75	1.5	.3	1.8	91.0	2.0	.3	2.3	90.9	1.5	2.3	3.8	87.6
R 2063 + Avadex	3 +1.5	5.4	1.0	6.4	68.2	11.8	1.9	13.7	46.1	4.4	8.1	12.5	59.0
Pyramin + 64-296B	3 +1	3.9	1.5	5.4	73.1	3.8	2.0	5.8	77.2	3.0	2.1	5.1	84.3
Pyramin + Tillam	3 +2	1.6	.0	1.6	92.0	.0	.2	.2	99.2	.8	.2	1.0	96.7
Pyramin + R 2063	3 +2	.0	.6	.6	97.0	4.0	.3	4.3	83.1	—	1.9	1.9	91.6
Pyramin + TD 282	3 +2	—	1.1	1.1	33.1	—	.2	.2	50.0	--	.8	.8	96.5
Pyramin + CP45592	3 +1	3.0	.0	3.0	85.0	5.7	.0	5.7	77.6	5.5	.3	5.8	81.0
Pyramin + Avadex	3 +1.5	2.0	1.1	3.1	84.6	3.0	4.8	7.8	69.3	2.8	4.3	7.1	76.7
Check	0	18.5	1.6	20.1	0.0	25.0	.4	25.4	0.0	8.0	22.5	30.5	0.0

Table 9. Summary of yield data obtained from herbicide study on Delmar winter wheat. Plot 12 rows, 20 feet long. Three replications. Northwestern Montana Branch Station. Field No. R-8, 1964-65

Date Seeded: September 23, 1964 Date Harvested: August 30, 1965
Size of Plot: 32 square feet

Treatment	Date Applied	Rate oz/a	1	2	3	Total	Yield bu/a
Check (Hand weeded)			1330	1034	1272(a)	3636	60.6a[1]
Ioxynil	11- 3-64	16	1085	1119	1060	3264	54.4ab
Dicamba	4-27-65	2	975	1065	1020	3060	51.0ab
Ioxynil+Surfactant	4-27-65	4	940	915	1095	2950	49.1ab
Ioxynil	4-27-65	16	855	1015	1065	2935	49.0abc
Ioxynil	11- 3-64	8	816	1012	1080	2908	48.4abc
Dicamba	11- 3-64	2	865	922	1101	2888	48.1abc
Dicamba	11- 3-64	1	974	830	1075	2879	48.0 bc
Ioxynil+Surfactant	4-27-65	8	810	980	1029	2819	47.0 bc
Dicamba	4-27-65	1	826	951	981	2758	46.0 bcd
2,4-DLV Ester	11- 3-64	24	820	815	1124	2759	46.0 bcd
Ioxynil	11- 3-64	4	830	1055	804	2689	44.8 bcd
Ioxynil[2]	4-27-65	8	736	970	975	2681	44.7 bcd
Ioxynil[2]	4-27-65	8	840	900	942	2682	44.7 bcd
Ioxynil	4-27-65	4	850	931	895	2676	44.6 bcd
Ioxynil+Surfactant	11- 3-64	8	905	862	900	2667	44.4 bcd
2,4-DLV Ester	4-27-65	24	800	851	945	2596	43.3 bcd
Ioxynil+Surfactant	11- 3-64	4	824	715	1034	2573	42.9 bcd
Ioxynil	11- 3-64	8	820	975	783	2578	42.9 bcd
Check (Not weeded)			626	1025	875	2526	42.1 bcd
Ioxynil+Surfactant	4-27-65	16	892	466	1165	2523	42.0 bcd
Dicamba + 2,4-D	4-27-65	1+ 8	648	700	971	2319	38.6 cde
Ioxynil+ Surfactant	11- 3-64	16	675	940	341	1956	32.6 de
Dicamba + 2,4-D	4-27-65	1+ 8	425	630	560	1615	26.9 e

(a) Calculated missing plot
[1] Duncan multiple range test
[2] ½ volume of H_2O of other treatments

$\bar{x}$..... 45.1
S.E.$\bar{x}$..... 3.99571
C.V.%..... 8.68

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	89153.8	4.65**
Treatment	23	51510.3913	2.69**
Error	46	19158.90869	
Total	71		

Table 10. Fall vs Spring applications of herbicides on Delmar winter wheat. Plots 12 rows - 20ft long - space 1 ft, 3 replications.

Treatment	Rate	Application Time Spring Yield Bushel/Acre	Fall Yield Bushel/Acre
2,4-DLV Ester	1½#	43.3	46.0
Ioxynil	¼#	44.6	44.8
Ioxynil	½#	44.7	42.9
Ioxynil	1 #	49.0	54.4
Dicamba	1 oz	46.0	48.0
Dicamba	2 oz	51.0	48.1
Ioxynil + Surfactant	¼#	49.1	42.9
Ioxynil + Surfactant	½#	47.0	44.4
Ioxynil + Surfactant	1 #	42.0	32.6
Ioxynil + Surfactant	½# *	44.7	48.4
Dicamba + 2,4-D	1oz -8 oz	38.6	26.9
Check (hand weeded)		60.6	60.6
Check		42.1	42.1
	$\bar{x}$	46.5	44.8

* ½ volume of other treatment

Table 11. Data from logrithmic herbicide plot on field gromwell growing in winter wheat in 1965. Application date: May 27, 1965

Herbicide	Constant Rate oz/a	Variable Starting Rate oz/a	Remarks (June 1, 1965)
2,4-D + ACP65-15-B	8	16	Some burning of leaves to 42 feet. No real control.
2,4-D +ACP 64-386	8	16	Evidence of control, burning of leaves to about 45 feet.
2,4-D + ACP 166A	8	16	Some control to 30 feet.
2,4-D + ACP 64-53	8	16	No apparent control.
2,4-D + ACP 64-16B	8	16	Burning of top gromwell leaves. No evidence of good control.
2,4-D + Dicamba	8	4	Reduction in plant height, epinasty noted to 50 feet. Plants appear to be recovering.
2,4-D + Picloram	8	1	No control, some injury noted on gromwell.
2,4-D	8		No apparent control.
ACP 65-15B		16	Good control to 30 feet, then less control to 50 feet.
ACP 64-386		16	Control to 25 feet.
ACP 63-166A		16	No control.
ACP 64-53		16	No control.
ACP 65-16B		16	Some plant injury to 20 feet.
Picloram		1	No apparent control.
Check		0	No control.

Table 12. The effect of certain herbicides on the control of weed and yield of potatoes. Field Number X-4

Date Seeded: May 26, 1965 Date chemical applied: June 4, 1965
Size of Plot: 70 square feet Date Harvested: September 27, 1965

Chemical Compound	Rate/A Active Material	Weed Score 1-10	Yield in Pounds per Plot I	II	III	Total	$\bar{x}$	Cwt per acre
Prometryne	1	7.7	21	45	41	107	35.7	222.2
Prometryne	2	7.7	38	30	52	120	40.0	248.9
Prometryne	4	9.0	44	34	35	113	37.7	234.6
Dymid	2	4.0	44	35	41	120	40.0	248.9
Dymid	4	6.0	31	30	35	96	32.0	199.1
Dymid	6	6.3	29	41	36	106	35.3	219.7
Check(Hand weeded)	0	x	39	35	47	121	40.3	250.8
Check	0	0.0	39	25	43	107	35.7	222.2

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	2	107.29167	
Treatment	7	26.07149	N.S.
Error	14	57.625	
Total	23		

$\bar{x}$.....	230.8
S.E.$\bar{x}$.....	27.2732
L.S.D.....	N.S.
C.V.%.....	11.82

YEAR: 1965

TITLE: Forage Investigations 5022

LOCATION: Western Montana Branch Station, Corvallis, Montana
Tutvedt Brothers Ranch, Kalispell, Montana

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

DURATION: Indefinite

OBJECTIVES:

To determine the adaptability of certain commercial corn hybrids.

EXPERIMENTAL DESIGN AND PROCEDURES:

The corn silage study this year was seeded on the Western Montana Branch Station and the technique is described in the Annual Report of 1964, page 65. In addition to this study a field study was conducted on the Tutvedt Brothers ranch Northwest of Kalispell, Montana. The field study was planted in single row plots, .2 of a mile long, spaced 38 inches. These were planted with a regular field corn planter and the harvesting was accomplished with a field chopper.

RESULTS AND DISCUSSION:

The study located on the Western Montana Branch Station was completely destroyed by hail in approximately twenty minutes on August 21, 1965. No data then was obtained from the study located at Corvallis.

The field study located at Tutvedt's was seeded, June 1st. and harvested on October 12th. Which is approximately thirty days following the first frost date.

At harvest time all of the varieties were broken over about one half way up the stalk at the node and most contained some type of fungus growing in the area of the break. An estimation of ten percent loss of leaves and stalks at harvest time was made, however no weights were recorded to make an exact determination.

Table 1, shows that DeKalb 664 was significantly better than any other of the entries in this study. It is interesting to note that the 120-140 day entries seem to be just slightly better in yield generally than the 110-119 day corn or Northrup King's KC 3, which is an early variety. This could be due in part to the later maturing variety, because the leaves stayed on a bit better than on the earlier maturing lines. A complete tabulation of data on a dry matter basis is found in Table 1.

FUTURE PLANS:

Will continue to evaluate commercial corn hybrids.

SUMMARY:

The 120-140 day corn maturity range group was somewhat higher in yield this year than the 110-119 day lines. This is in contrast when this was reversed in 1964, however it is the authors opinion that the harvest date may be the determining factor in this particular case.

Table 1. Agronomic data from corn silage study conducted on the Tutvedt Brothers Ranch, Kalispell, Montana in 1965. Field type plots.

Date Seeded: June 1, 1965 Date Harvested: October 12, 1965
Size of Plot: 3343.99 sq. ft.

Variety	Maturity Range	% Moisture at Harvest	Total Dry Weight in pounds I	II	Total	Tons/A
DeKalb 664	120-140	59.36	462.2	260.3	1022.5	3.3a[1]
DeKalb 346	120-140	62.89	376.2	449.0	825.2	2.7 b
Northrup King KT665	120-140	62.53	406.8	383.2	790.0	2.6 bc
Northrup King KM567	110-119	67.38	426.6	309.8	736.4	2.4 bcd
DeKal 633	120-140	62.74	359.9	332.5	692.4	2.3 bcd
Northrup King KT626	110-119	72.92	345.3	349.3	694.6	2.3 bcd
Northrup King KF435		65.68	349.8	357.9	707.7	2.3 bcd
Northrup King PX 78	120-140	71.41	366.8	303.7	670.5	2.2 bcde
Northrup King KT652	120-140	69.58	327.0	291.2	618.2	2.0 cde
Northrup King KC 3		66.91	301.8	238.0	539.8	1.8 de
P.A.G. 348	120-140	67.68	222.1	239.4	461.5	1.5 e

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

$\bar{x}$..... 2.3
S.E.$\bar{x}$... .19
C.V.%... 8.34

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	1	770.547	
Varieties	10	10952.2964	6.33**
Error	11	1729.404818	
Total	22		

YEAR: 1965

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

RESULTS AND DISCUSSION:

Intrastate Nursery

A dryland and an irrigated intrastate and station yield nursery were grown in 1965. Growing conditions were excellent during the season. Rain in the fall during harvest made this operation difficult. Lodging was sever in both the dryland and irrigated studies.

Herta was the highest yielding entry in the dryland nursery. The mean yield was 76.7 bushels per acre. Test weights were good in most varieties. Table 1.

Glacier x Mars (115.0 bu/a) was the highest yielding entry in the irrigated nursery. This was significantly higher in yield than Ingrid which is one of the recommended varieties for irrigation. Table 2.

Off Station Nurseries

Four off station nurseries containing ten entries were seeded in 1965. They were single row plots replicated six times, with the exception of one which was a four row plot and replicated four times. The four row plot study was grown as a comparison with the single row plot, six replication nursery. A discription by counties follows.

Missoula County - Ingrid was the highest yielding variety in the Missoula County nursery. There was considerable competition from wild oats in this study. Rain during the harvest period, no doubt caused the reduction in test weight of most entries. Table 3.

Spring Barley (con't)

Ravalli County - Hail on August 21st destroyed all barley nurseries in that location. Thus the comparison of single row, six replication with a four row, four replication nursery could not be made.

Lake County -- Snow in early September caused severe damage to the Lake County nursery. Six inches of snow lodged all varieties, causing the rows to become mixed. Thus the nursery was not harvested.

Two-six row Isogenic Barley Yield Nursery

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

Data obtained from both dryland and irrigated nurseries were yields, plant height, lodging and percent plump. Under irrigation heading date was also obtained.

In the dryland study the six row type was superior in yield to the two row types. The Munsing x Titan cross was the lowest in yield of the three crosses studied. See Table 4 for details.

There were no statistical differences in the irrigated study. However, the late cross of Munsing x Titan was much lower in yield than the other crosses. See Table 5 for complete details of this study.

Hill Study

F_5 lines of Betzes x Compana and Freja x Betzes were grown in 2 x 2 hills. Heading date and height and yield data were secured from this study. At the writing of this report these data have not been returned to the author. Thus they will be included in next years report.

Maturation Study

A maturation study was conducted at six locations throughout Montana in 1965. The tabulation and analysis of the data is not completed at this writing. A yield summary of the data from the Northwestern Montana Branch Station is made a part of this report.

A comparison of immature and mature barley yields of eight varieties is shown. Immature barley was harvested at 35% moisture and mature at 15% moisture. Eight varieties were used in the study. All varieties except Vantage and Ingrid gave higher total dry matter per acre when harvested as mature grain, Ingrid 791 pounds per acre. See Table 6 for summary of 1965 data.

FUTURE PLANS:

Will continue about the same program as in 1965.

Spring Barley (con't)

SUMMARY:

1. Glacier x Mars was significantly higher in yield than Ingrid under irrigated conditions.

2. Dryland yields were good. Freja significantly higher in yield than Palliser.

3. Irrigated isogenic nursery non-significant. Dryland isogenic nursery, six row type, out yielded two row type. The Munsing x Titan cross lowest yielding cross.

4. Maturation study shows some yield advantage can be secured with immature harvest of six of the eight varieties grown. Ingrid and Vantage have greater yield as mature seed.

5. Summary of yield data is shown for dryland and irrigated barley varieties in Tables 7 and 8 respectively.

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Table 1. Dryland intrastate and station barley yield nursery, Northwestern Montana Branch Station, 1965.
Experimental Design - Random Block - Four Replications

Date Seeded: April 28, 1965 Harvest Date: August 30, 1965
Size of Plot: 16 square feet

Number	Variety	Yield Bu/A	Weight Lb/Bu	% Plump	Height in Ins	Lodging %
8097	Herta	92.7	50.5	96	31	3
7130	Freja	91.4	48.5	92	27	43
12130	Lico x Ogalitsu	91.3	45.0	89	34	88
86350	Glacier x Mars	90.5	44.0	99	33	18
86076	Glacier x Mars	89.6	43.2	95	34	55
10877	Keystone	88.8	46.0	94	37	32
11497	Svalof 02148	84.5	49.6	90	28	16
25428	C.I. 5461 Sel. 59745	83.3	45.5	78	36	70
9558	Piroline	80.8	50.8	96	30	6
10421	Unitan	80.4	46.5	95	30	44
5438	Compana	79.8	47.5	94	28	97
11772	Hypana Erect Heads	75.8*	47.1	98	32	26
11758	Grande	75.7*	44.0	99	33	21
50050	Hypana 50x50 Mixture	75.6*	45.9	99	35	58
25369	C.I. 5461 Sel. 59772	75.1*	46.0	91	34	35
6398	Betzes	73.5*	49.5	94	31	37
10860	Palliser	73.4*	47.5	97	34	50
3351	DeKap	72.5*	47.6	86	27	79
11770	Glacier x Newal 2X Husky	71.0*	47.5	86	35	33
404839	Hypana Nodding Heads	69.2*	46.6	100	35	58
11868	Bet x HII 2X Pir 7155-60	68.0*	49.9	92	29	18
10648	Larker	66.6*	47.9	97	36	47
314116	C.I. 4116 F31	66.0*	46.0	94	35	83
10968	Dickson	63.6*	48.5	93	37	58
204197	Nupana Short Coleoptile	59.5*	54.5	83	27	99
37724	Nupana Bulk	55.7*	53.5	82	28	99

NOTE: Freja 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	546.1	4.54*
Varieties	25	426.7	3.54*
Error	75	120.2	
Total	103		

$\bar{x}$..... 76.7
S.E.$\bar{x}$..... 5.4
L.S.D.(.05) 15.4
C.V.%..... 7.14

Table 2. Irrigated intrastate and station yield barley nursery, Northwestern Montana Branch Station
Experimental Design - Random Block Four Replications
Planting Date: April 29, 1965 Harvest Date: Sept. 7, 1965 Size of Plot: 16 sq. ft.

C.I. Number	Variety or Cross	Yield Bu/A	Test Wt. Lb/Bu.	Percent Plump	Plant Height	Lodging Percent	Heading Date	
86350	Glacier x Mars	115.0**	43.2	97	34	57	6-28	
11497	Svalof 02148	110.6**	49.0	89	32	62	7- 7	
12130	Lico x Ogalitsu	108.3**	46.0	92	38	61	6-29	
7324	Vantage	101.6	45.4	92	36	63	7- 4	
586076	Glacier x Mars	97.6	43.3	92	39	29	7- 2	
9558	Piroline	95.9	51.6	91	36	64	7- 4	
11772	Hypana Erect Heads	95.1	45.8	94	38	82	7- 2	
6976	Glacier	95.0	41.4	96	36	26	6-28	
10083	Ingrid	92.0	48.1	92	38	79	7- 9	
11758	Grande	91.9	43.0	99	36	57	6-30	
211761	Domen x Betzes	89.9	49.0	93	39	66	7- 8	
211741	Domen x Betzes	89.7	47.3	94	38	36	7- 6	
6398	Betzes	88.5	49.0	87	37	78	7- 5	
10877	Keystone	88.4	46.6	88	38	59	7- 4	
204197	Nupana Short Coleoptile(a)	85.4	53.0	77	31	99	7- 3	
211749	Domen x Betzes	85.3	46.5	94	38	52	7- 6	
11868	Bet x HII 2x Pir 7155-60	84.9	50.0	86	37	91	7- 5	
10421	Unitan	84.4	45.5	93	39	55	6-29	
211812	Domen x Betzes	82.5	44.4	93	38	83	7- 5	
211742	Domen x Betzes	82.0	46.2	95	37	59	7- 7	
211602	Domen x Betzes	81.8	47.2	80	36	96	7- 6	
7130	Freja	77.8	47.5	84	32	70	7- 6	
37724	Nupana Bulk(a)	77.8	52.9	70	32	99	7- 2	
10860	Palliser	77.6	46.0	93	37	94	7- 5	
10968	Dickson	76.8	45.2	85	35	53	7- 3	
50050	Hypana 50 x 50 Mixture	75.3	44.7	94	42	94	7- 3	
25428	CI 5461 Sel. 59745	75.2	43.4	70	39	92	7- 5	
11770	Glacier x Newal 2x Husky	73.2	46.9	85	36	79	7- 3	
5438	Compana	70.7	43.0	87	33	99	7- 4	
25369	CI 5461 Sel 59772	70.0	44.5	72	37	98	7- 3	KS
10648	Larker	59.5*	47.2	95	35	48	7- 1	VRS

Table 2 . (con't)

C.I. Number	Variety or Cross	Yield Bu/A	Test Wt. Lb/Bu.	Percent Plump	Plant Height	Lodging Percent	Heading Date
324116	CI 4116 F32	58.5*	43.9	93	36	99	7- 4
404839	Hypana Nodding Heads	56.0*	44.5	94	39	94	7- 2

(a) Hulless variety where yield is not adjusted for lack of hull.
** Indicates varieties which yielded significantly more than Unitan at (.05)
* Indicates varieties which yielded significantly less than Unitan at (.05)

$\bar{x}$..... 84.7
S.E.$\bar{x}$..... 8.1
L.S.D.(.05) 22.8
C.V.%..... 9.59

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	558.1	2.10
Variety	32	776.8	2.93
Error	96	264.5	
Total	131		

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Table 3. Off station irrigated barley yield nursery, grown on the Tom Shaffer farm in Missoula County, Missoula, Montana in 1965. Experimental design - Random block - Six replications

Date Seeded: May 3, 1965 Harvest Date: September 3, 1965
Size of Plot: 16 square feet

Number	Variety	Yield Bu/A	Weight Lb/Bu	Height in Ins.
10083	Ingrid	53.1	48.0	26
6398	Betzes	49.2	47.5	29
9558	Piroline	48.2	48.2	26
10968	Dickson	46.7	45.4	28
11772	Hypana Erect Heads	45.3*	46.2	27
10860	Palliser	44.6*	46.9	28
7130	Freja	44.4*	48.1	24
10421	Unitan	44.0*	44.5	25
404839	Hypana Nodding Heads	41.9*	45.4	27
10648	Larker	38.3*	46.0	28

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

$\bar{x}$..... 45.6
S.E.x..... 2.7
L.S.D..... 7.7
C.V.%..... 5.95

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	5	1154.6	26.08*
Varieties	9	99.6	2.25*
Error	45	44.2	
Total	59		

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Table 4. Agronomic and yield data from two-six row isogenic nursery grown under dryland conditions at Creston, Montana in 1965
Four row plots - three replications - Field No. A1½ -
Split plot design - Latin square

Date Seeded: April 28,1965 Date Harvested: August 30, 1965
Size of Plot: 16 square feet

Variety or Cross	C.I. No.	Row Type	Height in Ins.	Yield Bu/A	Bu/Wt. in Lbs.	Lodging Percent	% Plump
Glacier	6976	6	31	86.7	41.8	15	95.7
Compana	5438	2	28	87.4	48.3	94	96.0
GlacierxCompana	MT110091	L2	35	97.4	47.0	70	98.7
GlacierxCompana	MT110090	L6	29	91.9	39.6	94	64.7
GlacierxCompana	MT110089	E2	27	62.0	48.1	13	99.0
GlacierxCompana	MT110088	E6	26	86.8	44.9	13	87.0
MunsingxTitan	MT110092	E6	28	71.1	48.0	77	88.0
MunsingxTitan	MT110093	E2	30	48.2	48.6	43	98.3
MunsingxTitan	MT110095	L2	33	75.9	46.0	02	98.7
MunsingxTitan	MT110094	L6	31	85.8	44.4	41	84.0
Munsing	6009	2	25	80.9	48.0	93	93.3
Titan	7055	6	34	88.5	45.0	62	92.3
GlacierxMunsing	MT110086	L6	27	80.8	38.2	63	88.0
GlacierxMunsing	MT110087	L2	31	86.5	41.5	53	98.0
GlacierxMunsing	MT110084	E6	26	85.0	37.4	66	89.0
GlacierxMunsing	MT110085	E2	28	72.6	40.5	05	99.0
Glacier	6976	6	30	98.3	42.0	33	98.7
Munsing	6009	2	26	86.4	48.0	98	76.0

Analysis of Variance

Source	D.F.	Mean Square	F.
Cols	2	40754.5	.911
Rows	2	45921.0	1.026
Cross	2	38931.5	.870
Error A	2	44729.5	---
Col 1 Col	2	8742.50	1.442
Trts	2	102323.0	16.882**
Txcs	4	12958.5	2.138
Error B	10	6060.90	---
Row Type	1	6434.3	10.743
CS x RT	2	5065.50	.845
T x RT	2	31207.5	5.210
CS x T x RT	4	5423.50	.905
Error C	18	5988.944	---
Total	14	17766.22	---

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Table 5. Agronomic and yield data from two-six row isogenic nursery grown under irrigation at Creston, Montana in 1965. Four row plots - Three replications - Field No. Y-2 - Plot design - Latin square.

Date Seeded: April 29, 1965 Date Harvested: September 2, 1965
Size of Plot: 16 square feet

Variety or Cross	C.I.No.	Row Type	Date Headed	Height in Ins	Yield Bu/A	Bushel Wt/Lbs	Lodging %	% Plump
Glacier	6976	6	6-28	35	93.4	42.4	58	94.7
Compana	5438	2	7- 3	30	73.5	43.9	99	89.7
Glacier x Compana	MT110091	L2	7- 4	40	84.0	45.4	99	95.3
Glacier x Compana	MT110090	L6	7- 4	35	60.1	41.5	99	61.7
Glacier x Compana	MT110089	E2	7- 3	32	74.0	46.5	28	96.0
Glacier x Compana	MT110088	E6	6-29	30	81.5	42.6	77	79.7
Munsing x Titan	MT110092	E6	6-28	29	36.4	44.7	79	88.0
Munsing x Titan	MT110093	E2	6-28	29	35.7	42.1	53	97.3
Munsing x Titan	MT110095	L2	7- 2	34	99.9	47.5	31	97.7
Munsing x Titan	MT110094	L6	7- 1	36	80.5	44.6	99	70.0
Munsing	6009	2	6-29	28	66.1	45.5	99	80.0
Titan	7055	6	7- 2	37	76.2	45.2	19	88.0
Glacier x Munsing	MT110086	L6	7- 1	34	101.3	38.4	99	83.3
Glacier x Munsing	MT110087	L2	7- 2	34	84.6	42.6	88	93.3
Glacier x Munsing	MT110084	E6	6-28	31	89.4	43.5	99	88.7
Glacier x Munsing	MT110085	E2	6-30	35	79.6	41.5	85	97.0
Glacier	6976	6	6-28	35	98.3	41.5	50	94.7
Munsing	6009	2	6-30	28	84.2	45.4	99	79.7

Analysis of Variance

Source	D.F.	Mean Square	F.
Cols	2	4962.50	.228
Rows	2	1981.50	.091
Cross	2	162358.0	7.477
Error A	2	21712.50	
Col 1 Col	2	36.000	.001
Trts	2	119421.50	3.826
T x Cs	4	95274.75	3.053
Error B	10	31205.4	
Row Type	1	13348.0	1.088
Cs x Rt	2	21023.0	1.715
T x Rt	2	40734.5	3.323
Cs x T x Rt	4	15416.0	1.257
Error C	18	12257.222	
Total	14	32702.905	

Table 6. Summary of maturation data obtained at the Northwestern Montana Branch Station in 1965.

Variety	Immature Harvest % Moisture at Harvest	Immature Harvest Total Dry Matter lbs/A	Mature Harvest % Moisture at Harvest	Mature Harvest Total Dry Matter lbs/A	Difference Dry Matter lbs/A
Betzes	36.38	3502	19.50	3001	501
Unitan	31.21	5091	15.23	4590	501
Vantage	36.83	3529	17.85	4779	1250
Compana	26.99	4047	14.65	3693	354
DeKap	28.06	3282	16.25	2926	356
Ingrid	41.01	3394	16.03	4185	791
Hypana	24.16	3613	14.15	3327	286
LicoxOgalitsu	31.52	4590	15.78	3381	1209

Table 7. Summary of yields of varieties in the dryland intrastate and station barley yield nursery 1954 - 1965 at Creston, Montana

Variety or Selection	C.I. or N No.	Average Yield in Bushels per Acre										Station Years	% of Compana
		1954	1955	1956	1957	1958	1959	1960	1961	1964	1965		
Betzes	6398	87.9	95.1	80.9		53.5	43.9	46.1	31.6	61.7	73.9	9	114
Bet.x HII 2xPir.7155-60	11868										68.0	1	85
Compana	5438	81.1	69.1	53.8	60.6	38.9	43.3	45.5	34.9	57.1	79.8	10	100
DeKap	3391	74.7	83.0	63.5	75.9	65.1	38.6	52.8	45.7	56.8	72.5	10	111
Dickson	10968									63.3	63.6	2	93
Freja	7130	100.0	89.5	91.8	77.1	60.9	46.7	46.9	40.2	67.6	91.4	10	126
Glacier x Mars	58-6076									62.3	89.6	2	111
Glacier x Mars	58-6350									52.0	90.5	2	104
Glacier x Mars x 2X Husky	11770									55.5	71.0	2	92
Grande	11758										75.7	1	95
Herta	8097									69.6	92.7	2	119
Hypana (Erect Heads)	11772								50.2	69.2	75.8	3	114
Hypana (Nodding Heads)	40-4839										69.2	1	87
Hypana 50 x 50 Mixture	50050										75.6	1	95
Keystone	10877									62.5	88.8	2	111
Larker	10648									52.3	66.6	2	87
Lico x Ogalitsu	12130										91.3	1	114
Nupana Bulk	63-7724									46.8	55.7	2	75
Nupana Short Coleoptile	20-4197										59.5	1	75
Palliser	10860								41.3	65.8	73.4	3	105
Piroline	9558					60.6	43.0	46.9	54.1	75.3	80.8	6	120
Svalof 02148	11497									69.7	84.5	2	113
Unitan	10421	91.8	72.7	84.2	75.9	74.5	51.9	50.0	37.9	65.5	80.4	10	121
C.I. 5461 Sel. 59745	62-5428									66.1	83.3	2	109
C.I. 5461 Sel. 59772	62-5369										75.1	1	94
C.I. 4116 F31	31-4116										66.0	1	83

Table 8. Summary of Agronomic data from irrigated intrastate barley yield nurseries, 1953-1965 Creston, Montana

Variety or Selection	C.I. or N. No.	Average Yield Bushel per Acre										Station Years	% of Vantage
		1953	1954	1955	1956	1957	1958	1959	1960	1961	1965		
Betzes	6398	57.3		62.4	67.2	62.8	71.9	93.0	65.0	66.9	88.5	9	89
Bet x HII 2X Pir. 7155-60	11868										84.9	1	84
Compana	5438	44.6	60.6	51.4	55.1	50.0	60.1	88.7	65.4	46.0	70.7	10	73
Dickson	10968										76.8	1	76
Domen x Betzes	21-1761										89.9	1	89
Domen x Betzes	21-1741										89.7	1	88
Domen x Betzes	21-1749										85.3	1	84
Domen x Betzes	21-1812										82.5	1	81
Domen x Betzes	21-1742										82.0	1	81
Domen x 2 Betzes	21-1602										81.8	1	81
Freja	7130	69.1	108.2	83.4	81.9	81.8	84.8	90.9	55.6	66.1	77.8	10	98
Glacier	6976				76.2	82.6	53.2				95.0	4	94
Glacier x Mars	58-6076										97.6	1	96
Glacier x Mars	58-6350										115.0	1	113
Glacier x Newal 2X Husky	11770										73.2	1	72
Grande	11758										91.9	1	91
Hypana Erect Heads	11772										95.1	1	93.6
Hypana 50 x 50 Mixture	50050										75.3	1	74
Ingrid	10083				98.4	94.2	94.4	101.7	68.8	90.8	92.0	7	117
Keystone	10877										88.4	1	87
Larker	10648									71.2	59.5	2	76
Lico x Ogallbsu	12130										108.3	1	107
Nupana Bulk	37724										77.8	1	77
Nupana Short Coleoptile	20-4197										85.4	1	84
Palliser	10860									64.0	77.6	2	82
Piroline	9558				76.9	85.8	80.4	94.2	72.4	78.7	95.9	7	107
Svalof 02148	11497										110.6	1	109
Unitan	10421				76.6	67.9	78.9	102.7	73.0	80.4	84.4	7	103
Vantage	7324	96.9	97.0	74.1	74.4	70.4	81.9	90.4	55.8	71.5	101.6	10	100
C.I. 5461 Sel. 59745	25428										75.2	1	74
C.I. 5461 Sel. 59772	25369										70.0	1	69

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YEAR: 1965

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.

EXPERIMENTAL DESIGN AND PROCEDURES:

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

The advanced yield hard red spring nursery contained thirty-one entries, the western regional soft white, thirty entries and the off station, twelve entries each.

RESULTS AND DISCUSSION:

Yields in the hard red spring wheat nursery were above average this past season. The moisture was excellent. In 1964 the mean yield on the advanced nursery was 49.4 bushels, in 1965 63.4 bushels per acre. This was due to above normal precipitation in 1965. Harvesting was difficult because of the continued rain. Harvest was completed September 24th, which is approximately three weeks later than the average harvest date. See Table 1.

Considerable sprouting was noted in some of the varieties because of the wet weather. Those varieties that had the higher degree of sprouting were not submitted for quality evaluation this year. A report of the quality is made in the quality report by C. Watson.

Stripe rust was a factor in the white wheat nursery again this season, as it was in 1964. A tabulation of the stripe rust data is found in Table 2. No yield data was obtained from this nursery because of the sprouting of almost every entry in the nursery, because of the wet weather.

Spring Wheat (con't)

Three off station nurseries were seeded in the spring of 1965, however none were harvested. The nursery in Ravalli County was destroyed by hail, August 21, 1965, snow completely covered the nursery in Lake County making it impossible to harvest and the third nursery in Missoula County was abandoned because of the large amount of wild oats.

FUTURE PLANS:

Continue in a limited way spring wheat varietal studies.

SUMMARY:

1. Yields were above average for the season. This is due in part to continous rain which also caused a reduction to test weight.

2. The white wheat nursery contained some resistant varieties to stripe rust but susceptible varieties were severly affected.

3. No harvest was made of off station nurseries this year because of adverse growing conditions.

Table 1. Agronomic data from the advanced yield spring wheat nursery grown at Creston, Montana in 1965.

Date Seeded: May 5, 1965 Date Harvested: September 24, 1965
Size of Plot: 16 square feet

C. I. or Sel. No.	Variety	Yield Bu/A	Weight Lb/Bu	Plant Ht.	Date Headed	Lodging Severity	Lodging Prevelance
647	(NRN10-BVR14 x TC)x 498	63.0	52.7	38.7	7- 8	8.2	99.0
6086	N2211 x Centana	73.3*	58.0	47.5	7- 9	5.7	99.0
6194	II-50-17 x Pilot	66.7	59.3	48.2	7-10	7.7	95.5
6196	II-50-17 x Pilot	66.5	57.5	45.2	7-10	8.0	99.0
6197	II-50-17 x Pilot	60.2	57.9	58.5	7-10	7.5	99.0
6446	(NRN10-BVR14CNT) x CLY	61.8	46.9	32.7	7-11	9.0	99.0
6452	NRN10-BVR14 2x4 CNT	71.1	51.1	36.7	7-11	4.5	49.5
6900	Ceres	55.0	56.5	48.7	7-10	8.2	99.0
10003	Thatcher	65.4	55.8	40.7	7-10	7.5	99.0
12435	Rescue	63.5	53.8	46.5	7-12	9.0	99.0
12974	Centana	61.1	57.1	49.0	7-11	8.0	99.0
13165	Langdon	62.5	53.9	54.5	7- 9	8.7	99.0
13304	Sawtana	58.2	56.2	46.0	7-13	9.0	99.0
13320	Chinook	56.3	54.5	50.2	7-10	9.0	99.0
13333	Wells	58.4	51.7	52.0	7-10	7.5	99.0
13335	Lakota	67.1	49.6	49.5	7-10	8.7	99.0
13465	Crim	71.8	54.7	47.0	7- 8	7.2	99.0
13586	II-50-17 x Pilot,B61-95	72.8*	58.5	48.7	7-10	7.2	99.0
13596	51-3549 x II-50-17,60-54	76.8*	57.2	43.2	7-10	8.5	99.0
13655	II-50-17 x RMR II-54-30	58.3	59.1	47.0	7-10	8.5	99.0
13751	Chris, 525-1	59.3	55.1	47.0	7-11	9.0	99.0
13775	Manitou, R. L. 4159	62.2	55.6	44.7	7-10	7.5	99.0
13823	II-50-17 x Pilot, B60-82	57.8	56.3	48.2	7-10	9.0	99.0
13831	B50-18 x Rescue, B61-69	58.3	56.8	46.2	7-11	8.0	99.0
13832	Rescue x II-50-17, B61-23	54.9	52.5	48.7	7-10	8.7	99.0
13946	K338 x Lee, B61-89	68.4	53.2	45.5	7- 8	7.0	99.0
13950	(NRN10-BVR14xCNT)x RSC	60.6	53.3	35.7	7-11	9.0	99.0
13951	B57-107 x B52-91, B64-23	55.5	57.3	48.0	7-11	8.0	99.0
61138	(NRN10-BVR14 x CNT)x CLY	60.0	55.5	44.0	7-10	7.2	99.0
61146	(NRN10-BVR14xTC)x B52-91	70.7	53.9	45.0	7-10	8.7	99.0
266148	Leone	68.7	57.5	34.2	7-15	1.5	49.5

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

$\bar{x}$..... 63.4
S.E.$\bar{x}$..... 5.8
L.S.D.(.05).. 11.7
C.V.%..... 9.29

Analysis of Variance

Source	D.F.	MeanSquare	F.
Replications	3	53.4	.76
Varieties	30	144.9	2.08*
Error	90	69.5	
Total	123		

Table 2. Agronomic data from dryland western regional spring wheat nursery, grown at Creston, Montana in 1965.

Variety	C.I. No.	Heading Date	Stripe Rust Response	Stripe Rust % Severity
Lemhi	11415	7-14	9	98
Federation	4734	7-17	9	96
Idaed 59	13631	7-10	6	19
Baart	1697	7-12	9	90
Thatcher	10003	7-10	2	04
Burt x K.F. 57-70136	13641	7-20	2	03
Idaed x Burt 42-5	13722	7-10	4	07
Svenno x Lee - Semidwarf	13730	7-11	4	11
Premier x 5FR, 62M9-204	13732	7-13	8	69
Premier x 4FR,62M 47-68	13733	7-12	4	25
Burt x KF 58-2025	13736	7-20	6	15
Idaed x Burt 30-2	13742	7-10	3	50
N058-TC x TC-KF	13743	7-12	3	09
N058-TC x TC-KF	13744	7- 9	6	75
N058-TC x Lee	13745	7- 9	6	06
Yaqui 54	13218	7- 9	3	03
Nainari 60	13747	7-10	5	05
Lerma Rojo	13651	7- 9	2	01
Eureka x LMH2 x 2ID	13746	7-10	0	0
Idaho A613A-3-15	13969	7-15	5	21
NRN10 x Bvr 2 x 2 C112228	13970	7-12	8	27
NRN10 x Bvr 2 x 3 C112228	13971	7-13	7	07
NRN10 x Bvr 2 x 2 12228 3xL62	13972	7-11	7	62
Idaed x Burt, Pend 111-7	6	7-11	1	01
Burt x Onas 52 Lind 466	4468	7-16	8	80
Burt x Onas 52, Lind 168	4737	7-21	6	27
Premier x 2 Fr 2 x 3ID	13973	7- 9	5	02
Kenya 12186 x 2ID	13974	7- 9	2	03
Timstein-ID x FR	13975	7-16	6	22
Mar Fed Mutant, 5899	4788	7-17	6	19

YEAR: 1965

TITLE: Small Grain Investigations (Winter Wheat) 5023

LOCATION: Northwestern Montana Branch Station, Field No. E-1 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:

Intrastate Hard Red

This nursery consisted of eleven commercial varieties and fourteen breeding lines. Nine entries were bulks of P.I. 178383 x Westmont^2. The remaining lines were from material originally supplied by W.S.U. staff.

Delmar was used as the check variety. There were no entries superior in yield to the check.

Stand reduction in this nursery was due primarily to the lack of snow cover during the winter, and "snow mold" in some cases. It was difficult to determine for sure if kill was due to the cold weather or disease.

Dwarf smut was noted on all but two entries, namely; C 63-16 and C 61-9. The percent smut on Delmar was 4% and 10% on Tendoy 61.

Most of the bulk lines of P.I. 178383 x Westmont^2 were somewhat susceptible to dwarf smut and very weak straw. Table 1.

Western Regional Hard Red

There were 29 entries in the western regional hard red winter wheat nursery located in the bunt area, Northwest of Kalispell. High yields were secured from this nursery due in part to the application of 200 pounds of 16-20-0 fertilizer per acre at seeding time and favorable moisture. Lodging was severe on susceptable varieties. Smut was noted on all entries except two.

McCall was the highest yielding entry, but had a 24% smut rating. See table 2.

Western Regional White Wheat

The western regional white wheat nursery contained 19 entries. Winter killing in this nursery was quite severe on all entries. Data showing stand percentage is found in table 3. No yield data was secured because of bird damage during the growing season.

Off station

Growing conditions, results and other information about each nursery will be discussed under the individual county headings. A total of four nurseries were seeded in the fall of 1964. Each nursery consisted of fourteen entries.

Missoula County - There were excellent growing conditions for this test. Yields were above average for the area. Generally stands were good in most varieties. Dwarf smut was most prevalent in Wanalta. C 61-9 was the highest yielding entry. See table 4, for complete data.

Ravalli County - Growing conditions were excellent in the area east of Stevensville where this nursery was grown. Yields are about average for the area. Cheyenne is the lead variety for yield. See table 5.

Lake County - Good fall emergence, but some stand loss in some entries during the winter. C 62-44 is the highest yielding entry, but not significantly better than Westmont which is used as a check. See table 6.

Mineral County - This nursery was "stubbled in". Emergence was fair, but stands were poor at harvest time. Dwarf smut was quite high in susceptible varieties. With the low incidence of smut in Westmont one could conclude that the race present is D-2. See table 7.

Protein determinations were made for all varieties grown off station. The lowest average protein was in Missoula, and the highest in Ravalli County. See table 8.

In all off station locations C 61-9 was the highest yielding entry of the commercial varieties, Westmont and Cheyenne are about equal. See table 9.

A summary of selected varieties grown in Western Montana is found in table 10. For the ten year period Cheyenne is the leading variety in yield. For the last four years, Delmar leads in yield.

Breeding Nurseries

Elite Stripe Rust Yield Nursery

The elite stripe rust nursery contained 22 entries. These lines were selected from 1964 Breeding Nursery for advanced testing in 1965. Of the 22 entries only 15 were harvested. Westmont x P. I. 178383-7-14-5 is the most promising line in the study. See table 11 for details.

Intrastate Stripe Rust and Dwarf Bunt Nursery

The above named nursery was grown in two locations in 1964-1965. Namely the station at Creston and the Lance Claridge farm at Kalispell. The lines listed in table 12 were selected for further evaluation. A total of 344 lines were evaluated in this study.

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 depths are factors in dwarf bunt infection.

Four commercial varieties were used in the study and four dates of seeding.

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

Fall emergence of all seeding dates was excellent. Snow mold caused considerable damage on early seed plots (Aug. 15), reducing stands.

Yields increased with each succeeding date of seeding, with October 1, giving the highest yields. The shallow seeding was slightly higher in yield, but not significantly.

The highest smut reading was for the shallow seeds as it has been in the past years. Westmont and Cheyenne were the varieties with the highest smut readings. Delmar was the lowest. See tables 13, 14, 15.

FUTURE PLANS:

Plans for 1965-1966 will be in general like the past years research program.

SUMMARY:

Yield was above average in 1965, however wet conditions during harvest reduced yields and material affected bushel weights.

The white wheat nursery was lost mainly to severe winter damage.

McCall a new Washington release was the highest yielding entry in the hard red regional nursery.

In the off station locations C 61-9 was the highest yielding entry.

P. I. 178383 x Westmont^{2} 7-14-5 was the most promising entry in the advance testing of breeding material.

Table 1. Agronomic data from intrastate winter wheat nursery grown at Kalispell, 1965. Experimental design- random block. Number of replications - four.

Planting Date - September 19, 1964 Harvest Date - August 31, 1965
Size of Plot - 16 square feet

Variety	C.I. No.	Yield Bu. per acre	Test Wt. lbs/bu.	Height in ins.	Heading Date	Stand %	Dwarf Smut %	Lodging Prev.	Lodging Sever.
Tendoy 61	13675	55.3	56.6	38	6-14	85	10	72	2
Im462N10xIT684/83 C63-9	647	51.6	54.5	33	6-16	80	1	5	3
Burt x P.I.178383 C62-31	634	49.3	54.3	34	6-14	75	0	15	4
Cheyenne	8885	48.7	56.5	38	6-13	84	9	95	4
Delmar	13442	47.3	56.0	38	6-14	68	4	0	0
P.I. 178383 x It Bulk 2	6417	43.7	56.5	38	6-12	56	9	89	3
Burt x P.I.178383 C61-9	631	43.7	53.6	35	6-15	76	0	24	3-5
Burt x P.I. 178383 C62-44	635	43.1	54.5	35	6-14	80	18	13	1
Rego	13181	42.5	54.8	39	6-12	75	5	93	4
Westmont	12930	42.4	57.0	33	6- 9	80	16	42	2
P.I.178383 x Wmt Bulk 1	649	42.4	56.1	32	6-10	64	16	48	3
P.I.178383 x Wmt Bulk 3	6411	42.2	57.0	33	6-11	83	14	73	4
Itana W-1	13846	42.0	56.5	37	6-11	71	16	28	4
P.I.178383 x Wmt Bulk 7	6415	40.4	56.0	36	6-12	73	9	60	4
P.I.178383 x Wmt Bulk 5	6413	39.9	55.4	34	6-11	78	3	69	4
P.I.178383 x It Bulk 1	6416	38.9	56.5	36	6-11	74	2	79	3
Itana	12933	38.3	57.3	38	6-13	66	15	1	2
P.I.178383 x Wmt Bulk 2	6410	37.4	56.1	32	6-9	76	8	88	4
Warrior	13190	37.1	56.2	37	6-11	83	10	93	4
P.I.178383 x Wmt Bulk 6	6414	36.9	56.0	34	6-11	69	2	81	3
P.I.178383 x Wmt Bulk 4	6412	36.5	55.5	33	6-10	70	6	69	4
Tendoy	13426	35.5*	56.1	37	6-13	83	4	89	4
Winalta	13670	31.4*	56.6	36	6-12	81	25	75	2
Gaines	13448	24.7*	55.0	25	6-15	29	13	0	0
Im 462N10x83 C 63-16	648	20.5*	55.9	19	6-14	2	0	0	0

NOTE: Delmar used as a check in this nursery
*: Significantly less in yield than the check

KS VRS

Table 1 . (con't)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	231.9	3.38
Varieties	24	231.4	3.37
Error	72	68.6	
Total	99		

$\bar{x}$.....	40.5
S.E.$\bar{x}$.....	4.1
L.S.D.(.05)...	11.6
C.V.%.....	10.2

Table 2 . Agronomic data from western regional hard red winter wheat nursery grown on the Lance Claridge farm, Northwest of Kalispell. Four row plots, four replications.

Date seeded: September 15, 1964 Date Harvested: September 1, 1965 Size of Plot: 16 sq. ft.

Variety	C.I.No.	Heading Date	Ht. in Ins.	Replications I	II	III	IV	Total Grams	Yield Bu/A	Bu.Wt. in Lbs.	Stripe Rust Type	Stripe Rust Sever.	Dwarf Smut %	Lodging Type	Lodging Sever.	Lodging Pre.
Burt x Itana, Sel. 125 WC (McCall) BC Bulk #7	13842	6-22	41	615	689	675	824	2803	70.0	56.5	2	20	24	1	.5	8
P.I.178383 x West.		6-19	42	630	665	629	706	2630	65.8	58.2	1	4	9	1	7	99
P.I.178383 x West. BC Bulk #1		6-19	37	565	646	695	689	2595	64.9	56.4	i	0	27	1	7	98
NRN 10-BVR 14 x Burt Sel. 11	13739	6-22	26	647	601	677	665	2590	64.8	53.3	1	5	18	x	x	x
BurtxItana.sel.34	13844	6-21	39	681	565	625	635	2506	62.7	55.6	2	8	22	1	.2	20
Columbia x Utah 175A-53,Sel.275-40-3-1	13839	6-23	42	460	810	681	535	2486	62.2	56.2	2	13	2	1	5	73
P.I.178383 x West BC Bulk #6		6-19	41	564	650	512	736	2462	61.6	55.4	i	0	11	1	9	99
P.I.178383xWest.BC Bulk#2		6-17	41	635	612	640	568	2455	61.4	55.7	i	1	10		9	90
P.I.178383xWest.BC Bulk#3		6-17	40	525	648	594	670	2437	60.9	56.5	i	0	21		7	98
Delmar	13442	6-23	41	615	676	626	506	2423	60.6	56.7	1	1	12	x	x	x
Cheyenne	8885	6-22	44	625	645	594	555	2419	60.5	56.5	1	1	12	1	7	97
P.I.178383xIt.BC Bulk#1		6-21	46	480	805	546	584	2415	60.4	56.5	1	1	21	1	7	99

Table 2 . (con't)

Variety	C.I.No.	Heading Date	Ht. in Ins.	Replications I	II	III	IV	Total Grams	Yield Bu/A	Bu.Wt. in Lbs.	Stripe Rust Type	Stripe Rust Sever.	Dwarf Smut %	Lodging Type	Lodging Sever.	Lodging Prev.
Tendoy	13426	6-23	47	560	646	568	605	2379	59.5	56.8	2	2	24	1	6	97
(Rex-RioxCnn^2)xCnn^3,C62-44		6-24	43	485	590	639	658	2372	59.3	54.8	1	0	0		7	57
(Rex-RioxCnn^2)xCnn^3, 63 M 625	13867	6-18	43	574	631	520	635	2360	59.0	56.5	0	1	14		6	96
Columbia x Utah 175A-53,Sel.275-40-2-2	13840	6-23	40	660	560	560	565	2345	58.6	56.5	3	26	18	1	3	48
HussarxCheyenne^3, 63M525	13866	6-21	45	639	630	505	540	2314	57.9	57.2	1	1	29	1	3	48
Itana Sel. W-1	13846	6-23	43	620	594	690	412	2316	57.9	57.4	2	2	29		6	82
It.xKharkof-17 Sel. 1-26-1	13692	6-21	45	556	619	570	561	2306	57.7	56.9	3	4	18	1	5	62
P.I.178383xIt,BC Bulk#2		6-20	43	515	620	495	650	2280	57.0	57.0	1	2	10	1	9	93
Burt x P.I.178383, Sel. C61-9	13837	6-24	44	631	565	450	591	2237	55.9	54.3	1	0	0		7	87
P.I.178383xWest.BC Bulk#5		6-19	39	550	580	566	502	2198	55.0	55.8	1	0	21	1	7	99
Kharkof	1442	6-21	46	520	650	401	630	2201	55.0	56.0	2	5	17	1	7	96
P.I.178383xWest.BC Bulk#4		6-19	41	514	389	600	610	2113	52.8	56.3	1	0	15	1	8	99
Columbia	12928	6-20	40	544	499	565	480	2088	52.2	56.5	4	100	40		4	86
Rio	10061	6-23	47	492	599	521	477	2089	52.2	56.0	1	1	20		9	99
Colorow	12865	6-21	46	585	515	476	480	2056	51.4	56.9	1	2	25	1	7	82
WasatchxKharkof-17 Sel. 18-5	13691	6-23	48	476	545	471	536	2028	50.7	56.6	2	3	10	1	6	97
Itana	12933	6-21	44	408	535	506	540	1989	49.7*	55.5	4	100	39	1	4	97

NOTE: Delmar is used as a check in this nursery

*: Variety yielding significantly less than the check (.05)

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	13597.69333	2.55
Varieties	28	9548.31000	1.79*
Error	84	5334.87404	
Total	115		

$\bar{x}$..... 58.5
S.E.$\bar{x}$..... 3.65201
L.S.D.(.05).. 10.2
C.V.%..... 6.24

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Table 3. Heading date and stand data from uniform white winter wheat nursery grown at Creston, Montana in 1964-1965.

Date Seeded: September 19, 1964

Variety	C.I.No.	Heading Date	Stand in % Replications I	II	III	IV	% Stand	Smut
Kharkof	1442	6-12	20	0	10	0	7	x
Golden	10063	6-15	10	10	20	5	11	x
Omar	13072	6-15	10	5	35	20	18	x
Brevor	12385	6-13	10	15	20	10	14	x
Triplet	5408	6-12	5	10	10	10	9	x
Elgin	11755	6-15	55	10	--	5	18	x
Burt	12696	6-12	25	5	15	5	13	x
Gaines	13448	6-13	25	10	15	15	16	x
(Elgin 19 x Elmar)-111 x 1813, Sel. 4	13645	6-14	15	5	25	10	14	x
Burt x K.F.,57-70136-86W	13641	6-13	20	0	5	5	8	x
Burt Mutant	13728	6-13	--	25	20	25	18	x
(27-15 x Rio-Rex,53) x Elgin, Sel. 11	13725	6-14	10	10	10	65	24	x
P.I.178383xOmar^2,Sel.172	13740	6-15	0	5	5	0	2	none
Alba Sel. (Roedel Sel.)	13737	--	0	1	0	5	1	x
Delmar	13442	6-16	40	55	20	50	41	x
Suwon x Omar, BC 2-1	13748	6-15	40	55	25	30	35	x
Suwon x Omar, BC 2-3	13749	6-14	20	65	40	15	35	x
Omar x 1834-1	13750	6-15	15	15	20	35	21	x
(14 x 50-3) x Burt Sel.7	13968	6-14	20	30	25	25	25	x

Table 4. Agronomic Data from Off Station Winter Wheat Nursery grown in Missoula County on the Al Goodan Farm, Missoula, Montana in 1964-1965. Single row plot, six replications.

Date Seeded: September 24, 1964 Date Harvested: August 18, 1965 Size of Plot: 16 Square Feet

Variety	C.I.No.	Ht.in Inches	Dwarf Smut %	Survival %	Grams per Plot I	II	III	IV	V	VI	Total Grams	Yield Bu/A	Bushel Weight
Burt x P.I.178383 C61-9	13837	33		94	300	450	350	380	410	310	2200	36.7*	58.4
Warrior		35	4	95	286	405	444	349	325	211	2020	33.7	58.6
Cheyenne	8885	33	2	92	330	449	289	315	295	220	1898	31.6	59.0
Westmont	12930	32		93	272	462	290	303	215	240	1782	29.7	60.3
Tripplet	5408	35	2	91	265	310	260	320	295	265	1715	28.6	59.5
Wanalta		33	7	94	240	355	366	205	270	220	1656	27.6	61.0
	C63-9	31		80	164	265	355	335	286	217	1622	27.0	58.5
Burt x P.I.178383	C62-44	31		84	226	309	230	355	189	270	1579	26.3	57.3
Delmar	13426	36	.03	82	235	270	240	294	221	270	1530	25.5	60.5
Rego	13181	34	2	89	221	315	270	280	189	240	1515	25.2	58.6
Omar	13072	32		81	205	391	190	252	265	144	1447	24.1	58.6
Burt	12696	31	2	87	285	295	255	206	151	245	1437	23.9	60.0
Gaines	13448	25	.01	61	249	429	125	290	165	112	1370	22.8$^{1}_{=}$	59.5
Burt x K.F.57-70136	13641	32	.01	51	110	80	169	260	204	160	983	16.4$^{1}_{=}$	58.9

NOTE: Westmont is used as a check in this nursery.
*: Varieties yielding significantly more than the check (.05)
$^{1}_{=}$: Varieties yielding significantly less than the check (.05)

$\bar{x}$.....	27.1
S.E.$\bar{x}$.....	2.36399
L.S.D.(.05)..	6.7
L.S.D.(.01)..	8.9
C.V.%.....	8.73

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	5	25977.3900	7.75**
Varieties	13	14901.98538	4.44**
Error	65	3353.07769	
Total	83		

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Table 5. Agronomic data from off station winter wheat nursery grown in Ravalli County on the L.S. Clark farm, Stevensville, Montana, 1964-1965. Single row plots, six replications.

Date Seeded: September 24, 1964 Date Harvested: September 3, 1965 Size of Plot: 16 sq. feet

Variety	C.I.No.	Height Inches	Grams per Plot I	II	III	IV	V	VI	Total Grams	Yield Bu/A	Bu.Wt. Lbs.
Cheyenne	8885	28	385	389	360	344	356	280	2114	35.2**	58.4
Tripplet	5408	29	372	404	330	225	295	305	1931	32.2**	58.4
Warrior		31	319	323	336	270	319	240	1807	30.1*	58.1
Rego	13181	29	346	290	340	297	255	256	1784	29.7	57.1
	C63-9	26	390	277	289	235	255	260	1706	28.4	55.9
Gaines	13448	22	320	305	280	270	249	275	1699	28.3	55.1
Wanalta		27	360	294	280	205	265	292	1696	28.3	59.2
BurtxP.I.178383 C61-9	13837	27	270	286	365	210	270	299	1700	28.3	56.6
Burt	12696	25	385	252	245	235	230	280	1627	27.1	57.2
Omar	13072	25	309	251	355	255	234	206	1610	26.8	55.5
Delmar	13426	29	245	245	284	325	241	215	1555	25.9	58.0
Westmont	12930	28	236	275	259	259	250	246	1525	25.4	58.9
Burt x P.I.178383	C62-44	26	215	184	280	230	260	230	1399	23.3	56.0
Burt x K.F.57-70136	13641	26	135	220	199	165	186	155	1060	17.7	55.9

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)

$\bar{x}$.....	27.6
S.E.$\bar{x}$.....	1.56841
L.S.D.(.05)	4.4
L.S.D.(.01)	5.9
C.V.%.....	5.68

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	5	8147.726	5.52
Varieties	13	10051.06307	6.81
Error	65	1475.94677	
Total	83		

Table 6. Agronomic data from off station winter wheat nursery grown in Lake County on the Fleming farm, Pablo, Montana, 1964-1965. Single row plots, six replications.

Date Seeded: September 24, 1964 Date Harvested: August 13, 1965 Size of Plot: 16 sq. feet

Variety	C.I.No.	Height Inches	Dwarf Smut %	Survival %	Grams per Plot I	II	III	IV	V	VI	Total Grams	Yield Bu/A	Bushel Weight
Burt x P.I.178383	C62-44	29		83	315	376	260	294	255	278	1778	29.6	57.5
BurtxP.I.178383	C61-9 13837	31		85	245	245	270	325	195	285	1565	26.1	57.8
Westmont	12930	28	1	86	205	165	410	170	316	201	1467	24.4	60.2
	C 63-9	30		82	205	169	379	180	360	160	1453	24.2	56.5
Omar	13072	28		77	325	235	165	192	285	237	1439	24.0	56.1
Delmar	13426	33	2	85	396	224	168	244	212	175	1419	23.6	58.9
Tripplet	5408	30	9	85	290	165	170	150	145	270	1190	19.8	58.7
Warrior		30	4	86	185	229	230	156	180	144	1124	18.7	58.1
Gaines	13448	22	1	61	254	145	294	147	198	75	1113	18.5	58.5
Rego	13181	30	2	83	260	135	203	158	180	174	1110	18.5	56.9
Burt	12696	26		81	166	189	232	136	145	220	1088	18.1	57.7
Cheyenne	8885	28	2	70	236	105	260	74	205	186	1066	17.8	57.4
Wanalta		28	1	77	204	130	155	70	201	140	900	15.0*	58.5
Burt x K.F.57-70136	13641	30	7	47	115	75	154	125	195	136	800	13.3**	--

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

$\bar{x}$..... 20.8
S.E.$\bar{x}$..... 2.4383
L.S.D.(.05).. 6.9
L.S.D.(.01).. 9.2
C.V.%..... 11.70

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	5	1223.3792	
Varieties	13	12481.07384	3.50**
Error	65	3567.26215	
Total	83		

Table 7. Agronomic data from off station winter wheat nursery grown on the Charles Frey farm, Superior, Montana in Mineral County, 1964-1965. Single row plots, six replications.

Date Seeded: September 24, 1964 Date Harvested: August 18, 1965 Size of Plot: 16 sq. feet

Variety	C.I.No.	Height Inches	Dwarf Smut %	Survival %	Grams per Plot I	II	III	IV	V	VI	Total Grams	Yield Bu/A	Bushel Weight
	C 63-9	26	.05	52	181	165	340	145	211	200	1242	20.7	57.0
Burt x P.I.178383	C 62-44	26		64	185	228	130	200	215	211	1169	19.5	56.1
Gaines	13448	22	2	55	280	174	155	200	175	183	1167	19.4	58.5
BurtxP.I.178383 C61-9	13837	22	3	64	199	180	190	195	159	224	1147	19.1	57.9
Westmont	12930	24	6	61	236	190	245	125	145	200	1141	19.0	59.0
Delmar	13426	30	16	63	180	190	190	165	164	215	1104	18.4	58.0
Omar	13072	24	1	57	260	161	155	155	155	165	1051	17.5	57.4
Burt	12696	24	9	53	120	110	205	165	135	190	925	15.4	57.5
Cheyenne	8885	26	39	64	155	151	161	160	145	125	897	14.9	57.6
Rego	13181	18	23	60	102	165	174	120	110	185	856	14.2*	56.2
Warrior		29	43	52	136	120	120	135	160	172	843	14.0*	--
Tripplet	5408	18	57	59	120	140	150	140	75	189	814	13.6*	--
BurtxK.F.57-70136	13641	21	10	49	80	145	110	189	145	130	799	13.3**	--
Wanalta		25	38	56	125	155	110	75	130	110	705	11.7**	--

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

$\bar{x}$.....	16.5
S.E.$\bar{x}$.....	1.5270
L.S.D.(.05)..	4.3
L.S.D.(.01)..	5.7
C.V.%.....	9.25

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	5	1564.5714	1.12
Varieties	13	5027.69485	3.59**
Error	65	1399.06323	
Total	83		

Table 8. Protein data from winter wheat varieties grown off station in 1964-1965.

Variety	C.I. No.	County Protein Percentage				$\bar{x}$ Western Montana	Rank
		Missoula	Ravalli	Lake	Mineral		
Westmont	12930	8.0	14.0	11.4	11.2	11.2	3
Gaines[1]	13448	7.6	12.8	10.9	9.8	10.3	7
Cheyenne	8885	8.1	13.2	12.3	11.9	11.4	2
Delmar	13426	8.1	12.7	11.3	11.4	10.9	4
Omar[1]	13072	7.4	--	9.6	9.7	8.9	8
Warrior		8.5	12.8	12.2	12.0	11.4	2
Wanalta		9.1	13.2	13.0	12.4	11.9	1
Burt x K.F. 57-70136[1]	13641	8.7	13.8	11.9	11.3	11.4	2
Tripplet	5408	8.2	12.6	11.3	11.5	10.9	4
Rego	13181	8.8	12.0	10.4	10.9	10.3	7
BurtxP.I.178383(C-61-9)	13837	8.1	13.1	9.7	11.5	10.6	6
BurtxP.I.178383	C62-44	8.1	13.3	9.7	10.0	10.3	7
BurtxP.I.178383	C63- 9	8.3	11.9	10.7	10.4	10.3	7
Burt[1]	12696	8.2	12.3	11.3	11.1	10.7	5
$\bar{x}$		8.2	12.9	11.1	11.1	10.8	
$\bar{x}$ Hard Red		8.3	12.9	11.2	11.3	10.9	
$\bar{x}$ White		8.0	13.0	10.9	10.5	10.6	
$\bar{x}$ Soft Red		8.2	12.6	11.3	11.5		

[1] White Wheat

Table 9. Summary of winter wheat varieties grown in Western Montana in 1964-1965.

Variety	C.I.No.	Yields in Bushels/A Locations (County) Missoula	Ravalli	Lake	Mineral	$\bar{x}$	Average Protein %
Westmont	12930	29.7	25.4	24.4	19.0	24.6	11.2
Gaines[1]	13448	22.8	28.3	18.5	19.4	22.3	10.3
Cheyenne	8885	31.6	35.2	17.8	14.9	24.9	11.4
Delmar	13426	25.2	25.9	23.6	18.4	23.3	10.9
Omar[1]	13072	24.1	26.8	24.0	17.5	23.1	8.9
Warrior	13190	33.7	30.1	18.7	14.0	24.1	11.4
Wanalta	13670	27.6	28.3	15.0	11.7	20.7	11.9
BurtxK.F.57-70136[1]	13641	16.4	17.7	13.3	13.3	15.2	11.4
Tripplet	5408	28.6	32.2	19.8	13.6	23.6	10.9
Rego	13181	25.2	29.7	18.5	14.2	21.9	10.3
BurtxP.I.178383(c61-9)	13837	36.7	28.3	26.1	19.1	27.6	10.6
Burt x P.I.178383	C62-44	26.3	23.3	29.6	19.5	24.7	10.3
Burt x P.I.178383	C63- 9	27.0	28.4	24.2	20.7	25.1	10.3
Burt[1]	12696	23.9	27.1	18.1	15.4	21.1	10.7

[1] White Wheat

Table 10. Summary of selected winter wheat data from varieties grown at the Northwestern Montana Branch Station in 1956-1965

Variety	C.I.No.	Yield in Bushels per Acre 1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	$\bar{x}$	No. Years	Long Term % of Westmont	Average Bushel/Acre 2yr.	3yr.	4yr.	10yr.
Cheyenne	8885	71.0	59.3	49.0	51.8	41.4	49.5	55.5	61.9	57.5	48.7	54.6	10	105	53.1	56.2	55.9	54.6
Westmont	12930	68.6	60.7	64.9	53.3	34.3	51.1	57.2	45.6	41.5	42.4	52.0	10	100	42.0	43.2	46.7	52.0
Itana	12933	73.0	58.1	55.6	50.5	32.6	48.0	50.3	54.5	46.8	38.3	50.8	10	98	42.6	46.5	47.5	50.8
Rego	13181	66.7	50.0	59.8	55.6	35.5	46.7	60.6	60.2	49.9	42.5	52.8	10	102	46.2	50.9	53.3	52.8
Tendoy	13426			54.0	52.4	38.6	47.8	54.2	62.2	58.1	35.5	50.4	8	103	46.8	51.9	52.5	
Delmar	13442							55.3	71.8	51.4	47.3	56.5	4	121	49.4	56.8	56.4	
Gaines	13448								91.7	68.0	24.7	61.5	3	142	46.4	61.5		
Tendoy 61	13675									47.4	55.3	51.4	2	122	51.4			
Itana Sel.W-1	13846								76.6	54.1	42.0	57.6	3	133	48.1	57.5		
BurtxP.I.178383	13837									44.4	43.7	44.1	2	105	44.1			
Warrior	13190									45.8	37.1	41.5	2	99	41.5			
Winalta	13670									54.4	31.4	42.9	2	102	42.9			
BurtxP.I.178383	C62-44									48.1	43.1	45.6	2	109	45.6			
C 63-9											51.6	51.6	1	123				
C 62-31										44.1	49.3	46.7	2	111	46.7			
P.I.178383xIt. Bk.2											43.7	43.7	1	103				
P.I.178383xWest. Bk.1											42.4	42.4	1	100				
" " Bk.3											42.2	42.2	1	100				
" " Bk.7											40.4	40.4	1	95				
" " Bk.5											39.9	39.9	1	94				
P.I.178383x It. Bk.1											38.9	38.9	1	92				
P.I.178383xWest. Bk.2											37.4	37.4	1	88				
" " Bk.6											36.9	36.9	1	87				
" " Bk.4											36.5	36.5	1	86				
C 63-16											20.5	20.5	1	48				

Table 11. Agronomic and yield data from the Elite Stripe Rust Yield Nursery grown at Northwestern Montana Station in 1965. Single row plots, 16 feet. Replicated five times.

Variety	C.I.No.	Height in Ins.	Replications 1	2	3	4	5	Total Grams	Bu./ Acre	Bushel Weight	Lodging Type	Seve.	Prev.	Smut*
Westmont	12930	38	755	501	495	631	326	2208	54.2	57.2	0	1	47	H
Itana	12933	38	469	346	436	429	305	1985	39.7	57.1	1	1	63	H
Delmar	13442	39	430	451	482	405	311	2079	41.6	56.3	0	0	16	L
Cheyenne	8885	39	656	444	510	485	375	2470	49.4	56.4	1	4	95	H
West.^{2}xP.I.178383 8-10-8		32	606	310	526	320	276	2038	40.8	56.0	3	4	83	L
" " 7-14-5		36	652	374	570	752	452	2800	56.0	55.6	1	3	80	L
" " 13-5-17		37	436	506	614	529	356	2441	48.8	55.0	2	5	92	L
West. x P.I.178383 2-1-3		36	805	460	544	612	360	2781	55.6	57.2	3	3	95	L
Burt. x P.I.178383 C62-3		36	220	80	70	120	85	575	11.5	--	-	-	--	N
" " C62-69		34	399	356	430	394	389	1968	39.4	54.5	-	-	--	L
" " C63- 1		34	599	160	710	631	445	2545	50.9	54.5	-	--	--	L
" " C63- 4		33	769	640	464	480	373	2726	54.5	55.1	-	-	--	L
" " C63-10		34	610	400	845	685	554	3094	61.9	55.0	-	-	--	N
" " C63-11		34	765	364	485	481	410	2505	50.1	55.3	-	-	--	L

* N-None
L-Low
H-High

$\bar{x}$..... 46.7
S.E.$\bar{x}$..... 4.5312
L.S.D..... 12.8
C.V.%..... 9.69

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	4	122854.04	11.97**
Varieties	13	75295.115	7.33**
Error	52	10265.951	
Total	69		

KS
VRS

Table 12 . Agronomic data from Intrastate stripe rust and dwarf bunt nursery at Creston and Kalispell, Montana 1964-1965. (Only those lines selected for harvest are recorded)

Entry	1965 Row No.	Heading[1] Stage as of 6/10/65	Smut Reading[2] Kalispell	Smut Reading[2] Creston	Stripe Rust Type (0-4) Kalispell	Remarks Straw Type
P.I. 178383	1		OK	OK		Poor
Itana	2		--	--		
Westmont	3		--	--		Good
F_4[(W-3x83-7x -3)-1x -4]1-3-1	4		--	--		Fair
" " " 1-3-2	5		--	--		Good
" " " 1-3-3	6		--	--		Fair
" " " 1-3-4	7		--	--		Fair
" " " 1-1-1	8		--	--		Fair
" " " 1-1-2	9		OK	--		Fair
" " " 1-1-3	10		--	--		Fair
" " " 1-1-6	11		--	--		Fair
" " " 1-1-8	12		OK	OK		Poor
" " " 1-1-10	13		--	--		Fair
" " " 1-1-14	14		--	--		Fair
" " " 1-1-17	15		--	--		Fair
F_4[(W-3x83-7)-1-1F_2xW-19]-4-2-1	16		--	--		Fair
" " " 4-2-2	17		--	--		Fair
" " " 4-2-3	18		--	--		Fair
" " " 4-2-5	19		--	--		Fair
F_4[(W-3x83-7)-2-1F_2xW-19]-5-1-1	20		--	OK		Fair
" " " 5-2-1	21	S	--	--		Poor
" " " 5-2-5	23	N	OK	--		Poor
[(W-3x83-7)-3-1F_2xW-21]-6-2-1	25	H	OK	OK		Poor
F_4[(W-3x83-7)-3-1F_2xW-21]-6-4-1	29	N	OK	--		Poor
" " " 6-4-2	30	F	OK	--		Fair
" " " 6-5-2	31	S	--	--		Fair KS
" " " 6-5-3	32	F	OK	--		Fair VRS

Table 12 . Con't.

Entry	1965 Row No.	Heading[1] Stage as of 6/10/65	Smut Reading[2] Kalispell	Smut Reading[2] Creston	Strip Rust Type (0-4) Kalispell	Remarks Straw Type
F_4[(W-3x83-7)-3-1F_2xW-21]-6-6-1	33	S	OK	--		Fair
" " " 6-6-5	36	S	OK	--		
" " " 6-7-4	37	N	--	OK		Good
" " " 6-7-7	38	F	OK	3(heads)		Good
" " " 6-7-14	40	F	1(head)	OK		Good
" " " 6-11-1	41	F	OK	--		Fair
F_4[(W-2x83-1)-1-1F_2xW-19] 7-6-1	43	H	OK	OK		
" " " 7-6-4	44	S	OK	3(heads)		Fair
" " " 7-8-6	45	S	OK	--		Poor
" " " 7-10-1	46	F	1(head)	OK	2	Fair
" " " 7-10-2	47	S	OK	--		Fair
" " " 7-10-3	48	S	OK	OK		Fair
" " " 7-10-4	49	H	--	OK		Fair
" " " 7-11-1	50	H		OK		Poor
P.I. 178383	51	N	OK	OK		Poor
Itana	52	S	--	--		Good
Westmont	53	F	--	--		Good
F_4[(W-2x83-1)-1-1F_2xW-19] 7-11-4	55	S	--	OK		Fair
" " " 7-11-5	56	S	OK	OK	2	Fair
F_4[(W-2x83-1)-1-1F_2xW19] 7-8-10	57	H	--	--		Poor
" " " 7-13-2	59	S	--	--		Good
" " " 7-13-3	60	S	OK	--		Good
" " " 7-13-9	62	S	OK	--		Good
F_4[(W-2x83-1)-1-2F_2xW-18] 8-1-1	66	H	--	--		Good
" " " 8-1-2	67	S	--	--		Fair
" " " 8-1-5	68	F	OK	--		Fair
" " " 8-2-3	69	S	--	--		Poor
" " " 8-2-4	70	H	OK	OK		Fair KS
" " " 8-2-4	71	H	OK	--		Fair VRS
" " " 8-2-8	72	S	--	OK		Fair

Table 12 . Con't.

Entry	1965 Row No.	Heading[1] Stage as of 6/10/65	Smut Reading[2] Kalispell	Smut Reading[2] Creston	Stripe Rust Type (0-4) Kalispell	Remarks Straw Type
F_4[(W-2x83-1)-1-$2F_2$xW-18]-8-6-1	73	S	--	--		Poor
" " 8-6-2	74	S	--	OK		Poor
" " 8-6-4	75	N	--	OK		Poor
F_4[(W-2x83-1)-1-$2F_2$xW-18]-8-6-6	79	S	--	--		Poor
" " 8-6-8	80	H	OK	OK	0	Poor
" " 8-10-1	82	F	OK	OK		Poor
" " 8-10-2	83	F	--	--		Fair
" " 8-10-6	84	S	1(head)	OK	3	Poor
" " 8-10-9	85	H	--	--		Poor
F_4[(W-2x83-1)-2-$2F_2$xW-21]-10-7-1	86	H	--	--		Fair
" " 10-7-2	87	F	--	--		Fair
" " 10-7-3	88	S	OK	OK	0	Poor
" " 10-7-4	89	F	--	--		Poor
F_4[(W-2x83-1)-4-$2F_2$xW-19]-12-1-1	90	H	OK	--		Fair
" " 12-1-2	91	S	OK	--		Fair
" " 12-3-2	92	F	--	--		Fair
" " 12-5-2	95	S	OK	OK	1	Fair
" " 12-5-3	96	S	Ok	--		Poor
" " 12-5-7	97	H	--	--		Fair
F_4[(W-2x83-1)-5-$1F_2$xW-15]-13-7-2	99	S	--	--		Poor
" " 13-8-4	100	N	OK	OK		Poor
P.I. 178383	101	N	OK	OK		Poor
Itana	102	F	--	--		Fair
Westmont	103	F	--	--		Good
F_4[(W-2x83-1)-5-$1F_2$xW-15]-13-8-7	104	F	--	OK		Poor
" " 13-8-12	105	F	OK	OK		Good
" " 13-8-7	110	S	OK	OK		Good KS
" " 13-8-4	115	F	--	OK		Good VRS
" " 13-8-3	116	F	OK	OK		Good

Table 12 . Con't.

Entry	1965 Row No.	Heading[1] Stage as of 6/10/65	Smut Reading[2] Kalispell	Smut Reading[2] Creston	Stripe Rust Type (0-4) Kalispell	Remarks Straw Type
F_4[(W-2x83-1)-5-1F_2xW-15]-13-8-4	117	F	--	--		Good
" " -13-8-1	118	F	--	--		Fair
F_4[(W-3x83-7xW-3)-1xW-4]-2-1-2	119	S	OK	--		Fair
" " 1-4-1	120	S	OK	OK		Fair
" " 1-4-2	121	F	--	--		Fair
F_4[(W-3x83-7xW-3)-3-1F_2xW-21]-6-5-5	122	S	--	OK		Fair
F_4[(W-2x83-1)-1-F_2xW-19]-7-2-3	123	H	--	--		Good
" " 7-2-4	124	S	--	OK		Poor
" " 7-2-5	125	S	--	--		Fair
P.I. 178383	126	N	OK	OK		Poor
Itana	127	S	--	--		Good
Westmont	128	F	--	--		Good
F_4[(W-2x83-1)-1-F_2xW-19]-7-2-6	129	F	OK	--		Poor
" " 7-2-7	130	S	--	--		Fair
" " 7-2-9	131	F	OK	--		Poor
" " 7-3-6	134	H	OK	--		Fair
" " 7-3-7	135	F	OK	OK		Good
" " 7-7-3	136	H	OK	--		Fair
" " 7-7-4	137	F	OK	OK		Fair
" " 7-7-4	138	F	OK	--		Fair
" " 7-9-3	139	F	OK	OK	0	Fair
" " 7-9-6	140	F	OK	OK		Fair
" " 7-9-7	141	S	OK	--		Fair
" " 7-9-8	142	H	OK	--		Poor
" " 7-14-4	144	H	OK	OK		Fair
" " 7-14-6	146	S	--	--		Fair
" " 7-14-7	147	S	1(head)	2(heads)		Fair
" " 7-14-7	148	F	OK	--		Fair
F_4[(W-2x83-1)-1-2F_2xW-18]-8-3-3	156	S	--	OK		Poor

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Table 12 . Con't.

Entry	1965 Row No.	Heading[1] Stage as of 6/10/65	Smut Reading[2] Kalispell	Smut Reading[2] Creston	Stripe Rust Type (0-4) Kalispell	Remarks Straw Type
F_4[(W-2x83-1)-1-2F_2xW-18]-8-3-6	157	F	--	OK		Poor
" " " -8-8-1	159	F	OK	1(head)		Fair
" " " -8-8-2	160	F	OK	OK		Fair
" " " -8-8-4	161	F				Fair
" " " -8-8-6	162	S	OK	OK		Poor
" " " -8-8-6	163	F	OK	OK		Poor
F_4[(W-2x83-1)-2-2F_2xW-21]-10-6-1	164	S	OK	--		Fair
" " " -10-6-3	165	F	OK	--		Fair
F_4[(W-2x83-1)-4-1F_2xW-15]-11-3-1	166	F	OK	OK	3(10%)	Poor
" " " -11-3-3	168	S	OK	OK		Poor
" " " -11-3-4	169	N	OK	OK		Fair
" " " -11-3-5	170	F	OK	--		Fair
" " " -11-3-8	171	S	--	--		Fair
" " " -11-3-16	173	H	OK	--		Poor
F_4[(W-2x83-1)-4-2F_2xW-19]-12-2-3	175	S	--	OK		Poor
" " " -12-2-7	176	F	--	--		Fair
" " " -12-6-3	179	S	OK	OK		Fair
F_4[(W-2x83-1)-5-1F_2xW-15)]-13-1-3	181	H	OK	OK		Poor
" " " -13-1-4	182	S	OK	--		Poor
" " " -13-1-6	183	S	OK	OK	2	Fair
" " " -13-2-3	184	F	OK	--		Poor
" " " -13-2-5	186	F	2(heads)	OK		Fair
" " " -13-2-9	188	N	--	OK		Poor
" " " -13-2-11	189	N	--	-- 1(head)		
" " " -13-2-12	190	N	OK	7(heads)	3	Fair
" " " -13-2-18	194	S	--	--		Fair
" " " -13-2-19	195	S	OK	--		Fair
" " " -13-2-20	196	S	OK	OK		Poor KS
" " " -13-2-25	198	N	--	1(head)		Poor VRS
" " " -13-2-26	199	F	OK	OK		Fair

Table 12 . Con't.

Entry	1965 Row No.	Heading[1] Stage as of 6/10/65	Smut Reading[2] Kalispell	Smut Reading[2] Creston	Stripe Rust Type (0-4) Kalispell	Remarks Straw Type
F_4[(W-2x83-1)-5-1F_2xW-15]-13-5-1	200	F	--	OK		Poor
P.I. 178383	201	N	OK	OK		Poor
Itana	202	S	--	--		Good
Westmont	203	S	--	--		Good
F_4[(W-2x83-1)-5-1F_2xW-15]-13-5-6	204	H	--	1(head)		Poor
" " " -13-5-8	205	H	OK	1(head)		Poor
" " " -13-5-13	207	H	OK	OK		Poor
" " " -13-5-17	208	S	OK	OK		Poor
" " " -13-5-25	210	H	--	--		Poor
(83-?xIt12xIt6)-1xIt Comp.14-2-1	212	S	OK	--		Fair
" " " 14-2-2	213	H	--	--		Good
(83-?xIt12xIt6)-3xIt Comp.16-1-1	214	F	OK	OK		
" " " 16-1-3	215	F	--	--		Good
" " " 16-1-6	216	N	OK	--		Fair
" " " 16-1-8	217	S	OK	--		Poor
" " " 16-1-1	220	S	--	--		Fair
(83-2xIt-9xIt-6)-2xIt Comp21-2-2	221	F	--	--		Good
(83-2xIt-9xIt-6)-7xIt-8 -27-3-1	224	N	OK	--		Poor
" " " -27--5-7	229	S	--	--		Poor
(83-2xIt-9xIt-6)-8xIt Comp28-2-1	232	S	--	--		Poor
" " " 28-2-10	233	S	--	--		Poor
" " " 28-2-12	234	F	OK	OK		Poor
Oleo 28-2-12	235	F	--	OK		Poor
P.I. 178383	236	F	--	OK		Poor
83-4 x It^2 -4-3	239	F	OK	OK	3	Weak Straw
" " -4-7	241	F	OK	OK		Poor
83-2 x It^2 -1-5	248	F	--	--		Poor
P.I. 178383	251	N	OK	OK		Poor
Itana	252	S	--	--		Good
Westmont	253	S	--	--		Good

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Table 12 . Con't.

Entry	1965 Row No.	Heading[1] Stage as of 6/10/65	Smut Reading[2] Kalispell	Smut Reading[2] Creston	Stripe Rust Type (0-4) Kalispell	Remarks Straw Type
83 x 2 x It[2] -3-4	255	F	OK	OK	3	Good
" " " -3-5	256	F	OK	OK		Poor
" " " -4-2	258	S	OK	--		Fair
" " " -5-5	261	S	--	1(head)		Poor
" " " -6-6	264	N	OK	1(head)		Good
" " " -8-2	267	N	OK	OK		Fair
(West x 83-7)-1-1-3	271	S	OK	1(head)		Good
" " -1-1-6	273	F	OK	OK		Good
" " -2-2-2	274	N	OK	OK		Fair
" " -2-2-6	275	N	OK	OK		Fair
" " -3-1-3	279	F	OK	--		Grassy type -Poor
(West x 83-1)-1-1-5	286	F	--	OK		Good
" " -1-2-3	289	S	OK	OK		Fair
" " -1-4-2	290	H	OK	OK		Poor
" " -1-5-1	291	S	OK	--		
" " -2-1-3	293	F	OK	OK		Poor
" " -2-2-3	298	F	OK	OK		Poor
" " -2-4-1	299	H	OK	1(head)		Poor
" " -2-4-3	304	H	OK	2(heads)	1	Poor
" " -2-4-5	306	H	OK	--		Poor
" " -2-4-6	307	S	OK	--		Poor
" " -3-2-2	309	S	OK	OK	0	Fair
" " -4-2-3	316	S	OK	OK		Poor
" " -4-2-4	317	S	OK	OK		Poor
" " -4-2-5	318	S	OK	OK		Poor
" " -4-3-3	320	N	OK	1(head)	4	Poor
" " -4-3-6	321	N	OK	OK	1(head)	Fair
" " -4-3-7	322	N	OK	--		Fair
" " -4-3-8	323	F	OK	--		Fair
" " -4-3-10	324	F	OK	OK		Fair

Table 12 . Con't.

Entry	1965 Row No.	Heading[1] State of of 6/10/65	Smut Reading[2] Kalispell	Smut Reading[2] Creston	Stripe Rust Type (0-4) Kalispell	Remarks Straw Type
(West x 83-1)-4-4-1	325	N	--	--		Poor
P.I. 178383	326	N	OK	OK		Poor
Itana	327	S	--	--		Fair
Westmont	328	S	--	--		Fair
(West x 83-1)-4-4-4	329	N	--	OK		Poor
" " -5-1-3	330	S	OK	OK	3	Poor
" " -5-1-4	331	S	OK	OK		Poor
" " -5-2-5	335	F	OK	--		Fair
" " -5-4-5	340	F	--	OK		Poor
" " -5-5-1	341	S	OK	--		
" " -5-5-2	342	S	--	1(head)		Fair

[1] H - Headed 6/10/65
S - Several heads 6/10/65
N - No heads showing 6/10/65
F - Few heads showing 6/10/65

[2] OK - No Bunt
-- - Bunt
1 - Equal number of heads

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Table 14. Summary of yield data from date and depth of seeding grown on the Lance Clarge farm in 1965.

Variety	Yield Bushel per Acre Date Planted August 15	September 1	September 15	September 30	$\bar{x}$ for Varieties
Westmont	26.6	33.8	44.1	45.7	37.6
Gaines	18.9	34.1	36.2	43.1	33.1
Delmar	27.9	42.3	42.9	47.6	40.2
Cheyenne	31.5	43.2	46.9	54.1	43.9
$\bar{x}$ for Dates	26.2	38.4	42.5	47.6	)38.7-$\bar{x}$

Variety	Seeding Depth D_1	D_2	$\bar{x}$ for Varieties
Westmont	39.7	35.3	37.5
Gaines	35.7	30.5	33.1
Delmar	39.7	40.6	40.2
Cheyenne	43.3	44.6	43.9
$\bar{x}$ for Depths	39.6	37.8	)38.7-$\bar{x}$

Table 15. Summary of smut data from date and depth seeding study.

Variety	Percent Dwarf Smut Date Planted August 15	September 1	September 15	September 30	$\bar{x}$ for Varieties
Westmont	10	44	23	30	27
Gaines	10	35	25	19	22
Delmar	1	18	18	25	16
Cheyenne	10	37	32	30	27
$\bar{x}$ Date	8	34	25	28	)24 $\bar{x}$

Variety	Seeding Depth D_1	D_2	$\bar{x}$ for Varieties
Westmont	30	24	27
Gaines	27	18	22
Delmar	20	11	16
Cheyenne	33	22	27
$\bar{x}$ for Smut	28	19	)24 - $\bar{x}$

YEAR: 1965

TITLE: Oil Crops Investigations 5028

LOCATION: Northwestern Montana Branch Station

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

DURATION: Indefinite

OBJECTIVES:

To determine the agronomic adaptability of winter rape species.

EXPERIMENTAL DESIGN AND PROCEDURES:

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

RESULTS AND DISCUSSION:

Oil crop nursery was seeded on the station, September 3, 1964 in four row plots, replicated four times. The ten entries in the nursery were secured from lines of winter rape grown two years previous. These were the only lines surviving and were included in the yield study. Yields were variable from 499 pounds to 1362 pounds of seed. Maturity ranges were considerably different. Harvest dates were August 27 for the late date and July 28 for the early harvest date.

These materials have been submitted to the chemical research laboratory for oil analysis. The results of this will be found in the 1966 annual report, in that they are not available at this writing.

FUTURE PLANS:

No work on oil crops is planned in 1966.

SUMMARY:

There may be a potential for some of the winter rapes from these selections for use in Western Montana.

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Talbe 1. Yield data from winter rape nursery grown at the Northwestern Montana Branch Station in 1964-1965. Four row plots, four replications. Field No. R-6a

Date Planted: September 3, 1964 Size of Plot: 32 square feet

Discription	Harvest Date	Grams per Plot I	II	III	IV	Total Grams	Yield Lbs/A
Dwarf Essex	8-27	256	277	219	315	1067	801
1961 - No. 1	8-27	201	145	173	146	665	499
1961 - No. 3	8-27	230	289	201	211	931	698
1961 - No. 4	8-27	286	162	350	339	1137	853
1961 - No. 5	8-27	164	157	102	148	571	428
1961 - No. 6	7-28	477	435	240	672	1824	1368*
1961 - No. 7	7-28	406	316	244	363	1329	997
1961 - No. 8	7-28	494	420	151	675	1740	1305*
1961 - No. 9	7-28	392	364	439	471	1666	1250*
1961 - No.10	7-28	380	418	510	509	1817	1363**

NOTE: Dwarf Essex used as a check in this nursery.
*: Entries yielding significantly more than the check .05.
**: Entries yielding significantly more than the check .01.

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	26700.82666	3.18*
Varieties	9	55987.39220	6.68**
Error	27	8387.54703	
Total	39		

$\bar{x}$.....	956
S.E.$\bar{x}$.....	137.419
L.S.D.(.05)	398
L.S.D.(.01)	538
C.V.%.....	14.37