

FOURTEENTH ANNUAL REPORT

1962

NORTHWESTERN MONTANA BRANCH

MONTANA AGRICULTURAL EXPERIMENT STATION

Route Four

Kalispell, Montana

This report deals briefly with fiscal matters and activities and reports in detail the research work done by C. W. Roath, Superintendent with fertilizers, forages, potatoes, and farm flock investigation and by Vern R. Stewart, Associate Agronomist with fertilizers, cereals, oil seed and miscellaneous crops, and weed control.

Research work is also reported by projects in appropriate Research Committee 1962 annual reports.

	<u>Page</u> <u>No.</u>
Part I by C. W. Roath	
Part II by Vern R. Stewart	

PART I
Annual Research Report
Northwestern Montana Branch
of the
Montana Agricultural Experiment Station
Kalispell, Montana
by
C. W. Roath
Superintendent

TABLE OF CONTENTS

	<u>Page. No.</u>
Fiscal Projects	
General Administration..1062.....	1
Physical Plant.....1063.....	1
General Farm.....1064.....	1
Activities.....	2
 Research Projects	
Forages.....	3
Preliminary Investigations.....	27
Farm Flock.....	42

GENERAL ADMINISTRATION 1062

Staff:

C. W. Roath, Superintendent
Vern R. Stewart, Associate Agronomist

Don Merkley, Associate Entomologist, received a portion of his salary from the Northwestern Montana Branch Station budget. However, since his major responsibilities were at the Western Montana Branch Station where he maintained residence, report of his work will be found in the reports of that Station.

Help:

Paul Boss again did the major part of the general farm work. Jeff Buller helped Paul and together they constituted the total labor force for research plot assistance. Audrey Holman, in two or three days each week, did all clerical and stenographic work.

General Statement:

Even with the least staff time and smallest labor force in recent years no excuses are offered for the overall research accomplishments in 1962.

The 1962-63 administrative budget was for \$5113.00.

PHYSICAL PLANT 1063

A 1962-63 budget of \$4345.00 proved to be generally adequate for heat, light, and minor repairs and maintenance of the physical plant.

Plans have been made for drilling a domestic well and for construction of a machine shed and a forage-livestock building from insurance funds available to the Director. The well is expected to provide adequate domestic water for the first time since the Station was established. The two buildings will provide for machine and hay storage and for efficient handling of the farm flock and permit removal of the ancient red barn.

GENERAL FARM 1064

Fall seeding of alfalfa in winter wheat stubble in strips in the dryland lease successfully established stands. Fall seeding in fallow strips was less successful due to soil movement, and blown out areas were reseeded in the spring.

Planned expansion of pasture areas provided adequately for the Station farm flock.

Announced increases in I.H.C. equipment leases will make general farm operations considerably more costly if these actually go into effect.

General Farm - Continued

The aim of general farm operations is to provide suitable conditions for research. Yields improve with good farming, however, and incidental receipts from crops and livestock help pay for research. Receipts for 1962-63 will closely approximate the \$4000.00 estimate.

The 1962-63 budget was for \$6425.00.

1962 ACTIVITIES

Chief among the Station activities in 1962 was the staging of a very successful Field Day in recognition of the 100th anniversary of the Land Grant College System.

Chairman of the Advisory Committee, Harold Tutvedt, very effectively served as chairman of the Field Day committee which included all segments of the agricultural economy. A program was planned, exhibits located, transportation for exhibits furnished, publicity secured including a special issue of the Kalispell News, handbills, posters, and a parade by the Old Car Club.

Over 300 people from all over western Montana attended the Field Day program designed to acquaint attendants with the nature and extent of agricultural progress in 100 years and of the role of the Land Grant College System in this progress.

Our thanks to all who helped with or participated in this activity.

Usual activities such as issuance of the monthly letters, a progress report, talks at meetings, and participation in community and area activities such as Conservation education, fairs, and tours have been continued.

Notable among the favorable recognition received for activities was the fine speech by Congressman Arnold Olsen which was read into the Congressional Record July 20, 1962 A 5592-93.

TITLE: Pasture studies

LOCATION: Northwestern Montana Branch Station

PERSONNEL: C. W. Roath and Forage Research Committee

DURATION: 1960 - 1965

OBJECTIVES: Objectives and reasons for study are those adopted by the Forage Research Committee.

1962 annual data attached.

RESULTS:

- A. Sanfoin performed well under dryland conditions at Creton producing three crops for grazing and yields significantly above Neb. 50 Intermediate at the five percent level. No grass in the study improved the yield of Sanfoin.
- B. Sanfoin bloat hazard and palatability - sheep graze Sanfoin with relish unless allowed to become too stemmy then strip off the leaves. Ewes confined to an area seeded to Sanfoin (four ewes on 1/5 acre) for several days until utilized showed no tendency to bloat.
- B. Ten yearling ewes were confined for four days to a fifty feet by sixty feet enclosure containing five Tall Fescue varieties, then removed and the refused grass cut and weighed.

It was determined that sheep don't relish fescue. Lack of agreement between plots seems to indicate that no preference was indicated.

Table A. Sanfoin Pastures - 1962. Season's yields in tons per acre at 12% moisture.

Species or Mixtures	Replications				Total	Average
	I	II	III	IV		
Sanfoin	2.67	2.92	3.18	2.71	11.48	2.87 **
Sanfoin & Neb. 50	2.19	2.45	1.95	3.13	9.72	2.43 **
Sanfoin & Stipa	2.71	2.97	2.97	3.18	11.83	2.96 **
Stipa	.17	.12	.12	.20	.61	.15
Sanfoin & Nordan	3.10	2.41	3.31	3.19	12.01	3.00 **
Nordan	.81	1.40	1.44	1.14	4.79	1.20
Neb. 50	1.16	1.76	.76	1.36	5.04	1.26

Note: Neb. 50 is used as the check.
 ** Species yielding significantly more than the check (.05).

Analysis of Variance

\bar{x}	1.98
S.E. \bar{x}.....	.16668
L.S.D. (.05)....	.50
L.S.D. (.01)....	.68
C.V.	8.41%

Source	D.F.	Mean Square	F
Replications	3	.10716	
Varieties	6	4.97737	44.78 **
Error	18	.11113	

Table B. Palatability of Fescues determined by refused grass.

Variety	Grass Residue in Grams		Average	Palatability Rank
	Rep. 1	Rep. 2		
Alta	70	260	165	2
Ky. 31	120	170	145	1
Goar	160	170	165	2
Ky. G 32	220	200	210	4
Ore. 4-36	165	245	205	3

TITLE: Off-station Dryland Grass Studies

LOCATION: Polson and Ovando

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

DURATION: Possibly through 1965

OBJECTIVES: Determine adaptability and productivity under Northwestern Montana conditions.

1962 annual data attached.

RESULTS:

- A. Intermediate and Tall wheatgrasses produced more, significant at the five percent level, than Standard Crested at Polson. Russian Wild Rye, Potomac Orchard, Meadow Foxtail, and Hopkins Timothy were lower in yield.
- B. Observations of stand, height, maturity, and yield rank 1 - 10 were made of grass plots seeded by the late Mr. Tice near Ovando. Intermediate and Tall Wheatgrasses and Alfalfa ranked high in yield, followed closely by Orchardgrass in this quite favorable moisture location.

Maturity was some two weeks behind that at Polson for the same varieties.

SIGNIFICANT FINDINGS: Intermediate Wheatgrass and Tall Wheatgrass demonstrate superiority under Northwestern Montana dryland conditions.

Table A. Dryland Grasses in Lake County - 1962. Tons per acre at 12%.

Variety	Replications				Total	Average
	I	II	III	IV		
Intermediate	.86	.89	.56	.64	2.95	.74 *
Nordan Crested	.71	.29	.41	.65	2.06	.52
Standard Crested	.74	.28	.42	.44	1.88	.47
Pubescent	.33	.75	.24	.43	1.75	.44
Tall	.71	.70	.69	.60	2.70	.68 *
Manchar Brome	.28	.71	.51	.43	1.93	.48
Slender Wheat	.29	.31	.42	.67	1.69	.42
Russian Wild Rye	.24	.17	.11	.28	.80	.20 <u>1</u>
Potomac Orchard	.24	.20	.11	.19	.74	.19 <u>1</u>
Sherman Big Blue	.48	.75	.52	.34	2.09	.52
Meadow Foxtail	.17	.24	.17	.20	.78	.20 <u>1</u>
Alta Fescue	.39	.62	.15	.39	1.55	.39
Lincoln Brome	.57	.50	.50	.69	2.26	.57
Hopkins Timothy	.14	.29	.05	.32	.80	.20 <u>1</u>

Note: Standard Crested is used as the check.
 * Varieties yielding significantly more than the check (.05).
1 Varieties yielding significantly less than the check (.01).

\bar{x} 43
 S.E. \bar{x}07240
 L.S.D. (.05) .21
 L.S.D. (.01) .29
 C.V. 16.90%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	.04487	2.14
Varieties	13	.12795	6.10 **
Error	39	.02097	

Table B. Dryland Grasses in single plots near Ovando - 1962.

Name	Stand	Height	Maturity	1 - 10 Yield Rank 1-highest
British Perennial Rye Grass #23	few	6	heading	10
Kent Rye Grass (pasture)	few	8	headed	10
British Rye Grass #24	few	10	headed	9
Wild Russian Rye Grass	fair	12 lvs. 36 hds.	headed	6
Imported Meadow Fescue (pasture)	fair	10	boot	8
#215 Meadow Fescue (hay)	fair	16	headed	7
Timothy British #48 (hay)	good	16	boot	5
British Pasture Timothy #50	fair	6	imm	9
#21 Timothy British Hay Strain	fair	16	heading	5
Orchard Grass #20 (pasture)	good	16	heading	4
Orchard Grass #143 (pasture)	good	20	heading	3
Orchard Grass #37 (hay)	good	16	heading	4
#100 British White Clover	few	6	bloom	10

Continued ---

Table B. (Continued)

Name	Stand	Height	Maturity	1 - 10 Yield Rank 1-highest
British late Flowering Red Clover	some	8	imm	7
#184 Wild White Clover	few	4	bloom	10
Dorset Marl Grass Broad Red Clover	few	10	bloom	8
Meadow Foxtail	good	36	bloom	4
Creeping Meadow Foxtail	good	36	bloom	4
Meadow Foxtail	good	36	bloom	4
Greenar Intermediate	good	24	boot	1
Creeping Red Fescue	good	16	heading	8
Topar Pubescent Wheat	good	18	boot	2
Siberian Wheatgrass	good	20	headed	3
Smutless Crested Wheat	good	26	headed	2
Latar Orchardgrass	good	28	heading	2
Russian Wild Rye	good	14 lvs. 26 hds.	headed	5
Ladak Alfalfa	good	24	buds	1
Alta Fescue	good	26	headed	5
Tall Wheatgrass	good	20	jointing	3
Nordan Crested Wheat	good	24	headed	2
Sodar Streambank Wheatgrass	good	6 lvs. 18 hds.	headed	8
Whitmar Beardless Wheat	good	22	headed	5
Alsike Clover	some	10	bloom	7
Poa Longifolia (Armenian Bluegrass)	good	40	headed	6
Big Bluegrass	good	28	headed	5
Canada Bluegrass	good	14	headed	4
Kenland Red Clover	fair	12	blooming	6
Lethridge Orchardgrass	good	24	bloom	5
Avon Orchard	good	30	bloom	3
Creeping Red Fescue	fair	16	head	7
Mandan Rice (a failure) Fall Seeded '59	few	24	heading	6
Mandan Rice (a fair stand)	few	24	heading	6
Belgian Alfalfa - Triumph Dullord	good	22	buds	3
Engels Rye Grass (pasture)	fair	4	imm	9
MerKense Red Clover	fair	12	ea bloom	6
Violetta Red Clover	fair	12	ea bloom	6
Kroper hay and pasture	good	14	heading	5
Engels Rye Grass (hay type)	fair	10	headed	8
English Meadow Fescue	fair	5	imm	9
Kent Wild White Clover	very few	8	bloom	10
Perennial Rye Grass	fair	4	imm	9

TITLE: Alfalfa-Grass Mixtures for Hay

LOCATION: Lake County and Northwestern Montana Branch Station

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

DURATION: Three harvest years for each study

OBJECTIVES:

- a. Determine performance and adaptability to Northwestern Montana conditions
- b. Develop sound recommendations based on reliable information.

1962 annual data on Tables A - D.

RESULTS:

Hay mixtures - Lake County

Fair two cutting yields, 2.5 to 4.0 tons per acre at twelve percent moisture, were obtained in an irrigated hay mixture study on clay loam soil in Lake Co.

Vernal and Rhizoma produced more, based on four plot averages, than Ladak or any of the Ladak-grass mixtures. Great variation between plots seeded to any given entry rendered data non-significant.

PLANS: Discontinue

Bluegrass-Alfalfa Mixtures

Introduced bluegrasses seeded with alfalfa for hay produced 3.5 to 4.5 tons per acre at twelve percent moisture in two cuttings. One introduction (13703-208) produced significantly more than the orchard-alfalfa check this season. During the three year harvest period only .16 ton per acre separates the two, however.

PLANS: Discontinue

One Cutting Hay Mixtures

The objective of this work, i.e., to have mixtures mature during favorable weather for field curing, produce four tons per acre, and have one ton per acre regrowth for fall grazing, has been partially realized.

Yields of four tons in one cutting harvested July 6 were secured as also was one ton of regrowth from some entries.

PLANS: Continue to harvest these mixtures and also seed other grasses and legumes for harvest under one cutting-fall grazing management. Probably also use nitrogen mid-season to increase fall grass growth.

Table A. Hay Mixtures - Lake County in 1962. Season's yield in tons per acre at 12% moisture in two cuttings.

Species or Mixture	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Total	Average
Vernal Alfalfa	4.92	3.29	3.41	3.62	15.24	3.81
Rhizoma Alfalfa	4.63	4.07	3.58	3.62	15.88	3.97
Ladak Alfalfa	3.45	2.93	2.26	3.46	12.10	3.03
Whitmar Wheatgrass	2.32	2.76	4.92	2.72	12.72	3.16
Greenar Wheatgrass	3.38	2.84	3.62	4.19	14.03	3.51
Ree Wheatgrass	3.21	3.98	3.95	3.33	14.47	3.62
Mandan 404 Brome	2.73	2.81	4.92	3.49	13.95	3.49
Manchar Brome	2.15	3.46	3.13	2.19	10.93	2.73
Lincoln Brome	3.01	1.87	4.35	4.92	14.15	3.54
Potomac Orchard	3.09	3.58	2.80	3.66	13.13	3.28
Alta Fescue	2.97	3.62	2.19	2.88	11.66	2.92
Sherman Big Blue	3.50	1.95	2.72	3.91	12.08	3.02
Reed Canary	3.13	2.72	2.11	4.27	12.23	3.06
Meadow Foxtail	2.20	2.36	2.84	2.97	10.37	2.59
Green Stipa	2.80	4.43	3.33	2.48	13.04	3.26
Tall Oatgrass	3.05	3.86	3.26	3.70	13.87	3.47

Analysis of Variance				\bar{x}	3.27922
Source	D.F.	Mean Square	F	S.E.x.....	.39020
Replications	3	.35372	---	L.S.D.	NS
Varieties	15	.56868	---	C.V.	11.89%
Error	45	.60902			
Total	63				

Table B. Irrigated Bluegrasses - 1962. Season's yields in tons per acre in two cuttings.

Variety	Rep. 1	Rep. 2	Rep. 3	Total	Average
P - 5731	3.77	4.08	3.23	11.08	3.69
P - 8903	4.22	4.26	3.21	11.69	3.89
P - 846	4.15	3.26	3.00	10.41	3.47
P - 15398	4.40	4.51	3.43	12.34	4.11
13949 - 410	4.48	3.85	3.15	11.48	3.83
13783 - 33	3.56	3.41	3.27	10.24	3.41
13703 - 208	4.59	4.51	4.68	13.78	4.59 *
P - 13819	4.08	3.68	3.97	11.73	3.91
14095 - 803	3.98	4.11	3.81	11.90	3.97
Sherman	4.20	4.37	3.28	11.85	3.95
Potomac	4.13	4.44	3.32	11.89	3.96
Troy	3.60	3.85	3.74	11.19	3.73

Note: Potomac is used as the check.	\bar{x}	3.88
* Varieties yielding significantly more than the check (.05).	S.E.x.....	.194
	L.S.D.(.05)....	.57
	C.V.	5.00%

Analysis of Variance			
Source	D.F.	Mean Square	F
Replications	2	1.24463	11.03 **
Varieties	11	.28085	2.49 *
Error	22	.11287	

Table C. First cutting in tons per acre.

One cutting hays 1962 actually cut twice on July 6 and September 3 in tons per acre at twelve percent moisture.

Species or Mixtures	Rep. 1	Rep. 2	Rep. 3	Total	Ave.
Canary and Trefoil	2.18	2.18	2.53	6.89	2.30
Canary and Mammoth	3.05	4.09	3.05	10.19	3.40
Canary and Sanfoin	3.75	3.83	4.23	11.81	3.94
Intermediate and Mammoth	4.84	4.62	5.01	14.47	4.82 **
Intermediate and Trefoil	3.14	3.57	4.70	11.41	3.80
Intermediate and Sanfoin	4.53	4.14	3.83	12.50	4.17
Brome and Trefoil	4.14	2.79	3.14	10.07	3.36
Brome and Sanfoin	2.87	3.48	3.92	10.27	3.42
Brome and Mammoth	3.61	4.27	5.18	13.06	4.35 *

Note: Reed Canary and Mammoth is used as the check.

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

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

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	.36508	1.27
Varieties	8	1.58311	5.50 **
Error	16	.28790	
Total	26		

\bar{x}	3.72851
S.E. \bar{x}.....	.30978
L.S.D.(.05)...	.93
L.S.D.(.01)...	1.28
C.V.	8.31%

Table D. Second cutting in tons per acre.

One cutting hays 1962 actually cut twice on July 6 and September 3 in tons per acre at 12% moisture.

Species or Mixtures	Rep. 1	Rep. 2	Rep. 3	Total	Ave.
Canary and Trefoil	.58	1.34	2.06	3.98	1.33
Canary and Mammoth	1.02	1.60	.87	3.49	1.16
Canary and Sanfoin	1.86	1.71	2.38	5.95	1.98 *
Intermediate and Mammoth	1.77	1.19	1.48	4.44	1.48
Intermediate and Trefoil	1.28	1.57	1.71	4.56	1.52
Intermediate and Sanfoin	1.97	1.86	1.86	5.69	1.90 *
Brome and Trefoil	.70	.99	1.57	3.26	1.09
Brome and Sanfoin	1.39	1.68	1.83	4.90	1.63
Brome and Mammoth	1.02	1.02	.73	2.77	.92

Note: Reed Canary and Mammoth is used as the check.

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

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	.23385	1.87
Varieties	8	.38624	3.10 *
Error	16	.12458	
Total	26		

\bar{x}	1.44592
S.E. \bar{x}.....	.20378
L.S.D.(.05)...	.61
C.V.	14.09%

TITLE: Alfalfa Variety Evaluation

LOCATION: Northwestern Montana Branch Station and off-station locations

PERSONNEL: C. W. Roath and Forage Research Committee

DURATION: 1953 - 1965

OBJECTIVES: Objectives and procedures are generally those accepted by the Forage Research Committee.

1962 annual data plus some summaries of completed tests are tabulated on attached pages.

RESULTS:

- A-B. Stands of standard irrigated and dryland alfalfa evaluation nurseries seeded in 1961 are all 90% or above except for 79.25% for Ladak in the dryland nursery.
- C. A one cutting harvest of the irrigated alfalfa variety evaluation nursery shows significant yield differences with Vernal and Orenberg.
- D. Stands of varieties in the standard winter hardiness nursery seeded in 1960 were reduced by winter injury. Vernal came through better than other varieties.
- E. A one cutting harvest of varieties in the winter hardiness nursery shows Vernal to be above others in yield on the average. Data was non-significant.
- F. A comparison of other varieties with Ladak was made from records of completed trials. Ranger was 99.7%, Rhizoma 112.6%, and Vernal 110% of Ladak in the same locations and years.

SIGNIFICANT FINDINGS:

Vernal alfalfa appears well adapted to, and productive in, Northwestern Montana.

Table A. Irrigated Variety Evaluation Nursery - Stand Percentages

<u>Variety</u>	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV.</u>	<u>Total</u>	<u>Average</u>
Vernal	93	100	96	97	386	96.50
Orenberg	98	100	100	89	387	96.75
Rambler	97	96	88	80	361	90.25
Teton	100	94	95	94	383	95.75
Ladak	96	98	97	95	386	96.50

Table B. Dryland Variety Evaluation Nursery - Stand Percentages

Variety	I	II	III	IV	Total	Average
Vernal	95	82	100	97	374	93.50
Orenberg	94	89	95	99	377	94.25
Rambler	88	72	100	100	360	90.00
Teton	89	89	98	92	368	92.00
Ladak	53	76	100	88	317	79.25

Table C. Irrigated Alfalfas Variety Evaluation. Second Cutting.

Variety	Replications				Total	Average
	I	II	III	IV		
Vernal	3.73	3.73	4.57	3.81	15.84	3.96 *
Orenberg	2.37	2.88	3.05	1.86	10.16	2.54 <u>1</u>
Rambler	3.30	2.29	4.07	2.46	12.12	3.03
Teton	2.71	2.88	3.81	3.13	12.53	3.13
Ladak	3.56	3.56	3.73	2.63	13.48	3.37

Note: Ladak is used as the check.

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

1 Varieties yielding significantly less than the check (.05).

\bar{x}	3.21
S.E. \bar{x} .....	.19148
L.S.D. (.05).....	.59
L.S.D. (.01).....	.83
C.V.	5.97%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	1.02835	7.01 **
Varieties	4	1.07534	7.33 **
Error	12	.14666	

Table D. Percent Stand in Hardiness Nursery - 1962.

Variety	Replications				Total	Average
	I	II	III	IV		
Lahontan	62	29	77	53	221	55.3
Vernal	77	71	79	75	302	75.5
Zia	42	33	63	63	201	50.3
N. Mex. 11-1	69	47	42	39	197	49.3
N. Mex. 22-2	50	50	36	63	199	49.8

Table E. Winter Hardiness Alfalfa - 1962. Tons per acre from one cutting at 12% moisture.

Variety	I	Replications			Total	Average
		II	III	IV		
Lahontan	1.95	2.54	1.69	.68	6.86	1.72
Vernal	2.46	2.20	1.86	2.12	8.64	2.16
Zia	1.27	.51	.76	1.86	4.40	1.10
N. Mex. 11-1	1.52	1.19	.76	1.10	4.57	1.14
N. Mex. 22-2	1.19	.68	1.27	1.69	4.83	1.21

Analysis of Variance

Source	D.F.	Mean Square	F	
Replications	3	.14414		\bar{x} 1.465
Varieties	4	.84906	2.96	S.E. \bar{x}. ... .26758
Error	12	.28640		L.S.D. ... NS
Total	19			C.V. 18.27%

Table F. Comparison of Certain Alfalfa Varieties in Northwestern Montana.

Variety	Dryland	Irrigated				% Ladak Same Years
	1.	2.	3.	4.	5.	
Ladak	4.51	5.40	5.11	3.53	2.66	100.0
Ranger	4.61	4.77	5.59			99.7
Rhizoma	4.90	5.39	5.84	3.79	2.96	112.6
Vernal			5.62	3.82	2.99	110.0

1. Creeping Alfalfa - Creston 53-55
2. Legume Nursery - Creston 54-55
3. Intrastate Irrigated Alfalfa - 58-59
4. Ravalli County - 1960
5. Lake County Hay Mixture - 60-62

TITLE: Montana Standard Intrastate Small Seeded Legumes - Dry and Irrigated

LOCATION: Northwestern Montana Branch Station

PERSONNEL: C. W. Roath and Montana Forage Research Committee

DURATION: 1960 - 1963

OBJECTIVES: Objectives and reasons for study are those adopted by the Forage Research Committee.

1962 annual data are tabulated on attached pages.

RESULTS:

- A. Yields of dryland legumes were quite exceptional and ranged from 1.9 to 4.3 tons. Tetra Alsike was high for the second year. Sanfoin, Milk Vetches, alfalfa, Alsike, and Dollard red clover were significantly above Kenland in yield.
- B. Considerable winter injury occurred in the irrigated nursery. Fortunately, however, this affected the several plots of each entry quite uniformly so that yield data was highly significant. Seven red clover varieties were above Kenland in yield.
- C. Regrowth was ranked 1 - 10 according to apparent forage growth one month after the hay cutting. In both nurseries Vernal alfalfa, Lakeland, Dollard and Kenland red clover, and Sanfoin ranked high in regrowth.
- D. Stands were reduced in varying degrees in the irrigated nursery to below 60% stands for Alaskland and Pennscott red clover and Vernal alfalfa.
- E. Pennscott red clover suffered the greatest stand loss by winter injury in the dryland nursery. Sickle Milk Vetch has a low stand percentage in the table, but this is an improvement over the previous year.
- F. Maturity characteristics of legumes were observed. The earliest red clovers were Alaskland and Pennscott. Last to reach the half bloom stage were Alta-swede, Tomminsto, and Weibull's Resistanta red clovers. These late clovers were highest in yield when cut at one-half bloom.

PLANS: Continue harvest and observation of maturity characteristics one more year. Put late clovers with late grasses in one cutting hay study.

SIGNIFICANT FINDINGS: Nurseries contain varieties more productive and more winter hardy than Kenland.

Table A . Dryland Legumes - 1962.

Variety	Replications				Total	Average
	I	II	III	IV		
Zigzag	3.29	3.20	3.50	2.98	12.97	3.24
Pennscott	2.23	1.78	1.92	2.04	7.97	1.99
Kenland	2.54	3.04	1.46	2.43	9.47	2.37
Lakeland	2.99	3.65	2.98	3.25	12.87	3.22
Dollard	3.76	4.67	3.20	3.49	15.12	3.78 **
Montgomery	3.15	2.87	2.49	2.59	11.10	2.78
Com. Alsike	3.50	2.52	5.22	3.57	14.81	3.70 **
Tetra Alsike	4.14	4.48	3.86	4.92	17.40	4.35 **
Vernal Alfalfa	2.72	4.64	3.26	3.60	14.22	3.56 *
Cicer Vetch	3.31	3.13	3.83	3.90	14.17	3.54 *
Sickle Vetch	3.23	3.30	3.84	2.89	13.26	3.32 *
Astrag. semi.	3.54	3.12	2.09	1.68	10.43	2.61
Sanfoin	3.18	3.37	2.63	4.46	13.64	3.41 *

Note: Kenland is used as the check.

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

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

\bar{x} 3.22
 S.E. \bar{x}31321
 L.S.D.(.05).90
 L.S.D.(.01)1.21
 C.V.....9.73%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	.15965	.41
Varieties	12	1.63062	4.16 **
Error	36	.39240	

Table B. Irrigated small seeded legumes- 1962. Tons per acre at twelve percent moisture. Sixty square feet cut July 3, 1962.

Variety	Replications				Total	Average
	I	II	III	IV		
Zigzag	2.81	4.32	2.78	3.00	12.91	3.23 **
Pennscott	1.65	1.52	1.18	1.49	5.84	1.46
Kenland	2.35	2.08	1.71	1.21	7.35	1.84
Lakeland	2.91	2.28	2.25	2.11	9.55	2.39
Dollard	3.07	2.50	2.42	2.66	10.65	2.66 *
Altaswede	2.87	4.17	3.07	2.97	13.08	3.27 **
Ottio Mammoth	2.65	2.94	2.60	1.67	9.86	2.46
Weibull's Tetra Red Clover	3.09	2.48	2.69	4.37	12.63	3.16 **
Tomminsto	2.87	2.30	3.52	2.89	11.58	2.89 **
Alaskland	1.61	1.69	1.56	1.32	6.18	1.54
Manhardy	3.81	3.44	2.78	3.59	13.62	3.40 **
Weibull's Resistanta	3.62	2.28	2.03	3.72	11.65	2.91 **
Common Alsike	2.10	2.04	2.19	2.47	8.80	2.20
Tetra Alsike	1.62	1.92	1.55	1.94	7.03	1.76
Vernal Alfalfa	2.31	1.81	1.91	2.17	8.20	2.05
Cicer M. Vetch	1.71	1.81	1.84	2.05	7.41	1.85
Sickle M. Vetch	1.74	1.53	1.52	1.88	6.67	1.67
Sanfoin	2.29	2.34	2.49	1.88	9.00	2.25

Note: Kenland is used as the check.

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

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

\bar{x}	2.39
S.E. \bar{x}.....	.23245
L.S.D.(.05)..	.66
L.S.D.(.01)..	.89
C.V.	9.73 %

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	.24350	1.13
Varieties	17	1.63986	7.59 **
Error	51	.21613	

Table C. Yield rank of legume regrowth at Creston, Montana in 1962. Estimates made August 6, 1962 with one (1) the greatest.

Variety	Irrigated						Dryland					
	Replications				Total	Rank	Replications				Total	Rank
	I	II	III	IV			I	II	III	IV		
Zigzag	7	4	4	5	20	5	5	5	4	5	19	6
Pennscott	5	3	6	3	17	4	6	6	5	6	23	7
Kenland	1	2	5	6	14	3	3	5	5	3	16	4
Lakeland	2	1	2	4	9	1	2	4	4	4	14	2
Dollard	4	3	4	5	16	3	3	3	4	5	15	3
Altaswede	5	5	4	5	19	4						
Ottio Mammoth	5	4	4	7	20	5						
Weibull's Tetra	5	4	5	4	18	4						
Tomminsto	4	4	3	4	15	3						
Alaskland	7	5	6	6	24	6						
Manhardy	5	5	5	5	20	5						
Weibull's Resistanta	4	3	4	5	16	3						
Common Alsike	8	9	8	9	34	8	9	10	8	9	36	10
Tetra Alsike	9	9	8	10	36	9	9	9	8	8	34	9
Vernal Alfalfa	1	5	3	3	12	2	1	1	1	1	4	1
Cicer Vetch	8	8	7	8	31	7	7	6	8	6	27	8
Sickle Vetch	9	10	8	9	36	9	9	8	9	9	35	10
Sanfoin	3	4	5	5	17	4	4	5	5	4	18	5

Table D. Irrigated Legumes - stand percentages based on five readings per plot.

Variety	Replications				Total	Percent Average
	I	II	III	IV		
Zigzag	71	94	96	87	348	87.00
Pennscott	48	62	60	52	222	55.50
Kenland	65	81	68	61	275	68.75
Lakeland	77	95	95	78	345	86.25
Dollard	75	85	91	80	331	82.75
Altaswede	75	91	98	83	347	86.75
Ottio Mammoth	57	69	83	54	263	65.75
Weibull's Tetra	74	78	91	80	323	80.75
Tomminsto	92	90	94	94	370	92.50
Alaskland	18	28	53	34	133	33.25
Manhardy	85	87	93	69	334	83.50
Weibull's Resistanta	83	74	90	88	335	83.75
Common Alsike	67	74	74	89	304	76.00
Tetra Alsike	71	83	80	79	313	78.25
Vernal Alfalfa	47	46	52	67	212	53.00
Sanfoin	67	62	71	63	263	65.75

Table E. Dryland legumes - stand percentages based on five readings per plot.

Variety	Replications				Total	Percent Average
	I	II	III	IV		
Zigzag	79	94	93	92	358	89.50
Pennscott	50	35	44	44	173	43.25
Kenland	75	48	47	91	261	65.25
Lakeland	66	87	64	82	299	74.75
Dollard	87	100	92	65	344	86.00
Common Alsike	71	32	86	45	234	58.50
Tetra Alsike	79	90	93	89	351	87.75
Vernal Alfalfa	88	67	76	85	316	79.00
Sanfoin	65	46	31	64	206	51.50
Cicer M. Vetch	45	64	51	88	248	62.00
Sickle M. Vetch	23	41	17	31	112	28.00

Table F. Legume Maturity-1962. Date of half bloom and harvest. Tons per acre at 12% moisture.

Variety	Cut	Date	Tons	Season's Tons
			Per Acre	Per Acre
Zigzag	1st	7- 3	2.71	
	2nd	9- 3	1.14	3.85
Pennscott	1st	6-18	.42	
	2nd	8- 6	.68	1.10
Kenland	1st	6-23	1.69	
	2nd	8- 6	1.06	2.75
Lakeland	1st	6-25	2.29	
	2nd	8-15	1.69	3.98
Dollard	1st	7- 3	2.37	
	2nd	8-23	1.10	3.47
Altaswede	1st	7-16	3.73	
	2nd	9- 3	.76	4.49
Weibull's Tetra	1st	7- 3	2.29	
	2nd	9- 3	1.23	3.52
Tomminsto	1st	7-16	4.15	
	2nd	9- 3	.64	4.79
Alaskland	1st	6-18	1.44	
	2nd	8- 6	1.52	2.96
Manhardy	1st	7- 3	2.84	
	2nd	9- 3	.51	3.35
Weibull's Resistanta	1st	7-16	4.74	
	2nd	9- 3	.93	5.67
Common Alsike	1st	6-25	1.36	
	2nd	---	0	1.36
Tetra Alsike	1st	7- 3	2.03	
	2nd	---	0	2.03
Vernal Alfalfa	1st	6-30	1.57	
	2nd	8-15	2.03	3.60
Cicer Vetch	1st	7- 3	2.12	
	2nd	9- 3	.42	2.54
Sanfoin	1st	6-25	2.75	
	2nd	8- 6	1.19	3.94

TITLE: Montana Uniform Intrastate Orchardgrass

LOCATION: Northwestern Montana Branch Station

PERSONNEL: C. W. Roath and Montana Forage Research Committee

DURATION: 1959 - 1962

OBJECTIVES: Objectives, reasons for the study, and procedures are those adopted by the Research Committee.

1962 annual data are tabulated on attached pages.

RESULTS: Winter injury greatly reduced the yield potential of all varieties and some possible more than others.

- A. Dryland yields were low. Only one cutting was secured. No significance in data. Wisc. 52 and Avon highest.
- B-C. Irrigated yields from two cuttings exceeded two tons in only a few varieties. One variety was below Potomac at the five percent level. Iowa 6 and Wisc. 52 highest.
- D. Chinook equaled Potomac in livability in a separate nursery.

SIGNIFICANT FINDINGS: Data would hardly support consideration for release of a replacement of Potomac with another early variety. However, a later variety such as Pennlate which is equally as hardy and productive would be welcomed.

Table A. Dryland Orchardgrass - 1962. Tons per acre at 12% moisture.

Variety	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Total	Ave.
Potomac	.75 <u>1</u>	.70	.67	.51	2.63	.66
Akaroa	.46 <u>1</u>	.14 <u>1</u>	.91	.35 <u>1</u>	1.86	.47
Aurora	.69	.84	.76	.77	3.06	.77
Commercial	.65 <u>1</u>	.44	.89	.67 <u>1</u>	2.65	.66
Iowa 1	.76	.72	.91	.62	3.01	.75
Iowa 6	.36	.80	.78	.71	2.65	.66
Ky. Syn.	.41	.81	.71	.77	2.70	.68
Latar	.40 <u>1</u>	.45	.42	.65	1.92	.48
Pa. Early	.70	.37	.61	.70	2.38	.60
Pa. Medium	.64	.65	.60	.57	2.46	.62
Pennlate	.81	.50	.70	.59	2.60	.65
Avon	1.04	.59	.86	.79	3.28	.82
Danish	.83	.54	.27 <u>1</u>	.48 <u>1</u>	2.12	.53
Wisc. 52	1.31	.67	.77	.73	3.48	.87
Utah Syn. 2	.86	.61	.51	.58	2.56	.64
S - 26	.45	.15 <u>1</u>	.37 <u>1</u>	.32 <u>1</u>	1.29	.32
S - 37	.79	.35 <u>1</u>	.73 <u>1</u>	.81 <u>1</u>	2.68	.67
S - 143	.70	1.16 <u>1</u>	.48 <u>1</u>	.32 <u>1</u>	2.66	.67
Trogdon	1.14	.65	.39	.87	3.05	.76

1 Plots thought to be showing severe winter injury at time of cutting.

Continued —

Table A. (Continued)

Analysis of Variance				\bar{x} .....	.64526
Source	D.F.	Mean Square	F	S.E. \bar{x} .....	.10225
Replications	3	.06918	1.65	L.S.D.	NS
Varieties	18	.06755	1.61	C.V.	15.85%
Error	54	.04182			
Total	75				

Table B. Irrigated Orchardgrass - 1962. Tons per acre by cuttings on June 6th and July 23rd.

Variety	Cut	Replications				Total	Ave.	
		I	II	III	IV			
Potomac	1st	.62	1.20	1.38	1.09	4.29	1.07	
	2nd	.42	.95	.79	.91	3.07	.77	1.84
Akaroa	1st	.57	.87	1.14	.80	3.38	.85	
	2nd	.72	.92	1.04	.57	3.25	.81	1.66
Aurora	1st	.91	1.46	1.26	1.07	4.70	1.18	
	2nd	.69	.73	.91	.81	3.14	.79	1.97
Commercial	1st	1.22	.92	1.39	1.05	4.58	1.15	
	2nd	.87	.84	.70	.62	3.03	.76	1.91
Iowa 1	1st	1.14	1.51	.87	1.28	4.80	1.20	
	2nd	.81	.90	.72	.66	3.09	.77	1.97
Kty. Syn.	1st	1.48	1.65	1.11	.98	5.22	1.31	
	2nd	.72	.84	.79	.69	3.04	.76	2.07
Latar	1st	1.15	1.15	1.02	.99	4.31	1.08	
	2nd	.66	.77	.67	.82	2.92	.73	1.81
Pa. Early	1st	1.34	1.07	1.42	1.14	4.97	1.24	
	2nd	.87	.65	.68	.77	2.97	.74	1.98
Pa. Med.	1st	1.19	1.55	1.05	1.04	4.83	1.21	
	2nd	.85	.92	.87	.84	3.48	.87	2.08
Pennlate	1st	1.21	1.26	1.03	1.00	4.50	1.13	
	2nd	.77	1.00	.84	.78	3.39	.85	1.98
Avon	1st	1.53	1.34	1.36	1.02	5.25	1.31	
	2nd	.90	.66	.61	.68	2.85	.71	2.02
Danish	1st	1.13	1.34	1.14	.92	4.53	1.13	
	2nd	.77	.90	.61	.65	2.93	.73	1.86
Wisc. 52	1st	1.32	1.38	1.52	1.07	5.29	1.32	
	2nd	.79	.82	.98	.66	3.25	.81	2.13
Utah Syn. 2	1st	.86	1.20	.87	.95	3.88	.97	
	2nd	.59	.85	.62	.90	2.96	.74	1.71
S - 26	1st	.93	.92	.83	.89	3.57	.89	
	2nd	.64	1.06	.72	.82	3.24	.81	1.70
S - 37	1st	.89	.91	1.13	.98	3.91	.98	
	2nd	.59	1.09	.91	.81	3.40	.85	1.83
S - 143	1st	.61	.97	.92	.56	3.06	.77	
	2nd	.36	.72	.69	.64	2.41	.60	1.37
Trogdon	1st	1.37	1.30	1.08	1.13	4.88	1.22	
	2nd	.58	.73	.76	.89	2.96	.74	1.96
Iowa 6	1st	1.41	1.47	1.38	1.05	5.31	1.33	
	2nd	.93	1.06	.66	.65	3.30	.83	2.16

Table C. Irrigated Orchards - 1962. Season's yields in tons per acre at 12% moisture.

Variety	Replications				Total	Average
	I	II	III	IV		
Potomac	1.04	2.15	2.17	2.00	7.36	1.84
Akaroa	1.29	1.79	2.18	1.37	6.63	1.66
Aurora	1.60	2.19	2.17	1.88	7.84	1.96
Commercial	2.09	1.76	2.09	1.67	7.61	1.90
Iowa 1	1.95	2.41	1.59	1.94	7.89	1.97
Kentucky Syn.	2.20	2.49	1.90	1.67	8.26	2.07
Latar	1.81	1.92	1.69	1.81	7.23	1.81
Pa. Early	2.21	1.72	2.10	1.91	7.94	1.99
Pa. Medium	2.04	2.47	1.92	1.88	8.31	2.08
Pennlate	1.98	2.26	1.87	1.78	7.89	1.97
Avon	2.43	2.10	1.97	1.70	8.20	2.05
Danish	1.90	2.24	1.75	1.57	7.46	1.86
Wisc. 52	2.11	2.20	2.50	1.73	8.54	2.14
Utah Syn. 2	1.45	2.05	1.49	1.85	6.84	1.71
S - 26	1.57	1.98	1.55	1.71	6.81	1.70
S - 37	1.48	2.00	2.04	1.79	7.31	1.83
S - 143	.97	1.69	1.61	1.20	5.47	1.37 *
Trogdon	1.95	2.03	1.84	2.02	7.84	1.96
Iowa 6	2.34	2.53	2.04	1.70	8.61	2.15

Note: Potomac is used as the check

* Varieties yielding significantly less than the check (.05).

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	.46561	6.71 **
Varieties	18	.14684	2.11 **
Error	54	.06944	

\bar{x}	1.90
S.E. \bar{x}.....	.13176
L.S.D.(.05).....	.38
L.S.D.(.01).....	.50
C.V.	6.95%

Table D. Stand data for Orchard variety evaluation 1962. Based on five readings per plot.

Variety	Dryland					Irrigated				
	Replications					Replications				
	I	II	III	IV	Ave.	I	II	III	IV	Ave.
Chinook	99	100	96	98	98.25	98	100	99	96	98.25
Potomac	93	98	97	99	96.75	100	96	99	95	97.50

TITLE: Uniform Intrastate Wheatgrass

PROJECT NUMBER: 5022

PERSONNEL: C. W. Roath and Montana Forage Research Committee

LOCATION: Northwestern Montana Branch Station

DURATION: 1960 - 1963

OBJECTIVES: The objectives, reasons for the study, and procedure are those adopted by the Research Committee. 1962 annual data are tabulated on attached pages.

RESULTS:

- A. Irrigated yields in one cutting varied from 1.26 to 2.69 tons per acre at twelve percent moisture. Analysis indicates significance. Some varieties were lower but none higher than Neb. 50. No regrowth of consequence this season.
- B. Dryland yields varied from .25 to 2.88 tons per acre at twelve percent moisture. Data highly significant. S. Dak. 20 higher in yield than Neb. 50 at one percent level.
- C-D. Stands equal those during the previous season.
- D. Spread is greatest for Sodar Streambank. None of the Tall varieties spread in excess of Standard Crested. Intermediate and Pubescent varieties have similar spreading tendency relatively double that of Crested since seeding in 1960 but with some variation between varieties.
- E. By date of initial bloom Pubescents and Intermediates are similar in maturity and most Talls ten days later.

PLANS: Put late Talls with late legumes in hay mixture study. Harvest present nurseries in 1963.

SIGNIFICANT FINDINGS: S. Dak. 20 (Oahe) outstanding as a dryland variety.

Table A. Irrigated Wheatgrasses - 1962. Tons per acre at 12% moisture. 60 square feet cut July 11.

Variety	Replications				Total	Average
	I	II	III	IV		
Whitmar	1.51	1.39	1.59	1.17	5.66	1.42 **
Siberian P 27	2.10	1.82	2.21	1.62	7.75	1.94
Crested Standard	1.81	1.50	.87	.85	5.03	1.26 **
Tall Mandan 1422	2.67	2.17	3.03	2.44	10.31	2.58
Tall Neb. P.I. 985263	2.41	2.62	2.21	1.99	9.23	2.31
Tall S 64	2.20	2.96	2.05	1.90	9.11	2.28
Tall Aikar	2.28	2.54	2.61	1.72	9.15	2.29
Tall A 12465	2.08	1.87	3.45	2.31	9.71	2.43
Int. Amur	2.29	2.38	1.83	1.92	8.42	2.11
Int. Greenar	2.55	1.89	4.26	2.04	10.74	2.69
Int. Idaho 3	2.60	2.61	2.13	1.85	9.19	2.30
Int. Neb. 50	2.40	2.03	3.11	1.85	9.39	2.35
Int. Ree	2.41	2.68	2.67	2.48	10.24	2.56
Int. S. Dak. 20	2.18	2.58	3.23	1.97	9.96	2.49
Pub. Mandan 759	2.33	1.77	1.55	1.74	7.39	1.85
Pub. Topar	1.79	1.95	2.38	1.52	7.64	1.91
Pub. Utah 109	2.27	2.90	2.18	1.85	9.20	2.30
Streambank Sodar	1.30	1.51	1.96	.28	5.05	1.26 **

Note: Int. Neb. 50 is used as the check.

* Varieties yielding significantly less than the check (.05).

** Varieties yielding significantly less than the check (.01).

\bar{x}	2.13
S.E. \bar{x}.....	.21143
L.S.D. (.05) ..	.60
L.S.D. (.01) ..	.80
C.V.	9.94%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	1.35132	7.56 **
Varieties	17	.77280	4.32 **
Error	51	.17881	

Table B. Dryland Wheatgrasses - 1962.

Variety	Replications				Total	Average
	I	II	III	IV		
Whitmar	.70	.42	.50	.22	1.84	.46 <u>2</u>
Siberian P 27	1.53	1.20	1.59	1.11	5.43	1.36
Standard Crested	.57	.61	.40	1.31	2.89	.72 <u>2</u>
Tall Mandan 1422	1.49	1.12	1.16	.62	4.39	1.10 <u>1</u>
Tall Neb. P.I. 985263	1.03	.97	.59	.87	3.46	.87 <u>2</u>
Tall S 64	1.60	1.35	1.34	1.37	5.66	1.42
Tall Alkar	1.49	1.33	1.21	1.53	5.56	1.39
Tall A 12465	1.40	1.15	1.32	1.07	4.94	1.24
Int. Amur	1.72	1.70	1.39	1.34	6.15	1.54
Int. Greenar	1.88	1.95	1.71	1.83	7.37	1.84
Int. Idaho 3	1.13	1.51	1.63	2.06	6.33	1.58
Int. Neb. 50	1.63	1.76	1.53	1.24	6.16	1.54
Int. Ree	1.81	1.71	1.98	1.87	7.37	1.84
Int. S. Dak. 20	2.48	2.62	3.17	3.25	11.52	2.88 **
Pub. Mandan 759	1.64	1.34	1.68	1.33	5.99	1.50
Pub. Topar	.74	.71	1.17	.90	3.52	.88 <u>2</u>
Pub. Utah 109	1.24	1.28	1.40	1.97	5.89	1.47
Streambank Sodar	.26	.24	.23	.28	1.01	.25 <u>2</u>

Note: Int. Neb. 50 is used as the check.

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

1 Varieties yielding significantly less than the check (.05).

2 Varieties yielding significantly less than the check (.01).

\bar{x}	1.33
S.E. \bar{x}.....	.12526
L.S.D.(.05).....	.36
L.S.D.(.01).....	.48
C.V.	9.45%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	.02107	
Varieties	17	1.38992	22.15 **
Error	51	.06276	

Table C. Stand data for irrigated wheatgrass, Creston, Montana, April 23, 1962.
Based on five readings with twenty units. Percent stand.

Variety	Replications				Total	Average
	I	II	III	IV		
Whitmar	14	8	12	22	56	14
Siberian	86	86	75	69	316	79
Standard Crested	—	—	—	—	—	—
Mandan 1422 Tall	81	92	94	76	343	86
Neb. P.I. 985263	57	60	44	57	218	55
S 64 Tall	89	92	95	94	370	93
Alkar Tall	87	90	86	92	355	89
A 12465 Tall	93	91	94	91	369	92
Amur Intermediate	80	84	74	75	313	78
Greenar Intermediate	88	92	86	81	347	87
Idaho 3 Intermediate	83	72	55	70	280	70
Neb. 50 Intermediate	76	86	62	68	292	73
Ree Intermediate	89	78	72	84	323	81
S. Dak. 20 Int.	91	87	86	92	356	89
Man. 759 Pub.	72	74	79	69	294	74
Topar Pub.	80	61	78	75	293	73
Utah 109 Pub.	82	72	67	92	313	78
Sodar Streambank	95	94	63	88	340	85

Table D. Stand and spread data for dryland wheatgrass at Creston, Montana, April 20, 1962. Based on five readings with twenty units and five readings with twelve units of frame.

Variety	Percent Stand						Spread					
	Replications				Total	Ave.	Replications				Total	Ave.
	I	II	III	IV			I	II	III	IV		
Whitmar	37	41	27	32	137	34	4.0	4.0	4.0	4.0	16.0	4.0
Siberian	82	93	88	77	340	85	4.6	4.0	4.2	4.0	16.8	4.2
Standard Crested	17	13	23	22	75	19	5.2	4.8	4.0	4.0	18.0	4.5
Mandan 1422 Tall	72	82	84	72	310	78	4.2	5.6	4.2	4.0	18.0	4.5
Neb. P.I. 985263	43	46	19	52	160	40	4.0	4.0	4.2	4.0	16.2	4.1
S 64 Tall	77	88	91	79	335	84	4.0	4.4	4.0	4.0	16.4	4.1
Alkar Tall	69	77	86	75	307	77	4.0	4.2	4.2	4.0	16.4	4.1
A 12465 Tall	62	70	81	69	282	71	4.0	4.0	4.4	4.0	16.4	4.1
Amur Int.	74	74	71	80	299	75	9.0	8.8	8.6	8.2	34.6	8.7
Greenar Int.	81	88	87	83	339	85	7.2	8.4	6.2	7.0	28.8	7.2
Idaho 3 Int.	75	82	75	78	310	78	6.4	7.4	7.4	8.2	29.4	7.4
Neb. 50 Int.	81	85	79	83	328	82	8.6	8.0	7.8	7.4	31.8	8.0
Ree Int.	72	81	70	92	315	79	8.2	7.6	7.2	8.4	31.4	7.9
S. Dak. 20 Int.	84	86	86	88	344	86	8.0	8.4	7.6	7.2	31.2	7.8
Man. 759 Pub.	77	64	87	73	301	75	7.8	7.6	9.0	8.0	32.4	8.1
Topar Pub.	67	77	88	82	314	79	7.8	9.4	7.8	8.2	33.2	8.3
Utah 109	75	66	75	91	307	77	7.0	6.2	7.6	7.8	28.6	7.2
Sodar Streambank	85	84	84	86	339	85	10.6	10.2	9.4	9.6	39.8	10.0

Table E. Wheatgrass Maturity - 1962.

Variety	Stage 6-18	Rate of Bloom & Cut	Tons per Acre ¹ / ₋
Whitmar	Headed	7- 8	1.69
Siberian	Headed	7- 8	1.69
Standard Crested	Headed	—	—
Mandan 1422 Tall	Heading	7-16	2.37
Neb. P.I. 985263 Tall	Boot	7-21	3.90
S 64 Tall	Boot	7-21	2.37
Alkar Tall	Boot	7-21	3.39
A 12465 Tall	Boot	7-21	4.15
Amur Int.	Heading	7-11	1.52
Greenar Int.	Heading	7-11	1.91
Idaho 3 Int.	Heading	7-11	1.61
Neb. 50 Int.	Heading	7-11	2.33
Ree Int.	Heading	7-11	1.52
S. Dak. 20 Int.	Heading	7-11	2.16
Man. 759 Pub.	Heading	7-11	1.78
Topar Pub.	Headed	7- 9	1.86
Utah 109 Pub.	Heading	7- 9	2.63
Sodar Streambank	Headed	6-25	1.57

¹ Tons per acre at twelve percent moisture from nine square feet of single plot samples.

TITLE: Potato Production - Determine the Effect of Potash and Other Fertilizers on Yield and Quality of Potatoes

PROJECT NUMBER: 5027

LOCATION: Lake and Flathead Counties

PERSONNEL: C. W. Roath, G. M. Smith, and Soils Research Committee in cooperation with Extension personnel and potato growers

DURATION: 1962 - 1965

OBJECTIVES:

1. Determine effects of fertilizer elements in various combinations upon yield of potatoes grown on Northwestern Montana soils
2. Determine effects upon specific gravity, hollow heart incidence, and other measurable quality factors
3. Develop sound recommendations for production of economic yields of quality potatoes.

1962 annual data is tabulated for the Lake County location in Tables A - C and the Flathead County location in Tables D - F.

OBSERVATIONS:

Observations were taken at the Lake County location on July 2, August 9, and August 23. On July 2 checks were noticeably light green in color and small. Those with only 24# N were light green and had fair growth. Those with only 19# P were medium dark green in color and vigorous. All four plots with 16# K were called dark green and vigorous, while all four with 184# K were called medium green and vigorous. On August 9 one hill from each treatment was dug and the tubers cut and observed for indication of hollow heart. Aside from the fact that some were more brittle than others and would split more easily, none was found. On August 23 one hill was dug in three replications of all treatments. Hollow tubers were found in three of the seventy-two plots dug.

Observations were made at the Flathead County location August 5 and 25. On August 5 vines on check plots and those with 225# N were noticeably smaller than on those with 75# N. Differences in color and size were much less than at the Lake County location. On August 25 vines on all checks plus some on plots receiving only 19# P and some on plots receiving 225# N were small and off-color, otherwise by vine character there was no noticeable difference. Some discoloration of vascular system was noted in tubers cut but only two hollow tubers were found in seventy-two hills dug.

RESULTS:

Potatoes at the Lake County location were found to be varying in yield from 137 for checks to 343 hundred weight per acre for the best fertilizer treatment on a field run basis. Sorted yields varied from 133 to 305 hundred weight per acre. Analysis of variance shows all treatments to be above the checks at the one percent level. Hollow heart incidence was much lower than in the 1961 trial.

At the Flathead County location yields varied to a lesser degree from 134 to 207 hundred weight per acre field run and 108 to 158 hundred weight per acre sorted. Analysis of Variance shows most treatments to yield are above checks at the one percent level. Exceptions on a field run basis are treatments 3 and 7, both with 225# N per acre, 12 with only 19# Phosphoric Acid, and 24 with minor elements. On a sorted basis no treatment having 225# N reached significance at the one percent level. No hollow heart was found.

EFFECT OF TREATMENTS:

Table H shows yield increases to be due both to increase in set (number of tubers per plot) and to increase in size when compared to checks.

Numbers varied from 139 to 183 in Lake and from 121 to 158 in Flathead. Size varied from .197 pounds (3.15 ounces) to .402 pounds (6.43 ounces) in Lake and from .267 pounds (4.27 ounces) to .317 pounds (5.07 ounces) in Flathead. This is a four plot average number and size for field run tubers.

Table A . Potato Fertilizer Trial - 1962 in Lake County. Yield per acre, four replications, 1/500 acre plots, field run tubers.

Treatments No.	Major Elements			Minor Elements	Replications				Total	Average
	N	P	Kcl		I	II	III	IV		
1	0	0	0	0	155.0	125.0	147.5	120.0	547.5	137
2	75	60	50	0	257.5	292.5	267.5	197.5	1015.0	254 **
3	225	60	50	0	300.0	247.5	280.0	310.0	1137.5	284 **
4	75	180	50	0	200.0	255.0	250.0	250.0	955.0	239 **
5	225	180	50	0	277.5	307.5	297.5	332.5	1215.0	304 **
6	75	60	150	0	287.5	330.0	325.0	282.5	1225.0	306 **
7	225	60	150	0	320.0	307.5	305.0	330.0	1262.0	316 **
8	75	180	150	0	300.0	305.0	325.0	300.0	1230.0	308 **
9	225	180	150	0	377.5	332.5	310.0	325.0	1345.0	336 **
10	24	120	100	0	235.0	260.0	220.0	210.0	925.0	231 **
11	276	120	100	0	262.5	280.0	257.5	297.5	1097.5	274 **
12	150	19	100	0	285.0	315.0	265.0	312.5	1177.5	294 **
13	150	221	100	0	325.0	332.5	265.0	305.0	1227.5	307 **
14	150	120	16	0	327.5	240.0	300.0	310.0	1177.5	294 **
15	150	120	184	0	317.5	377.5	385.0	290.0	1370.0	343 **
16	150	120	100	0	322.5	310.0	300.0	355.0	1287.5	322 **
17	75	180	50	1	277.5	257.5	325.0	235.0	1095.0	274 **
18	225	180	50	1	315.0	277.5	250.0	312.5	1155.0	289 **
19	75	180	150	1	317.5	300.0	317.5	305.0	1240.0	310 **
20	225	180	150	1	317.5	340.0	340.0	340.0	1377.5	334 **
21	150	120	100	2	302.5	365.0	315.0	330.0	1312.5	328 **
22	150	120	100	2	315.0	270.0	325.0	295.0	1205.0	301 **
23	150	120	100	2	310.0	290.0	325.0	360.0	1285.0	321 **
24	150	120	100	2	322.5	305.0	325.0	275.0	1227.5	307 **
1	K ₂ SO ₄								x.....	292.2
2	All minor elements except boron								S.E.x.....	13.70945
3	Both sulfate and nitrate forms of N								L.S.D.(.05)...	38.6
**	Treatments yielding significantly more than the check (.01).								L.S.D.(.01)...	51.4
									C.V.	4.69%

Table B. Potato Fertilizer Trial - 1962 in Lake County. Yields per acre of sorted tubers from four replications, 1/500 acre plots.

No.	Treatments			Minor Elements		Rep. 1	Rep. 2	Rep. 3	Rep. 4	Total	Average	Average Cwt.
	N	P	Kcl	Elements								
1	0	0	0	0	0	15,250	12,500	14,250	11,500	53,500	13,375	133.75
2	75	60	50	0	0	24,250	26,250	24,250	18,250	93,000	23,250	232.50 **
3	225	60	50	0	0	25,000	23,000	23,750	28,500	100,250	25,063	250.63 **
4	75	180	50	0	0	17,250	22,000	24,000	22,500	85,750	21,438	214.38 **
5	225	180	50	0	0	26,750	26,250	26,750	31,000	110,750	27,688	276.88 **
6	75	60	150	0	0	25,250	27,000	29,750	24,500	106,500	26,625	266.25 **
7	225	60	150	0	0	27,500	26,250	26,000	29,250	109,000	27,250	272.50 **
8	75	180	150	0	0	24,500	28,750	28,500	26,000	107,750	26,938	269.38 **
9	225	180	150	0	0	33,500	29,750	27,250	30,000	120,500	30,125	301.25 **
10	24	120	100	0	0	21,500	22,500	20,250	20,000	84,250	21,063	210.63 **
11	276	120	100	0	0	21,500	24,250	21,000	25,750	92,500	23,125	231.25 **
12	150	19	100	0	0	25,000	28,750	22,000	28,750	104,500	26,125	261.25 **
13	150	221	100	0	0	30,000	30,750	23,500	28,250	112,500	28,125	281.25 **
14	150	120	16	0	0	30,000	22,000	28,500	29,000	109,500	27,375	273.75 **
15	150	120	184	0	0	27,750	34,750	34,500	25,000	122,000	30,500	305.00 **
16	150	120	100	0	0	29,500	28,500	26,500	32,750	117,250	29,313	293.13 **
17	75	180	50	1	1	25,500	24,250	31,000	21,000	101,750	25,438	254.38 **
18	225	180	50	1	1	27,500	26,250	20,500	29,250	103,500	25,875	258.75 **
19	75	180	150	1	1	28,000	27,250	27,750	28,750	111,750	27,938	279.38 **
20	225	180	150	1	1	26,500	29,250	29,250	30,500	115,500	28,875	288.75 **
21	150	120	100	1	1	26,500	34,500	29,000	30,250	120,250	30,063	300.63 **
22	150	120	100	0	0	28,750	24,750	27,750	24,500	105,750	26,438	264.38 **
23	150	120	100	x	x	28,250	26,000	27,750	33,000	115,000	28,750	287.50 **
24	150	120	100	x	x	29,000	25,000	27,750	25,250	107,000	26,750	267.50 **

\bar{x} 261.46
 S.E. \bar{x} 14.24
 L.S.D. (.05) 40.07
 L.S.D. (.01) 53.37
 C.V. 5.44%

1 K_2SO_4
 2 All minor elements except boron
 3 Both Sulfate and Nitrate forms of N
 ** Treatments yielding significantly more than the check (.01).

Table C. Yield analysis of potato fertility study on the Walt Mangles farm located in Lake County near Polson, Montana in 1962.

No.	Treatment			Field Run	Hollow Heart
	N	P	K		
15	150	120	184	343	
9	225	180	150	336	x
20	225	180	150	334	
21	150	120	100	328	x
16	150	120	100	322	
23	150	120	100	321	
7	225	60	150	316	
19	75	180	150	310	
8	75	180	150	308	
24	150	120	100	307	
13	150	221	100	307	
6	75	60	150	306	
5	225	180	50	304	
22	150	120	100	301	
14	150	120	16	294	x
12	150	19	100	294	x
18	225	180	50	289	
3	225	60	50	284	x
11	276	120	100	274	
17	75	180	50	274	
2	75	60	50	254	x
4	75	180	50	239	x
10	24	120	100	231	x
1	0	0	0	137	
				<u>SORTED</u>	
15	150	120	184	305.00	
9	225	180	150	301.25	x
21	150	120	100	300.63	x
16	150	120	100	293.13	
20	225	180	150	288.75	
23	150	120	100	287.50	
13	150	221	100	281.25	
19	75	180	150	279.38	
5	225	180	50	276.88	
14	150	120	16	273.75	x
7	225	60	150	272.50	
8	75	180	150	269.38	
24	150	120	100	267.50	
6	75	60	150	266.25	
22	150	120	100	264.38	
12	150	19	100	261.25	x
18	225	180	50	258.75	
17	75	180	50	254.38	
3	225	60	50	250.63	x
2	75	60	50	232.50	x
11	276	120	100	231.25	
4	75	180	50	214.38	x
10	24	120	100	210.63	x
1	0	0	0	133.75	

Table D. Potato Fertilizer Trial - Flathead County in 1962. Yield per acre, four replications, 1/415 acre plots, field run tubers.

No.	Treatment			Minor Elements	Replications				Total	Average	
	N	P	K		I	II	III	IV			
1	0	0	0	0	145.3	107.9	149.4	132.8	535.4	133.8	
2	75	60	50	0	186.8	190.9	172.2	244.9	794.8	198.7 **	
3	225	60	50	0	149.4	128.7	153.6	170.2	601.9	150.5	
4	75	180	50	0	170.2	203.4	209.6	186.8	770.0	192.5 **	
5	225	180	50	0	155.6	170.2	182.6	182.6	691.0	172.8 **	
6	75	60	150	0	178.4	174.3	147.3	188.8	688.8	172.2 **	
7	225	60	150	0	130.7	107.9	195.1	139.0	572.7	143.2	
8	75	180	150	0	195.1	190.9	197.1	190.9	774.0	193.5 **	
9	225	180	150	0	180.5	155.6	174.3	172.2	682.6	170.7 **	
10	24	120	100	0	168.1	170.2	182.6	180.5	701.4	175.4 **	
11	276	120	100	0	157.7	149.4	195.1	193.0	695.2	173.8 **	
12	150	19	100	0	118.3	157.7	147.3	122.4	545.7	136.4	
13	150	221	100	0	174.3	168.1	201.3	182.6	726.3	181.6 **	
14	150	120	16	0	170.2	163.9	182.6	180.5	697.2	174.3 **	
15	150	120	184	0	155.6	170.2	184.7	213.7	724.2	181.1 **	
16	150	120	100	0	168.1	186.8	163.9	199.2	718.0	179.5 **	
17	75	180	50	$\frac{1}{1}$	0	182.6	193.0	195.1	230.3	801.0	200.3 **
18	225	180	50	$\frac{1}{1}$	0	145.3	174.6	184.7	199.2	703.8	176.0 **
19	75	180	150	$\frac{1}{1}$	0	193.0	180.5	224.1	232.4	830.0	207.5 **
20	225	180	150	$\frac{1}{1}$	0	170.2	197.1	161.9	182.6	711.8	178.0 **
21	150	120	100	$\frac{1}{1}$	0	174.3	180.5	184.7	205.4	744.9	186.2 **
22	150	120	100	$\frac{2}{3}$	0	166.0	170.2	199.2	207.5	742.9	185.7 **
23	150	120	100	$\frac{2}{3}$	x	180.5	176.4	211.7	178.5	747.1	186.8 **
24	150	120	100	$\frac{2}{2}$	x	161.9	174.3	149.4	159.8	645.4	161.4 *

<u>1</u>	K ₂ SO ₄	\bar{x}	175.5
		S.E. \bar{x}	8.4
<u>2</u>	All minor elements except boron	L.S.D. (.05)...	23.64
		L.S.D. (.01)...	31.48
<u>3</u>	All minor elements	C.V.	4.78%

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

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

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	2387.05	8.46 **
Treatments	23	1461.51174	5.17 **
Error	69	282.27072	
Total	95		

Table E. Potato Fertilizer Trial - Flathead County in 1962. Yield per acre, four replications, 1/415 acre plots, sorted tubers.

No.	Treatments			Minor Elements	Replications				Total	Average
	N	P	K		I	II	III	IV		
1	0	0	0	0	128.7	91.3	105.8	107.9	433.7	108.4
2	75	60	50	0	151.5	139.4	101.7	199.2	591.8	148.0 **
3	225	60	50	0	126.6	107.9	126.6	134.9	496.0	124.0
4	75	180	50	0	124.5	155.6	161.9	137.0	579.0	144.8 **
5	225	180	50	0	139.0	137.0	143.2	128.7	547.9	137.0 *
6	75	60	150	0	143.2	126.6	116.2	147.5	533.5	133.4 *
7	225	60	150	0	105.8	85.1	145.3	92.4	428.6	107.2
8	75	180	150	0	147.3	161.9	155.6	149.4	615.2	153.6 **
9	225	180	150	0	145.3	116.2	141.1	139.0	541.6	135.4 *
10	24	120	100	0	137.0	126.6	132.8	149.4	545.8	139.0 *
11	276	120	100	0	118.3	120.4	145.3	141.1	525.1	131.3
12	150	19	100	0	89.2	132.8	118.3	91.3	431.6	107.9
13	150	221	100	0	143.2	132.8	137.0	118.3	531.3	132.8 *
14	150	120	16	0	143.2	139.0	141.1	128.7	552.0	138.0 *
15	150	120	184	0	120.4	137.0	116.2	155.6	529.2	132.3 *
16	150	120	100	0	143.2	137.0	122.4	161.9	564.5	141.1 **
17	75	180	50	1	134.9	141.1	126.6	168.1	570.7	142.7 **
18	225	180	50	1	116.2	120.4	147.3	124.5	508.4	127.1
19	75	180	150	1	153.6	126.6	170.2	182.6	633.0	158.3 **
20	225	180	150	1	124.5	155.6	114.1	143.2	537.4	134.4 *
21	150	120	100	1	143.2	134.9	147.3	145.3	570.7	142.7 **
22	150	120	100	2	120.4	134.9	149.4	132.8	537.5	134.4 *
23	150	120	100	2	159.8	128.7	163.9	128.7	581.1	145.3 **
24	150	120	100	2	141.1	126.6	124.5	126.6	518.8	129.7

1	K_2SO_4	X.....	134.4
		S.E. \bar{x}	8.49
2	All minor elements except boron	L.S.D.(.05)...	23.90
		L.S.D.(.01)...	31.83
3	All minor elements	C.V.	6.32%

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

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	352.24333	1.22
Treatments	23	673.43783	2.33 **
Error	69	288.56536	
Total	95		

Table F. Yield analysis of potato fertility study on the Koenig farm in Flathead County - 1962.

No.	Treatments			Yield
	N	P	K	
19	75	180	150 $\frac{1}{2}$	207.5
17	75	180	50 $\frac{1}{2}$	200.3
2	75	60	50	198.7
8	75	180	150	193.5
4	75	180	50	192.5
23	150	120	100	186.8
21	150	120	100 $\frac{1}{2}$	186.2
22	150	120	100	185.7
13	150	221	100	181.6
15	150	120	184	181.1
16	150	120	100	179.5
20	225	180	150 $\frac{1}{2}$	178.0
18	225	180	50 $\frac{1}{2}$	176.0
10	24	120	100	175.4
14	150	120	16	174.3
11	276	120	100	173.8
5	225	180	50	172.8
6	75	60	150	172.2
9	225	180	150	170.7
24	150	120	100	161.4
3	225	60	50	150.5
7	225	60	150	143.2
12	150	19	100	136.4
1	0	0	0	133.8

 $\frac{1}{2}$ K_2SO_4

Table G. Incidence of hollow heart - Lake County in 1962.

No.	N	P	K	Form of K	No. Reps.
2	75	60	50	Cl	2
4	75	180	50	Cl	3
5	225	180	50	Cl	1
9	225	180	150	Cl	1
10	24	120	100	Cl	2
12	150	19	100	Cl	1
14	150	120	16	Cl	1
17	75	180	50	SO ₄	3
18	225	180	50	SO ₄	1
19	75	180	150	SO ₄	3
20	225	180	150	SO ₄	1
21	150	120	100	SO ₄	2

Table H. Pounds per plot, tubers per plot, and average size of tubers in Lake and Flathead Counties - 1962. Four plot averages.

Treatment Number	Lake County			Flathead County		
	Lbs.	No.	Size	Lbs.	No.	Size
1	27.4	139	.197	32.3	121	.267
2	50.8	150	.339	47.9	151	.317
3	56.9	168	.339	36.3	123	.295
4	47.8	150	.319	46.4	149	.311
5	60.8	155	.392	41.6	144	.288
6	61.3	165	.372	41.3	139	.297
7	63.1	157	.402	34.5	117	.295
8	61.5	162	.380	46.6	158	.295
9	67.3	183	.368	41.1	132	.311
10	46.3	161	.288	42.3	153	.276
11	54.9	150	.366	41.9	138	.304
12	58.9	171	.344	32.9	117	.281
13	61.4	167	.368	43.8	141	.311
14	58.9	167	.353	42.0	142	.296
15	68.5	183	.374	43.6	146	.299
16	64.4	176	.366	43.3	138	.314
17	54.8	157	.349	48.3	157	.308
18	57.8	165	.350	42.4	138	.307
19	62.0	182	.341	50.0	163	.307
20	66.9	170	.394	42.9	141	.304
21	65.6	170	.386	44.9	153	.293
22	60.3	177	.341	44.8	144	.311
23	66.8	169	.395	45.0	148	.304
24	61.4	153	.401	38.9	135	.288

TITLE: Potato Production

PROJECT NUMBER: 5027

OBJECTIVES:

1. Determine effect of potash and other fertilizers
2. Study rotation effects
3. Evaluate Montana crosses.

1962 WORK AND RESULTS:

1. Determine effect of potash and other fertilizers. A separate report for the Soils Research Committee is included in this section
2. Study rotation effects.

1962 WORK AND RESULTS:

Plot 1: Soybeans planted May 29. plowed under when 18-24 inches high in Sept.

Plot 2: Netted Gem potatoes planted following sweet clover in 1961 on May 24. Four rows 120 feet long harvested for yield:

Row 1	-	135 pounds	
Row 2	-	116 pounds	
Row 3	-	140 pounds	
Row 4	-	<u>165 pounds</u>	
Total	-	556 pounds	Average - 139 pounds
139 x 110 = 152.9 cwt. per acre			

Four rows of Triumph were included for observation of scab incidence. These had light to moderately heavy scab.

Plot 3: Planted to Netted Gem potatoes May 24. Four rows 120 feet long harvested for yield:

Row 1	-	181 pounds	
Row 2	-	170 pounds	
Row 3	-	156 pounds	
Row 4	-	<u>159 pounds</u>	
Total	-	666 pounds	Average - 166.5 pounds
166.5 x 110 = 183.15 cwt. per acre			

Four rows of Triumph potatoes included for observation of scab. These had light to moderately heavy scab. The rotation on this plot is wheat, barley, potatoes, with barnyard manure on the potatoes.

Plot 4: Red clover harvested for hay. Yield: $1\frac{1}{2}$ tons per acre.

Plot 5: Alfalfa harvested for hay. Yield: $2\frac{1}{2}$ tons per acre.

The first comparative evaluation of the rotations will be made in 1965 when all plots will be in potatoes.

Evaluate Montana Potato Crosses

Six crosses grown in 1961 and considered to be early prospects were planted April 19 in four hill rows in the garden. All had scab in this situation, much lighter scab than Triumph, however. One hill was dug July 17, one August 3, and two August 24. The tubers per hill of useful size (four ounces and over) on the three dates are:

M.S.C. Number	<u>Tubers per hill over 4 ozs.</u>			Scab	<u>Pounds per hill</u> 8/24
	<u>7/19</u>	<u>8/3</u>	<u>8/24</u>		
5903-5	3	10	6.5	Light	4.20
5903-4	3	5	6.0	Medium heavy	4.50
5915-1	2	6	7.5	Medium	5.25
5903-6	1	7	11.0	Medium heavy	6.00
5962-3	1	4	6.0	Light	2.50
5962-4	2	5	6.0	Medium	4.20
Triumph	2	5	6.5	Very heavy	3.75

These crosses and others for which sufficient seed was available from the 1961 plantings were planted in rows in the field, 50 feet to 120 feet in length, for observation under field conditions. Some were early and some late. Three that were free of scab under field conditions, reasonably early, and of nice type and color were selected for further study as early red potatoes for the area. These were 5913-2 as Sel. 1, 5903-4 as Sel. 2, and 5903-6 as Sel. 3.

In a study involving forty-eight Montana crosses these were planted in four replications of single hill plots. Each plot or hill was observed for vine character and maturity. One hill of each of the forty-eight was dug August 31, the other three after frost with Orville McCarver, Extension Horticultural Specialist, on hand to help with notes and appraisal. The tubers dug were taken to M.S.C. for official scab readings. Measurements and observations are tabulated on the following page.

It will be noted that selections 1, 2, and 3 are also in the hill planted trials this year where they performed quite well.

Montana crosses - 1962 Four replication averages, grown in four single hills, randomized and replicated plots.

No.	M.S.C. Code	Color	Type	Lbs. & ozs. /hill	Ma-turity	Scab	Ma-turity	Vine Size	Set	Faults	Comments
1	6012	Dk Red	RL	3-11	M	VL	M	VL	14	rough yel meat	
2	6012-1	Redburnt	LR	6-1	E	VL	E	S-M	11	rough irreg yel mt	
3	6015	Wh to Lt Rus	LR	3-12	L	0	L	M-L	11	hollow yel mt	
4	6016	Wh to Sl Rus	R	4-15	ME	L	ME	M	11	pink skin	
5	6021	Br Pk	LRP	4-8	ML	M	ML	L	12		
6	6024	Coarse Rus	RL	2-4	E	0	E	S	8	small	
7	6024-1	White	RP	4-3	ML	H	ML	S-M	12	scab	
8	6030	Wh to Lt Rus	LR	4-2	ME	0	ME	S	11	gr cracks yel meat	
9	6031	Russet	R	2-13	E	0	E	S	11	airchecks, irreg v yel mt	
10	6051	Pk to Redburnt	R	8-13	L	M	L	L	20	late	Late red prospect
11	6052	Pink	LRT	6-12	L	VL	L	L-VL	17	long poor shape	
12	6053	Coarse Rus	RL	2-13	E	0	E	S	9	rough gr cracks	
13	6054	Pink	LT	4-7	M	VL	M	M	16	pk skin, yel mt, hollow	
14	6070	Coarse Rus	R-LR	1-11	ME	0	ME	S	12	yel mt, small, hollow	
15	6075	Redburnt	R	5-14	ME	L	ME	S-M	9	hollow, gr cracks	
16	6077	Dark Pink	R	3-15	E	M	E	M	19	rough, gr cracks	
17	6080	Light Pink	RP	5-15	ME	VL	ME	S-M	14	flesh might be white	E. red prospect
18	6084	Ea Ohio	R-RP	5-11	ME	L	ME	S-M	18	uniform	
19	6084-1	Ea O to Rus	LRP	5-8	E	VL	E	M	13	hollow	
20	6084-2	Lt pk to Rus	R	3-0	E	VL	E	S	11	pink eyes	
21	6083	Wh to Lt Rus	RLT	4-9	ME	L	ME	S-M	12	irreg, pointed	
22	6086	Lt Pink	LR	7-0	M	M	M	L	13	bad scale	
23	6088	Coarse Rus	R	1-10	E	0	E	S	11	sl irreg	
24	60131	Lt Pink	R-RP	11-15	L	0	L	L	18	rough	
25	60152	Russet	R	1-13	ME	0	ME	S	17	small, irregular	
26	60201	Pink	R-LR	6-13	E	0	E	M	16	hollow, bud growth, cracks	

Continued ---

Montana potato crosses - 1962 (continued)

No.	M.S.C. Code	Color	Type	Lbs. & ozs. /hill	Ma-tur-ity	Vine Size	Set	Faults	Comments
27	60203	Dp Pk to Red	RIF	5-0	M	M	13	tapered	
28	60251	Pink	R	6-2	L	L	17	small, checks, pk skin	
29	60181	Russet	RIF	5-3	ML	L	9	rough, 2nd growth	
30	60266	Lt Pk	RF	7-12	M	M	15	checks	
31	60266-1	Lt Pk	R-LR	4-5	M	S	15	growth, cracks	
32	60266-2	Lt Pk	LRP	5-1	M	M	8	hollow, gr cracks	
33	60280-1	Wh to Sl Rus	LT	4-6	M	M	8	tapered, gr cracks	
34	60280-2	Wh to Sl Rus	LR	4-3	ME	S-M	12	tapered	
35	5962-7	Pk (flaky)	L	8-1	M	M	22	pink in flesh	
36	5903-6	Redburnt	R-RP	4-11	ME	S	17	small	Creston Sel. 3
37	5903-2	Pink	R-RL	6-7	M	M	14	hollow, rough	
38	5962-4	Br Pk	RF	6-1	M	S-M	16	late prospect	Late prospect
39	5913-2	Lt Pk to Rus	L	4-2	E	M	8	2nd growth, checks, hollow	Creston Sel. 1
40	5903-4	Deep Pink	R	5-2	E	S-M	14	some gr cracks	Creston Sel. 2
41	5948-11	Dk Pink	R-RP	4-5	M	L	15	hollow, checks	
42	5962-3	Pk to Rus	L	5-6	M	L	16	2nd growth, pk flesh, uneven	
43	5903-5	Wh to Lt Rus	R-RL	5-8	ME	M	16		
44	5971	Wh to Lt Rus	LRT	7-1	M	M-L	18	sl rough	
45	Netted Gem	Russet	L	4-13	M	M-L	11	2nd growth, rough, gr cracks	Netted Gem
46	5934-4	White	R-RL	3-2	ME	S	8	Irreg, yel mt, gr cracks	
47	5978-4	Russet	R-LR	3-4	ME	S	7	gr cracks	
48	Unknown	Dk Russet	R-LR	5-3	E	M-L	12	gr cracks	

TITLE: Fertilizers for Forages

PROJECT NUMBER: 5020

LOCATION: Northwestern Montana Branch Station

PERSONNEL: C. W. Roath and Forage Research Committee

DURATION: Ten years

OBJECTIVES: Determine effect on sustained yield of pastures of various annual applications of N and P₂O₅.

PROCEDURES: Apply treatments annually to four replications and three mixtures. Clip in a different plot location each harvest small samples for yield prior to each grazing. Irrigate once each harvest period. Harvest four times or when forage is twelve inches in height. Report yields in tons per acre at twelve percent moisture.

ANNUAL DATA: Tables A - C present season's yields for three mixtures and nine treatments. Table D shows early (May) yields following the severe winter of 1961-62.

RESULTS: Response to treatments varies somewhat by pasture mixture in this the second year of harvest of mixtures of orchard grass with three legumes. Analysis of variance indicates significance in response due to nitrogen for two mixtures and due to phosphorous for three mixtures with little N P interaction.

From the early harvest data (Table D) it appears that fertilizer use may have prevented winter injury or encouraged rapid recovery.

Table A. Fertilizers on Orchard-Trefoil pasture - 1962. Season's yields in tons per acre at twelve percent moisture from four clippings.

Treatment		Replications				Total	Average
N	P	I	II	III	IV		
50	40	3.73	3.65	4.02	3.42	14.82	3.71 *
100	40	4.07	3.64	3.27	3.43	14.41	3.60
0	40	3.43	3.39	3.78	2.87	13.47	3.37
100	0	4.06	4.52	3.48	3.17	15.23	3.81 **
0	80	3.46	3.52	3.26	3.26	13.50	3.38
100	80	3.99	4.08	4.24	3.65	15.96	3.99 **
50	80	4.41	4.37	3.94	4.20	16.92	4.23 **
50	0	3.19	3.09	3.97	3.76	14.01	3.50
0	0	2.84	3.05	3.61	3.00	12.50	3.13

Note: 0 - 0 is the check used in this study.
 * Treatments yielding significantly more than the check (.05).
 ** Treatments yielding significantly more than the check (.01).

\bar{x} 3.63
 S.E. \bar{x}16927
 L.S.D.(.05). .49
 L.S.D.(.01). .67
 C.V. 4.66%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	.18975	1.66
N	2	1.06998	9.34 **
P	2	.49993	4.36 **
N x P	4	.14761	1.29
Error	24	.11460	

Table B. Fertilizer on Orchard-Ladino pasture - 1962. Season's yields in tons per acre at twelve percent moisture.

Treatment		Replications				Total	Average
N	P	I	II	III	IV		
50	40	3.35	3.77	3.52	2.33	12.97	3.24 **
100	40	3.09	3.94	3.60	2.84	13.47	3.37 **
0	40	2.62	2.33	3.51	2.50	10.96	2.74 **
100	0	1.40	3.72	2.03	1.83	8.98	2.25 *
0	80	2.63	3.69	3.01	3.09	12.42	3.11 **
100	80	3.22	4.41	4.41	2.93	14.97	3.74 **
50	80	3.31	3.98	3.05	3.31	13.65	3.41 **
50	0	1.48	2.33	1.69	1.52	7.02	1.76
0	0	.98	2.80	1.99	1.47	7.24	1.81

Note: 0 - 0 is the check used in this study.
 * Treatments yielding significantly more than the check (.05).
 ** Treatments yielding significantly more than the check (.01).

\bar{x} 2.80
 S.E. \bar{x}16831
 L.S.D.(.05) .49
 L.S.D.(.01) .67
 C.V. 6.02%

Continued —

Table B. (Continued)
Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	2.10556	13.59 **
N	2	.96735	6.24 **
P	2	7.36938	47.25 **
N x P	4	.08436	
Error	24	.15497	

Table C. Fertilizer on Orchard-Alfalfa pasture - 1962. Season's yields in tons per acre at twelve percent moisture.

Treatment		Replications				Total	Average
N	P	I	II	III	IV		
50	40	3.69	4.32	4.83	4.36	17.20	4.30 *
100	40	4.02	4.44	4.82	4.91	18.19	4.55 **
0	40	3.18	4.32	3.93	4.24	15.67	3.92
100	0	3.64	3.48	4.29	2.84	14.25	3.56
0	80	4.23	4.24	4.57	4.36	17.40	4.35 **
100	80	4.46	4.70	5.00	5.55	19.71	4.93 **
50	80	4.19	5.22	4.40	5.08	18.89	4.72 **
50	0	4.11	4.49	3.73	2.59	14.92	3.73
0	0	2.50	4.27	3.09	3.52	13.38	3.35

Note: 0-0 is the check used in this study.

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

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

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	.64225	2.45
N	2	.75810	2.89
P	2	3.85731	14.72 **
N x P	4	.06839	.26
Error	24	.26198	

\bar{X} 4.16
S.E. \bar{x}25592
L.S.D.(.05)... .75
L.S.D.(.01)... 1.01
C.V. 6.16%

Table D. Early 1962 yields - 3 pasture mixtures - green tons per acre, four replication totals for mixture.

No.	Treatment		Mix 1 O - T	Mix 2 O - L	Mix 3 O - A	12 plot Total	Average
	N	P					
1	50	40	21.705	14.370	17.772	53.847	4.487
2	100	40	23.067	10.588	24.503	58.158	4.847
3	0	40	11.647	5.445	11.269	28.361	2.363
4	100	0	22.537	7.487	16.941	46.965	3.914
5	0	80	14.520	7.412	15.050	36.982	3.082
6	100	80	26.393	19.435	26.544	72.372	6.031
7	50	80	26.998	14.445	20.419	61.862	5.155
8	50	0	17.697	4.236	16.713	38.646	3.221
9	0	0	11.495	2.647	11.722	25.864	2.155

TITLE: Farm Flock

PROJECT NUMBER: 5029

LOCATION: Northwestern Montana Branch Station

OBJECTIVES:

1. Select replacements by production record
2. Fatten lambs on self fed rations
3. Compare crossbred with straight bred lambs
4. Explore possibility of off-season breeding habit.

Work done and results are discussed in this order.

1. Selection by production record

Selection of ewe lamb replacements must be by production records of their dams since obviously they have had little time for record making. Their appearance, birth weight, fleece characteristics, and body size and condition are considered, however.

The dam's index shown is a wool equivalent index for the first three years of production. One-fourth of the weaned lambs plus all shorn wool divided by three.

The lamb fleece measurements, wool grade estimates, and condition scores are by Drummond and Bassett, M.S.C.

Characteristics of 1962 ewe replacement selections:

<u>Flock No.</u>	<u>Dam's Index</u>	<u>Birth Wt.</u>	<u>Wean Wt.</u>	<u>Condi- tion</u>	<u>Twin or Single</u>	<u>M. M. Fleece Length</u>	<u>Spin Count</u>	<u>Defects</u>
2-1	30.2	9.0	71	3 +	Tw	9.2	56	Sl. c. b.
2-7	29.0	9.5	93	2 -	Tw	6.8	56	
2-10	36.0	9.5	81	3 +	Tw	7.5	60	Sl. w. fc.
2-16	38.0	10.0	67	3	Tw	7.8	56	
2-17	38.0	9.5	64	3 -	Tw	6.0	56	Sl. hairy
2-23	24.7	8.5	66	3 +	Tw	9.3	54	Sl. h. b.
2-24	2 yr. ewe	8.5	58	3 +	Tw	8.1	56	Sl. w. fc.
2-37	33.5	7.5	83	2	Tw	7.0	58	
2-51 c	31.3	11.0	89	2 +	Tw	5.3	58	
2-53 c	34.8	9.5	67	3 +	Tw	6.1	60	
2-56 c	30.4	12.0	64	3	Tw	5.4	58	W. fc.
2-64 c	32.1	7.0	62	3 +	Tw	5.3	60	
2-59 c	28.3	10.0	85	2 -	Tw	6.8	58	
2-63 c	32.1	8.0	68	2 -	Tw	5.1	60	

c - Crossbred Polled Dorcet ram on Columbia ewes

Flock numbers have reached present pasture capacity which permits selection on production records within the flock and sale of less desirable individuals. Twenty-four ewes were sold in 1962. In addition to production, defects and wool grade are considered. Grade estimates on individual 1962 fleeces, provided by Coleman of the Wool Lab, provided the basis for much of this season's selection.

It was considered advisable to cull those with short and coarse wool, irrespective of index, some of which were producing short wool due to age. A more uniform flock resulted from the sale. Three ewes were culled physical defects.

Ewes on hand January 1, 1963:

	<u>Reg.</u>	<u>Grade</u>	<u>Cross</u>	
3 - 5 years	9	5		
2 years	8	1		
1 year	4 $\frac{1}{2}$	4	9	
Under 1 year	8 $\frac{1}{2}$	0	6	
Total	29	10	15	= 54

$\frac{1}{2}$ - Subject to inspection

Within a relatively short time, expectations are that the mature flock will have an average index above thirty and all shear $\frac{3}{8}$ staple wool.

Characteristics of mature flock - 1962:

<u>Reg. Number</u>	<u>Year Born</u>	<u>Index</u>	<u>Wool Grade</u>
J-9438	1957	30.2	1/2 staple
J-9443	1957	29.6	1/4 staple
J-9442	1957	23.9	1/4 staple
L-1411	1958	36.4	3/8 staple
L-1410	1958	24.1	1/4 staple
L-1408	1959	28.4	3/8 staple
L-1407	1959	24.7	1/4 staple
L-1405	1959	29.0	3/8 staple
L-1406	1959	36.0	1/4 staple

Flock Number

238	1958	24.8	3/8 staple
473	1959	34.8	3/8 staple
251	1959	24.2	3/8 staple
287	1959	24.8	3/8 staple
297	1959	25.1	1/4 staple

Average index 28.3

2. Fatten lambs on self feeders

Two lots of lambs carefully selected to be equal in age, weight, sex, and breeding were from among those produced in 1962 that were weaned and placed on self fed rations July 25.

Lot 1 received a pelleted ration of :

<u>Pounds</u>		<u>Cost per cwt.</u>
900	ground barley	\$ 1.75 whole
150	ground oats	1.75 whole
150	dry beet pulp	3.00
150	wheat mixed feed	2.70
75	molasses	3.75
15	mono cal phos	7.00
75	soybean meal	4.75
	grind, mix, and pellet	<u>.30</u>

Total cost of ration \$ 2.56

Lot 2 received a ground ration of:

<u>Pounds</u>		<u>Cost per cwt.</u>
500	ground barley	\$ 1.75 whole
500	ground oats	1.75 whole
500	dry beet pulp	3.00
	grind and mix	<u>.20</u>
	Total cost of ration	\$ 2.37

Both lots received alfalfa hay and salt.

Comparison of costs and gains:

	<u>Lot 1</u> <u>Pelleted Feed</u>	<u>Lot 2</u> <u>Ground Feed</u>
Number lambs	22	23
Weight in	1596	1628
Weight out	1761	2056
Gain	165	428
Days on feed	30	30
Ave. daily gain per lamb	.25	.62
Losses	2	0
Feed consumed:		
Self fed ration	1280	2135
Per lamb per day	1.94	3.1
Hay	658	713
Feed per lb. of gain	11.7	6.65
Total feed cost	\$ 39.35	\$ 57.73
Feed cost per lb. gain	\$ 23.85	\$ 13.49

This report, while accurate, portrays the use of the two rations in the darkest way possible and may be unfair to the pelleted ration. This work was done July 25 to August 24. Losses were due to an attack by flies and resulting maggots because of scouring and would not have happened during a winter feeding period. However, prompt control measures had to be employed in this lot to prevent additional losses while the other lot just across a woven wire fence was having no problems. The individual gains for lambs in the two lots may be fairer to the two rations.

Thirty day individual lamb gains on self fed rations: (pounds)

	<u>Pelleted Ration</u>		<u>Ground Ration</u>	
	<u>Columbia</u>	<u>Crossbred</u>	<u>Columbia</u>	<u>Crossbred</u>
	16	19	20	16
	7	27	20	21
	18	27	15	19
	8	2	10	24
	18	13	15	15
	19	2	20	6
	10	20	19	15
	14	23	21	22
	8	23	14	29
	15	17	17	24
			23	14
			27	
TOTAL	<u>133</u>	<u>173</u>	<u>221</u>	<u>205</u>
Ave.	13.3	17.3	18.4	18.6

This shows that a majority of the lambs actually did very well and made remarkable gains considering the fact that the trial period was for the first thirty day period after weaning on both rations used.

It was our intention to put all lambs on the ground ration until sold and thus get additional information. However, our supplier was unable to secure dry pulp so lambs were fed on whatever ration was available until sold. Fat lambs sold in September for \$.19 and heavy feeders for \$.1765. For this particular season, self feeding at a feed cost of \$13.49 as with the ground feed ration would net a nice profit on gain alone. But the difference between selling a 100 pound fat lamb at \$19.00 and selling the same lamb weighing 70 pounds at \$.1765 would be \$6.64 less a feed cost of \$4.05 or \$2.59 per lamb over feed cost.

3. Compare crossbred with straight bred lambs

Ewes bred to a Polled Dorset ram for production of crossbred lambs produced no more pounds of weaned lamb in 1962 than did similar ewes bred to a Columbia ram. This differs from 1961 when there was a difference of 26.9 pounds per ewe in favor of crossbreds. This year the pounds of weaned lambs was the same even though the crossbred lambs averaged sixteen days younger when weaned than did the Columbia lambs. The crossbreds averaged some better in condition score.

Referring to the individual gains on feed (section two above) crossbreds gained four pounds more in thirty days on the pelleted ration than Columbia lambs.

Wool characteristics of the yearling crossbreds are interesting. According to grade estimates by Coleman of the Wool Lab six of the seven had 3/8 blood wool, five of the seven had 3/8 blood wool of staple length. This compares to five out of nine Columbias with 3/8 staple. The average yearling fleece weight for those with 3/8 staple wool was the same - 8.1 pounds.

1962 summary of Columbia-Crossbred comparison:

	<u>Columbia</u>	<u>Crossbred</u>
Ewes	15	15
Lambs born	26	27
Lambs weaned	22	22
Average birth weight - singles	11.6	13.7
Average birth weight - twins	9.05	8.98
Average age when weaned (days)	155	139
Weaning weight - singles	84	83
Weaning Weight - twins	66.4	67.7
Total pounds weaned lamb	1600	1596
Pounds weaned per ewe	106.7	106.4

<u>Condition Score:</u>	<u>Score</u>	<u>No. Lambs</u>	<u>No. Lambs</u>
	1 -	1	1
	2 +	0	3
	2	2	0
	2 -	2	3
	3 +	7	9
	3	5	4
	3 -	2	2
	4 +	1	
	4	2	
		<u>22</u>	<u>22</u>

4. Explore possibility of off-season breeding habit

Once each month, February through July, one crossbred yearling ewe and one Columbia yearling ewe were turned into the pen or pasture with five yearling Columbia rams. No hormones or artificial climate regulation gimmicks were used since the object was to determine natural tendency for off-season breeding. All were removed on August 7.

Result: No lambs were secured.

However, on November 30 Francis O'Connell reported having two yearling crossbred ewes, out of Columbia ewes bred to a Polled Dorset ram purchased from White's at Dayton, that had lambed November 26 and November 28. Each had ewe lambs. These ewes had the same sire as the ewes in the Station trial. These ewes and their lambs were secured from Mr. O'Connell December 1.

Possible explanation for the difference in results are:

1. White had more numbers of crossbreds
2. White had Dorset-Columbia cross rams.

PART II
Annual Research Report
Northwestern Montana Branch
of the
Montana Agricultural Experiment Station
Kalispell, Montana
by
Vern R. Stewart
Associate Agronomist

TABLE OF CONTENTS

	<u>Page No.</u>
List of Tables.....	i
Acknowledgements.....	v
Introduction.....	v
Climate.....	47
Fertilizer Investigations (5020).....	49
Weed Investigations (5021).....	56
Forage Investigations (5022).....	68
Small Grain Investigations (5023)	
Spring Barley.....	74
Winter Barley.....	78
Oats.....	86
Spring Wheat.....	90
Winter Wheat.....	93
Preliminary Investigations (5028)	
Cereal Root Rots.....	112
Oil Crops.....	117

LIST OF TABLES

<u>Table Number</u>	<u>Title</u>	<u>Page Number</u>
I	Summary of climatic data by months for the 1961-62 crop year (Sept. to Aug.) and averages for the period 1949-1962 at the Agricultural Experiment Station, Creston, Montana.....	48
II	Chemical analysis of soil samples secured at three locations in Western Montana in 1962.....	51
III	Effect of nitrogen and phosphate fertilizers on Olympia winter barley grown at Creston, Montana in 1961-62.....	52
IV	Effect of nitrogen and phosphate fertilizers on bundle weights of winter barley grown on Flathead fine sandy loam soil, field no. R-5c, Creston, Montana in 1961-62.....	53
V	Protein data from fertilizer study conducted on the L. B. McFadgen farm, Stevensville, Montana in 1962.....	54
VI	Effect of nitrogen and phosphate fertilizers on Westmont winter wheat grown on the Suco farm at Polson, Montana in 1961-1962.....	54
VII	Protein data from fertilizer study conducted on the Suco farm at Polson, Montana in 1961-1962.....	55
VIII	Yield and protein data from field fertilizer plots of Westmont winter wheat grown at Creston, Montana in 1961-62..	55
IX	Agronomic data from herbicide study grown on the George Hubbard farm at Kalispell, Montana in 1962.....	61
X	Weed control data from a study on wheat thief, <u>Lithospermum arvenses</u> , in a natural stand in seeded alfalfa. 1962.....	61
XI	Yield data on the effect of certain herbicides on the control of wild oats (<u>Avena fatua</u>) in spring barley at Creston, Montana in 1962.....	62
XII	Yield data from a herbicide study conducted on spring barley at Creston, Montana in 1962.....	63
XIII	Evaluation of seven herbicides in new seedlings of eight legumes for control of several weed species.....	64
XIV	The effect of certain herbicides on a natural weed population and on ten horticultural crops.....	65

<u>Table Number</u>	<u>Title</u>	<u>Page Number</u>
XV	Effect of herbicides on yellow mustard (commercial) grown for seed at Creston, Montana in 1962.....	66
XVI	Observation of herbicide plots on field bind weed (<u>Convolvulus arvensis</u>).....	67
XVII	Agronomic data from corn silage variety trial grown at Creston, Montana in 1962.....	70
XVIII	Yield data from corn cultural study grown at Creston, Montana in 1962.....	71
XIX	Agronomic data from small grain hay study grown under dryland conditions at Creston, Montana in 1962.....	72
XIXa	Bundle weight data from small grain hay study grown under dryland conditions at Creston, Montana in 1962.....	73
XX	Agronomic data from the irrigated Intrastate and Station yield nursery at Creston, Montana in 1962.....	76
XXI	Summary of yield of varieties in the irrigated yield nurseries 1953-1962 inclusive at Creston, Montana.....	77
XXII	Agronomic data from dryland Intrastate winter barley nursery grown at Creston, Montana in 1961-62.....	80
XXIII	Bundle weight and grain straw ratio from Intrastate winter barley nursery at Creston, Montana in 1961-62.....	81
XXIV	Agronomic data from two row dryland winter barley nursery at Creston, Montana in 1961-62.....	82
XXV	Bundle weight and grain straw ratio from two row dryland winter barley nursery at Creston, Montana in 1961-62.....	82
XXVI	Stand data obtained from dryland winter barley nursery grown in Missoula County on the County Airport at Missoula, Montana in 1961-62.....	83
XXVII	Agronomic data from off-station dryland winter barley nursery grown in Lincoln County on the Dick Britton ranch at Eureka, Montana in 1961-62.....	84
XXVIII	Summary of winter barley varieties grown at Creston, Montana 1951-1962.....	85
XXIX	Agronomic data from dryland oat nursery grown at Creston, Montana in 1962.....	87
XXX	Summary of yield in the dryland oat yield nursery 1953-1962 inclusive at Creston, Montana.....	89

<u>Table Number</u>	<u>Title</u>	<u>Page Number</u>
XXXI	Agronomic data from advanced yield spring wheat nursery at Creston, Montana in 1962.....	91
XXXII	Agronomic data from the Uniform Western Regional white wheat nursery (dryland) at Creston, Montana in 1962.....	92
XXXIII	Agronomic data from dryland Intrastate winter wheat nursery grown at Creston, Montana in 1961-62.....	98
XXXIV	Heading dates and dwarf smut percentages from the Western Regional hard red winter wheat nursery grown on the Howard Braaton farm at Kalispell, Montana in 1961-62.....	99
XXXV	Agronomic data from dryland short straw nursery grown at Creston, Montana in 1961-62.....	100
XXXVI	Bundle weights and grain straw data from dryland short straw nursery grown at Creston, Montana in 1961-62.....	101
XXXVII	Agronomic data from Western Regional white winter wheat nursery grown at Creston, Montana in 1961-62.....	102
XXXVIII	Agronomic data from dryland off-station winter wheat nursery grown in Missoula County at the Missoula County Airport, Missoula, Montana in 1961-62.....	103
XXXIX	Agronomic data from dryland off-station winter wheat nursery grown on the L. B. McFadgen farm at Stevensville, Montana in 1961-62.....	104
XL	Agronomic data from dryland off-station winter wheat nursery grown in Sanders County on the Sid Cross farm at Camas Prairie, Montana in 1961-62.....	105
XLI	Agronomic data from dryland off-station winter wheat nursery grown in Mineral County on the Charles Frey ranch at Tarkio, Montana in 1961-62.....	106
XLII	Agronomic data from dryland winter wheat nursery grown in Lincoln County on the Dick Britten ranch at Eureka, Montana in 1961-62.....	107
XLIII	Agronomic data on Vogel bulks (Burt x P.I. 178383).....	108
XLIV	Bulk row selections made on the Howard Braaton farm at Kalispell, Montana.....	108
XLV	Plant selections made on the Howard Braaton farm at Kalispell, Montana in 1961-62.....	110
XLVI	Yield and protein data from irrigated and dryland winter wheat grown at Creston, Montana in 1961-62.....	111

<u>Table Number</u>	<u>Title</u>	<u>Page Number</u>
XLVII	Summary of disease rating and yield data from cultural practice study on Freja barley at Creston, Montana in 1962.....	113
XLVIII	Comparison of packed and non-packed soil conditions.....	114
XLIX	Comparison date of seeding.....	114
L	Comparison seeding depths.....	115
LI	Yield and disease rating data from fungicide study conducted on Park oats grown at Creston, Montana in 1962.....	115
LII	Yield and disease rating data from fungicide study conducted on Compana barley grown at Creston, Montana in 1962.	116
LIII	Agronomic data from irrigated Intrastate mustard nursery grown at Creston, Montana in 1962.....	120
LIV	Agronomic data from dryland Intrastate mustard nursery grown at Creston, Montana in 1962.....	121
LV	Agronomic data from dryland new crops Intrastate nursery grown at Creston, Montana in 1962.....	122
LVI	Agronomic data from irrigated new crop Intrastate nursery grown at Creston, Montana in 1962.....	123

ACKNOWLEDGEMENTS

Cooperation with other agronomic staff members has made the research at the Northwestern Montana Branch Station effective and productive this past year. Three members of the Western Region Smut Control Laboratory in Pullman, Washington have helped in the dwarf smut control studies. They are Drs. E. L. Kendrick, J. R. Hoffmann, and L. H. Purdy.

Dr. E. R. Hehn spent several days on the Station working with the winter wheat breeding program. Dr. E. L. Sharp worked with the author in a root rot control study.

To the above mentioned research people the author would like to express his appreciation for their council and assistance.

A special thank you goes to Mr. G. W. Roath, Superintendent for his help and careful administration of the total Station research program.

To Mr. Paul Boss for his faithful help throughout the research year, the author says thank you.

The author wishes to express his appreciation to Mrs. Audrey Holman for the careful preparation of this report and her cheerful help during the past year.

INTRODUCTION

This report will include results of research on soil, cereals, weeds, annual forages, and oil crops.

The variety testing program in cereals was reduced because of fund limitations.

Several herbicides were studied for their effect on weeds and various agronomic and horticultural crops. This program was expanded from the 1961 research year.

Corn silage work was reduced. Annual forages, using cereals, were studied.

Oil seed crops made up about one-third of the research program.

A statement of climatic and growing conditions is made a part of this report.

During the 1962 calendar year the author took part or contributed to the following activities:

<u>Date</u>	<u>Meeting or Activities</u>	<u>Place</u>
January 16 - 18	Hard Red Winter	Lincoln, Nebraska
February 5	Montana Cooperative Council	Ronan, Montana
February 13	Agricultural Council	Kalispell, Montana
February 22	Western Montana Dist. County Agents	Missoula, Montana
February 23	Station Advisory Council	Missoula, Montana
March 7-9	Planning Conference	Bozeman, Montana
March 13	Agricultural Council	Kalispell, Montana

<u>Date</u>	<u>Meeting or Activities</u>	<u>Place</u>
March 20	Conservation Day	Polson, Montana
March 28	Conservation Day	Eureka, Montana
March 29	Conservation Day	Libby, Montana
April 10	Western Mont. Wheat Workers Conference	Missoula, Montana
April 12	4-H Club Talk	Stillwater Grange Hall
April 18	Kawanis Dinner (Dr. Renne)	Kalispell, Montana
May 8	Agricultural Council	Kalispell, Montana
May 30	Western Wheat Workers Conference	Bozeman, Montana
May 31	Western Section CSSA	Bozeman, Montana
August 1 - 2	Western Section CSSA	Bozeman, Montana
August 9	Agricultural Council	Kalispell, Montana
October 16-19	Annual Conference	Kalispell, Montana
November 8	Lions Club	Columbia Falls, Montana
November 9	Lake Co. Potato Growers Assoc.	Ronan, Montana
November 13	Agricultural Council	Kalispell, Montana
December 11	Agricultural Council	Kalispell, Montana

- CLIMATE -

1962 was the fourth consecutive season in which precipitation in June, July, and August was considerably below the long time average. Winter wheat yields were about average this season but dryland spring grains were low in yield. September, November, and December 1961 precipitation was somewhat above the twelve year average. The critical months of the growing season, June, July, and August, were 3.41 inches below the average.

Cool temperatures during the growing season was, no doubt, the main factor in winter wheat production. During the flowering through the filling stage of winter wheat, temperatures were cool. There was never a long period when temperatures were as high as they were in 1961. The highest temperature was 92° F in August 1962.

The growing season was ten days shorter than the 1949-1962 average. The last killing frost in the spring was May 30 and the first in the fall was September 3, making a total frost free period of 96 days.

Table I is a summary of 1962 climatic data and the period 1949-1962.

Table I. Summary of climatic data by months for the 1961-1962 crop year (September to August) and averages for the period 1949-1962 at the Agricultural Experiment Station, Creston, Montana.

	Month and Year												Total or Average Growing Season
	Sept. 1961	Oct. 1961	Nov. 1961	Dec. 1961	Jan. 1962	Feb. 1962	Mar. 1962	Apr. 1962	May 1962	June 1962	July 1962	Aug. 1962	
Precipitation (inches)													
Current year	3.40	1.22	1.77	2.09	1.33	1.15	1.59	.96	2.59	1.15	.11	.72	18.08
Ave. 1949 to 1961-62	1.39	1.64	1.58	1.61	1.58	1.31	1.08	1.33	2.22	2.51	1.17	1.45	18.87
Mean temperature (°F)													
Current year	49.6	42.3	28.2	23.6	17.4	25.7	30.9	47.2	51.5	58.6	62.1	62.1	41.6
Ave. 1949-1961-62	53.9	43.7	32.2	26.6	21.3	27.1	31.7	43.2	51.8	58.5	64.4	63.5	43.2
Last killing frost in spring *													
1962									May 30				(32°)
Ave. 1949-1962									May 30				
First killing frost in fall *													
1962									September 3				(25°)
Ave. 1949 to 1962									September 12				
Frost free period													
1962									96 days				
Ave. 1949 to 1962									106 days				
Maximum summer temperature													
Minimum winter temperature									92° on August 16				
									32° below 0 on January 21				

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

TITLE: Fertilizer Investigations

PROJECT NUMBER: 5020

PERSONNEL: Leader - Vern R. Stewart
Cooperator - C. W. Roath

FUNDS: State - \$853.33

LOCATION: Dryland lease - Rotation R and off-station locations in three north-western counties.

DURATION: Indefinite

OBJECTIVES:

1. To determine the effect of nitrogen and phosphorous on yield of winter grains
2. To determine how different soil types influence the effect of these fertilizers
3. To correlate these responses with chemical soil tests
4. To obtain information from which sound fertilizer recommendations can be made.

EXPERIMENTAL DATA:

INTRODUCTION

Fertilizer research on cereals this year was limited to winter grains. Studies were of two types: (1) the small plot carefully controlled research; and (2) large field plots using field machinery for seeding and harvesting.

Plots were located in areas which are quite representative of a winter wheat region in that county where they were grown.

MATERIALS AND METHODS

Where a soil survey was available the soils are described. Soil samples were obtained at 0 - 6" from each check plot and analyzed for N, P, K, and ph.

Research plots were four rows eighteen feet long. Seeding rate for wheat was sixty pounds per acre and barley was seventy pounds per acre. Seeding was done with a four row belt seeder. Seed and fertilizer were placed on the belt at the same time. This was found to have an adverse effect on the wheat at two locations. Seeding for large plots was done with a large IHC grain drill with a fertilizer attachment.

In the small plots three nitrogen and two phosphorous levels and in all possible combinations were used. In the large field plots several formulations of commercially mixed fertilizers were used.

Harvesting of small plots was done by hand and threshed with a Vogel thresher. Field plots were harvested with a self propelled combine with samples being taken at random throughout the field.

The variance analysis technique was used to analyze the data from the small research data. The larger plots are presented as simple averages of four or six samples per treatment. Protein data was obtained for all the fertilizer studies and that information is made a part of this report.

RESULTS AND DISCUSSION

Winter Barley

Only one fertilizer study on winter barley was conducted. This was grown on the dryland lease in field number R-5c. A soils test indicated low organic matter, P_2O_5 level, and K_2O level. Table II. On the basis of the soils test one would expect an increase in yield from the rates of fertilizers used as shown in Table III. It will be noted that there is little difference in yields between treatments and those differences are non-significant as determined by the variance analysis. This is also true of bundle weights shown in Table IV. Moisture was fair and these yields could be expected from this rotation. The question then arises as to what effect does the low K_2O level have on these yields? Were the rates of P and N high enough? Further work must be conducted on this area to answer the questions raised by this experiment.

Three off-station fertilizer studies on winter wheat were seeded in Sanders, Lake, and Ravalli Counties. Poor stands were obtained in Ravalli and Sanders Counties. It is felt that the method of applying the fertilizer and seed at the same time is responsible for this yield reduction. This was particularly true where soil conditions were quite dry as they were in Ravalli and Sanders Counties. Stands were very good in the plot in Lake County.

Ravalli County - This nursery was not harvested for yield because of poor and uneven stands. However, enough seed was harvested to provide material for a protein test. Table V presents the protein data for this study. As would be expected, increasing nitrogen rates increased protein percentages, whereas, P treatments decreased protein percentages. The closer the N and P are to a one to one ratio the higher the protein in relationship to P alone and the check plot.

Lake County - Yields from this nursery were below average for this area. The highest yield was obtained using thirty pounds of nitrogen and forty pounds of P_2O_5 per acre. The variance analysis indicate that nitrogen applications were of little value in increasing yields. It also shows that forty pounds of P_2O_5 per acre increase yields over the check by as much as ten bushels per acre. This seems to point out the importance of a balanced fertility level for maximum production. Nitrogen increased protein percentages in a linear manner, whereas, P_2O_5 applications decreased protein in a linear manner. Tables VI and VII show yield and protein data, respectively.

Sanders County - Complete loss of stands occurred in this nursery and no data of any kind was secured from this planting. Soil analysis data is shown in Table II.

The field plot studies were conducted on two soil types. They were Flathead fine sandy loam and Creston silt loam. This difference in soil type can be seen in the individual sample yields. The higher yields came from the Creston soil series found in the north portion of all the fields listed in Table VIII.

The field plot data is to be found in Table VIII. These data support previous data that a balance of fertility conditions is required for high yields and good protein percentages. Indication from these data are: (1) low nitrogen and high phosphate applications decrease protein content but may or may not increase yield; and (2) the minimum amount of nitrogen for adequate production should be thirty pounds and balanced with a one to one ratio with phosphate.

A simple calculation will show that 30N - 40P is the most economical application in this study.

Table II. Chemical analysis of soil samples secured at three locations in western Montana in 1962.

Sample Number	pH	Conductivity	P ₂ O ₅ #/Acre	Organic Matter Percent	K ₂ O #/Acre
<u>Flathead fine sandy loam ¹ - Creston, Montana, field no. R-5c</u>					
1	7.5	0	51	2.2	240
2	7.2	0	49	2.2	180
3	7.5	0	39	2.1	175
4	7.3	0	51	2.1	195
\bar{x}	7.4	0	47.5	2.2	197.5
<u>Heavy clay type soil - Camas Prairie, Montana (Cross farm)</u>					
1	7.5	24	188	2.6	1200
2	7.5	70	212	2.2	1200
3	7.8	102	172	2.2	1175
4	7.2	126	228	2.4	840
\bar{x}	7.5	80.5	200	2.4	1104
<u>Polson silt loam, gravelly phase ¹ - Polson, Montana (Suco farm)</u>					
1	7.3	0	122	2.2	800
2	7.2	0	64	2.4	720
3	7.0	0	47	2.6	800
4	7.0	0	49	2.6	425
\bar{x}	7.1	0	70.5	2.5	686

¹ soil survey description

Table III. Effect of nitrogen and phosphate fertilizers on Olympia winter barley grown at Creston, Montana in 1961-62. Grown on Flathead fine sandy loam soil in field no. R-5c, four row plots, three replications.

Date Seeded: 9/21/61 Date Harvested: 8/3/62 Size of Plot: 16 sq. ft.

N #/Acre	Yields in Bu/Acre P ₂ O ₅ in #/Acre			\bar{x}_n
	0	40	80	
0	44.5	49.1	44.6	48.1
15	41.9	56.2	51.8	52.2
30	46.4	59.7	53.9	55.7
45	50.7	51.0	48.4	52.2
\bar{x}_p	45.8	54.0	49.7	

\bar{x}_t 49.8
C.V. 10.06%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	45870.115	2.38
N	3	20214.92	1.05
P	2	51099.195	2.65
N x P	6	10408.305	—
Error	22	19309.0804	
Total	35		

Soils Test

O. M.	—	2.2
P ₂ O ₅	—	47.5
K ₂ O	—	197.5
pH	—	7.4

Table IV. Effect of nitrogen and phosphorous fertilizers on bundle weights of winter barley grown on Flathead fine sandy loam soil in field no. R-5c at Creston, Montana in 1962. Four row plots, three replications.

Date Seeded: 9/21/61 Date Harvested: 8/3/62 Size of Plot: 32 square feet

Treatments		Bundle Weight in Ounces per plot			Total Ounces	Bundle Weight #/Acre	Grain Yield in #/Acre	Grain Straw Ratio
N	P	I	II	III				
15	0	52	74	60	186	5275	2011	1.62
30	0	56	83	55	194	5502	2227	1.47
45	0	60	69	64	193	5573	2433	1.29
15	40	63	71	84	218	6182	2298	1.69
30	40	80	79	73	232	6579	2866	1.30
45	40	78	68	65	211	5984	2448	1.44
15	80	88	52	65	205	5814	2486	1.34
30	80	91	67	58	216	6126	2587	1.38
45	80	70	80	65	215	6097	2323	1.62
0	40	71	58	71	200	5672	2362	1.40
0	80	72	63	71	206	5842	2141	1.73
0	0	55	64	55	174	4935	2136	1.31

\bar{x} 5790
 S.E.x. .. 533.76
 G.V. 9.22%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	60.1111	---
N	3	73.37037	---
P	2	310.8611	2.63
N x P	6	13.00927	---
Error	22	118.0808	
Total	35		

Table V. Protein data from fertilizer study conducted on the L. B. McFadgen farm at Stevensville, Montana in 1962. Soil type - Burnt Fork - Ravalli loam.
Date Seeded: 9/14/61 Date Harvested: 8/7/62

N #/Acre	Protein Percent P ₂ O ₅ in #/A			\bar{x}_n
	0	40	80	
0	14.0	11.1	12.0	12.4
15	15.5	15.5	12.7	14.6
30	16.7	15.0	12.4	14.7
45	17.5	14.7	11.5	14.5
\bar{x}_p	15.9	14.1	12.2	
				$\bar{x}_t \dots 14.1$

Table VI. Effect of nitrogen and phosphate fertilizers on Westmont winter wheat grown on the Suco farm at Polson, Montana in 1961-62. Grown on Polson silt loam, gravelly phase, four row plots, four replications.

Date Seeded: 9/13/61 Date Harvested: 8/7/62 Size of Plot: 16 square feet

N #/Acre	P ₂ O ₅ #/Acre Yields in bushels per acre			\bar{x}_n
	0	40	80	
0	25.0	30.4	29.1	28.1
15	21.5	31.4	31.2	27.9
30	22.5	35.4	32.9	30.2
45	20.5	30.5	31.9	27.5
\bar{x}_p	22.3	31.9 *	31.2 *	

* Significantly higher in yield than the check (.05).

$\bar{x}_t \dots \dots \dots 28.5$ bu/A
C.V. 7.89%

Analysis of Variance

Source	D.F.	Mean Square	F	Soils Test
Replications	3	19469.18667	2.40	O. M. 2.5%
N	3	6777.74333	-----	P ₂ O ₅ 70.5 #/A
P	2	183758.27	22.68 **	K ₂ O 686 #/A
N x P	6	6188.41		pH 7.1
Error	33	8099.26333		
Total	47			

Table VII. Protein data from fertilizer study conducted on the Suco farm at Polson, Montana in 1961-62.

N #/Acre	Protein in Percent P ₂ O ₅ #/Acre			\bar{x}_n
	0	40	80	
0	10.9	9.4	9.7	10.0
15	12.6	10.0	10.5	11.0
30	13.2	11.3	11.5	12.0
45	14.1	12.5	12.5	13.0
\bar{x}_p	12.7	10.8	11.1	$\bar{x}_t \dots 11.5$

Table VIII. Yield and protein data from field fertilizer plot of Westmont winter wheat grown at Creston, Montana in 1961-62.

Date Seeded: 9/19/61 Date Harvested: 8/11/62 Size of Plot: 879.3 sq. ft.

Treatment N	Field P	Field No.	Plot Yield in Bushels/Acre						\bar{x}	Bu. Wt. in Pounds
			I	II	III	IV	V	VI		
32	40	R-4c	43.0	43.0	42.5	45.8		43.6	61.5	
22	96	R-4c	33.9	27.7	29.3	21.5		28.1	61.3	
32	40	R-6c	21.5	24.4	20.2	29.7		24.0	61.4	
22	96	R-6c	16.9	17.8	13.6	16.9		16.3	61.1	
0	0	R-6c	11.1	1.6	2.9	7.4		5.8	61.3	
19	84	R-7c	29.3	35.9	16.1	16.1	31.0	51.6	30.0	61.2
0	0	R-7c	32.6	38.8	16.5	23.5	4.5	50.7	27.8	61.3
<u>Protein Percentage</u>										
32	40	R-4c	11.4	11.6	12.1	11.4			11.6	
22	96	R-4c	10.1	10.5	10.3	10.2			10.3	
32	40	R-6c	10.3	11.1	11.3	11.6			11.1	
22	96	R-6c	9.3	8.3	9.2	8.8			8.9	
0	0	R-6c	11.8	10.3	11.0	10.5			10.9	
19	84	R-7c	9.2	9.7	10.6	11.4	12.3	14.1	11.2	
0	0	R-7c	13.5	11.9	9.6	13.5	13.4	12.9	12.5	

TITLE: Weed Investigations

PROJECT NUMBER: 5021

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

FUNDS: State - \$1591.66

LOCATION: Station and off-station

PROBABLE DURATION: Indefinite

EXPERIMENTAL DATA:

INTRODUCTION

Herbicides for control of weeds in farm crops was the main emphasis in the weed control research at the Northwestern Montana Branch Station this season. Twenty-two herbicides were studied as to their effect on sixteen agronomic and horticultural species. Two to three rates of each herbicide were used. A general discussion on technique and procedure will be found under Materials and Methods. However, specific procedure for a particular experiment will be included in Results and Discussion. A total of eight trials were conducted in 1962.

MATERIALS AND METHODS

Generally, all plots were five feet wide and twenty feet long providing one hundred square feet for study. Some plots are in multiples of five because of the nature of the experiment.

All materials were applied in a water solution with a research type spray rig (described on page 123 of the 1961 Annual Report).

Chemicals were incorporated in the soil with an offset double disk.

RESULTS AND DISCUSSION

Chemical Control of (*Lithospermum arvenses*) in Winter Wheat and Alfalfa

It has been the objective of this work to find a herbicide that will effectively control wheat thief (*Lithospermum arvenses*). Two naturally infested areas were selected in 1962. One was located on the George Hubbard farm in a field of Westmont winter wheat. The second was located in field R-5b of the dryland lease. Yield data were obtained from the wheat study along with an estimate of control. Only an estimate of control was obtained from the study located in field R-5b.

Application of herbicides was made when the wheat thief was in early bloom.

Herbicides used and their description are made a part of this record.

- Banvel D - 2 methoxy-3, 6-dichlorobenzoic acid
- Banvel T - 2 methoxy-3, 5, 6 trichlorobenzoic acid
- Dacamine - Oleoyl 1, 3-propylene diamine salt of 2,4-dichlorophenoxyacetic acid
- 2,4-D ester
- 2,4-D amine

The yields of winter wheat were non-significant in the study on Hubbards'. See Table IX. Banvel D at one pound per acre gave the best control of wheat thief. Considerable lodging was noted in the Banvel D and Banvel T plots. An observation made several weeks after treatment showed that only Banvel D had effectively controlled wheat thief and prevented the plant from going to seed. The other products retarded the growth of wheat thief but did not prevent it from going to seed.

The above listed products were used in the study in field R-5b with one exception. LV-4D 1 replacing 2,4-D ester was the exception. In this study LV-4D at one pound per acre was the most effective in controlling wheat thief. Banvel D at one pound per acre also gave a degree of control. See Table X.

1 2-Ethyl hexyl ester formulation of 2,4-D.

Control of Wild Oats (*Avena fatua*) With Certain Herbicides in Spring Barley

Two studies were conducted this season, both of which were on spring barley. Three herbicides were used in the replicated study and the field type study.

The replicated plots were sprayed with the small research sprayer. The field studies were conducted using field equipment for all operations from spraying to combining. The field plots were harvested with a self propelled combine with four samples being taken at random from each treated area. The replicated plots were handled in the usual manner for small grain plots. Both plots were located in a natural infestation of wild oats.

Compounds used in these studies were:

- Avadex BW - (2,3,3, Trichloroally diisopropylthiol-carbamate)
- Avadex - 2, 3 (Dichloroally diisopropylthiol-carbamate)
- Carbyne - 2-allylamine-4-chloro-6-isopropylamine-5-triazine.

Avadex BW and Avadex were applied before seeding and incorporated in the soil with an offset double disk. They were also applied following seeding and harrowed twice to incorporate in the soil.

Carbyne was applied when the wild oats were in the two leaf stage.

Moisture was good and the temperature about 60° F when Avadex and Avadex BW were applied on May 14, 1962. Carbyne was applied on June 8, 1962 in warm weather and a light breeze blowing.

Research Plots

No significant differences in yields were found between the pre plant and post plant of the Avadex treatments. This was also true in the Avadex EW treatments with the exception found at the .5 pound rate of both Avadex EW and Avadex. These two treatments were lower in yields than post planted treatments of Avadex at 1.0 pound per acre and Avadex EW at 1.5 pounds per acre. Carbyne at the .5 pound and 1.0 pound per acre provide more wild oat control than any of the other treatments. Table XI.

Field Plots

Carbyne at .75 pound per acre reduced yields significantly below that of the check in the field plots. This treatment tended to retard maturity and the barley was somewhat shorter than in other treatments. The Avadex EW seemed to have less effect on yield than Avadex and Carbyne. No weed counts were made in this study. Table XII presents the data in tabular form.

Use of Herbicides to Control Weeds in New Legume Seedings

Seeding of legumes without a companion crop is a practice of some operators. Weeds are usually controlled by clipping. It was the purpose of this study to find a herbicide that would give adequate control of weeds in new seedings.

Seven different herbicides were used in the study. The legumes used in the study were alfalfa (Ranger and Ladak), yellow sweet clover, White Dutch clover, Birdsfoot Trefoil, Sanfoin, Alsike, and Kenland red clover.

Herbicide plots were ten feet wide with all eight legumes planted on each herbicide plot in rows one foot apart. These compounds were applied pre plant, post plant, and post emergence of the legumes. The following listing shows the herbicides used and how they were used.

- a. Avadex - (2, 3, Dichloroallyl diisopropylthiol-carbamate)
 - (1) Apply pre plant and incorporate in the soil
- b. Eptam - (ethyl-n-n-di-n-propylthiol carbamate)
 - (1) Apply pre plant and incorporate in the soil
- c. Dacthal - (dimethyl 2, 3, 5, 6-tetrachloroterephthalic acid)
 - (1) Apply on soil surface after seeding
- d. Trifluralin - (2, 6-dinitro-n-n-di-n-propyl-a, a, a-trifluoro-p-toluidine)
 - (1) Apply pre plant and incorporate in the soil
- e. Avadex EW - (2, 3, 3-Trichloroallyl diisopropylthiol-carbamate)
 - (1) Apply pre plant and incorporate in the soil
- f. Butoxone amine - (4-(2, 4-dichlorophenoxy) butyric acid dimethylamine salt)
 - (1) Apply post emergence of weeds and legumes
- g. Butoxone ester - (4-(2, 3-dichlorophenoxy) butyric acid iso-oatyl ester)
 - (1) Apply post emergence of weeds and legumes.

The rate per acre of the foregoing herbicides is shown in Table XIII.

A weed score was recorded for each herbicide as to their effect on the natural weed population. Ratings of poor to very good were listed for legume vigor later in the season.

Trifluralin gave the best control of any compound used and had the least effect on the new legume seedling. The Butoxones were next for weed control followed by Dacthal. Dacthal had less effect on the legumes than the Butoxone compounds. Avadex, Avadex BW, and Eptam gave no control of broadleaved weeds, however, there were no wild oats present in the study so it is not known what their effect would have been on this weed species. See Table XIII for complete details.

Use of Herbicides For Weed Control in Ten Horticultural Crops

Horticultural crops are grown in small acreages or in home gardens and take considerable hand labor. This study was designed to determine the effect of certain herbicides on ten horticultural crops.

Herbicide plots were ten feet wide and twenty feet long with the crops being planted at right angles to the herbicides. Ten crops were planted across each herbicide plot with rows being spaced two feet apart.

Crops used were carrots, beets, lettuce, peas, beans, radishes, turnips, kohlrabi, spinach, and parsnips. Herbicides used were Banvel D and Banvel T, applied post emergence; Trifluralin, incorporated in the soil before seeding and a surface application following seeding; Avadex BW and Eptam, incorporated in the soil before seeding; and Dacthal, surface application after seeding. Rates of each of the compounds used are recorded in Table XIV. Description of these compounds are found earlier in this report.

Banvel D and Banvel T controlled all the broadleaved weeds but killed most of the crops treated. Trifluralin was the most effective compound of the group when applied pre plant at four pounds per acre with the exception of beets and spinach. Table XIV shows complete tabular results of this study.

Effect of Herbicides on Yellow Mustard (Commercial)

Interest in the production of mustard on a commercial basis in Western Montana in 1962 resulted in about 2000 acres being seeded. Therefore, a study to control weeds in this crop was started.

The purpose of this study was to determine what effect different herbicides would have on mustard. The plots were seeded in four row plots twenty feet long with two feet between each plot. The area treated with the herbicide was 100 square feet. The compounds used are described previously in this report. The rates of each and how applied are found in Table XV.

Avadex at .5 pound per acre was the only treatment that did not show some apparent effect from the herbicides used. The Banvel compounds caused severe damage and delayed maturity two weeks beyond the check.

There were no significant differences in yields when analysed statistically. Complete data are found in Table XV.

Leafy Spurge (Euphorbia esula)

Two compounds were applied to an area infested with leafy spurge. The herbicides used were furnished by Amchem. They were Weedone 638 (2,4-D), three pounds per gallon and Emulsamine E-3 (2,4-dichlorophenoxyacetic acid tertiary dodecyl, primary amine salts, three pounds per gallon. Applications were made on May 31, 1962 with some cloud cover and the temperature at 62° F.

The plots were observed June 18, 1962 and the following was noted. Emulsamine E-3 had burned the plants and all appeared to be dead. In the Weedone 638 application, the weeds were bent over and appeared to be dying. These plots were checked in the fall and little regrowth was noted. They will be checked in the spring of 1963 for regrowth.

Field Bind Weed (Convolvulus arvensis)

Field bind weed is a major problem on some farms in Northwestern Montana. Recent work with TBA has indicated that fall applications were more effective than spring and summer treatments. Thus, a study using four herbicides was set up to measure their effectiveness. These compounds were applied in early fall when bind weed was in bloom.

The herbicides used are shown in tabular form in Table XVI. Also in this table are some observations made nine days after the treatment. Complete evaluation of this study will be made in the spring of 1963. Table XVI.

Table IX. Agronomic data from herbicide study grown on the George Hubbard farm at Kalispell, Montana in 1962. Plots 5 x 20 feet, three replications.

Date Seeded: 9/1/61 Date Harvested: 8/10/62 Size of Plot: 16 sq. ft.

Herbicide	Rate Lbs./ Acre	Weed Score 1 - 10	Grams per Plot			Total Grams	Ave. Bu./ Acre	Bu. Wt.
			I	II	III			
Banvel D	1/4	2	429	415	412	1256	41.9	58.2
Banvel D	1/2	5	431	414	437	1282	42.7	59.0
Banvel D	1	8	480	370	365	1215	40.5	58.6
Banvel T	1/4	1	445	549	310	1304	43.5	58.2
Banvel T	1/2	1	429	402	325	1156	38.5	58.3
Banvel T	1	1	477	540	385	1402	46.7	58.3
Dacamine	1/2	1	471	550	460	1481	49.4	59.0
Dacamine	1	2	484	425	450	1359	45.3	59.0
2,4-D ester	1	3	415	475	365	1255	41.8	59.0
2,4-D amine	1	1	510	424	546	1480	49.3	58.5
Check	0	1	403	445	410	1258	41.9	58.5

\bar{x} 43.8
 S.E.M. 3.34595
 L.S.D. NS
 C.V. 7.64 %

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	9018.82	2.69
Treatments	10	3702.691	1.10
Error	20	3358.618	
Total	32		

Table X. Weed control data from a study on wheat thief (Lithospermum arvense) in a natural stand in seed alfalfa.
 Date applied: 5/10/62 Size of Plot: 10 x 40 = 400 sq. ft.

Treatment	Rate Lbs./ Acre	Weed Score 1 - 10	Observation as to control May 18, 1962
Banvel D	1/4	1	fair
Banvel D	1/2	2	good
Banvel D	1	7	very good
Banvel T	1/4	1	poor
Banvel T	1/2	1	poor
Banvel T	1	1	poor
Dacamine	1/2	3	good
Dacamine	1	3	very good
2,4-D LV 4D	1	9	very good
2,4-D amine	1	3	good
Check	0	1	poor

Table XI. Yield data on the effect of certain herbicides on the control of wild oats (*Avena fatua*) in spring barley at Creston, Montana in 1962. Four row plots, three replications, field no. Y-7. Date Seeded: May 10, 1962 Date Harvested: August 30, 1962 Size of Plot: 32 square feet

Herbicide	Treatment	Rate		Score	Grams Per Plot			Total Grams	Yield	
		Lbs./Acre	Need		I	II	III		Bu. Wt.	in Bu./Acre
Avadex E/	Post Plant	1.0	3	1058	1290	1699	4047	53.7	84.3	
Avadex E/	Post Plant	1.5	5	1115	1210	1446	3771	52.2	78.6	
Carbyne	Two Leaf Stage	.5	8	1090	1290	1295	3675	52.5	76.6	
Carbyne	Two Leaf Stage	1.0	9	1205	1130	1300	3635	52.3	75.8	
Avadex	Pre Plant	1.0	4	1110	1294	1230	3634	52.8	75.7	
Avadex	Post Plant	1.5	2	1100	1204	1282	3586	52.5	74.7	
Avadex E/	Pre Plant	1.5	3	1200	995	1380	3575	52.6	74.5	
Check		0	2	1210	1100	1262	3572	51.6	74.4	
Avadex E/	Pre Plant	1.0	4	1120	1199	1199	3518	52.6	73.3	
Avadex	Post Plant	.5	2	1060	1265	1185	3510	52.6	73.1	
Avadex E/	Post Plant	.5	4	1019	1130	1360	3509	52.5	73.1	
Avadex E/	Post Plant	1.0	3	1110	1101	1295	3506	52.2	73.1	
Avadex	Pre Plant	1.5	4	1022	1065	1305	3392	52.4	70.7	
Avadex	Pre Plant	.5	2	855	1173	1060	3088	51.9	64.4	
Avadex E/	Pre Plant	.5	3	1035	855	1124	3014	52.5	62.8	
Carbyne	Two Leaf Stage	.25	1	840	1006	890	2736	51.4	57.0	

X..... 72.6
 S.E.X. 4.02527
 L.S.D. (.05).... 11.6
 C.V. 5.54 %

1. Scale 1 - 10 1-no control 10-complete control

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	160057.90	12.87 **
Treatments	15	32358.62	2.60 *
Error	30	12435.78667	
Total	47		

Table XII. Yield data from a herbicide study conducted on spring barley at Creston, Montana in 1962. Field number Y-7.

Date Seeded: May 1, 1962 Date Harvested: September 4, 1962 Size of Plot: 439.7 square feet

Chemical	Treatment	Rate /Acre	Herbicide Application, Tillage & Seeding Technique	Yields in Bu./Acre				Total Bushels	Average Bu/Acre
				I	II	III	IV		
Avadex BW	Pre Plant	1	Applied, disked in, and then seeded	66.8	63.8	79.9	72.8	283.3	70.8
Avadex BW	Post Plant	1	Applied after seeding and harrowed in	71.8	54.7	65.8	69.8	262.1	65.5
Check		0		55.1	47.6	59.7	65.7	228.1	57.0
Avadex	Post Plant	1	Applied after seeding and harrowed in	46.5	46.5	70.8	52.6	216.4	54.1
Carbyne		.75	Apply when oats are in the two leaf stage	38.5	33.4	37.4	56.7	166.0	41.5
Avadex	Pre Plant	1	Applied, disked in, and then seeded	28.0	31.0	31.5	26.0	116.5	29.1

1 - Acid equivalent

\bar{x}	53.02
S.E. \bar{x} .	3.55543
C.V.	6.71%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	177.69	3.51 *
Treatments	5	955.42468	18.90 **
Error	14	50.564286	
Total	22		

Table XIII. Evaluation of seven herbicides in new seedings of eight legumes for control of several weed species. Plots ten feet wide and twenty feet long, legumes spaced one foot.

Herbicide	#/Acre	Weed Score 1-10 *				Σ	Legume Observations		
		I	II	III	I		II	III	
Check	0	0	0	0	0	poor ¹ / ₂	good	poor	
Avadex	1.0	0	0	0	0	poor ¹ / ₂	poor	poor	
Eptam	3.0	0	0	3	1	fair ¹ / ₂	poor	good	
Dacthal	6.0	7	6	4	6	v. good	good	fair	
Trifluralin	2.0	8	9	9	9	v. good	v. good	v. good	
Avadex BW	1.0	0	0	0	0	poor ¹ / ₂	fair	poor	
Butoxone ester	1.0	9	9	7	8	good ¹ / ₂	good	poor	
Butoxone amine	1.0	8	6	8	7	good ¹ / ₂	fair	good	

¹/₂ Trefoil and Ladino could not be seen because of Pigweed.

²/₂ Population of Pigweed was less but legumes not as vigorous in these plots.

* 1 - no control 10 - complete control

Table XIV. The effect of certain herbicides on a natural weed population and on ten horticultural crops. Plots ten feet wide with crops planted at right angle to the herbicide plots.

Date Seeded: May 16, 1962 Chemicals 3 applied: May 16, 1962

Herbicide	Weed Score 1-10	Crop Injury 1 - 10 <u>2</u>										Application	
		Rate #/A	Car- rots	Beets	Let- tuce	Peas	Beans	Rad- ish	Turn- ips	Kohl- rabi	Spin- ach		Par- snip
Banvel D	10	1	6	10	10	10	10	10	10	9	10	9	Post emergence
Banvel T	9	2	3	10	10	9	9	9	9	6	9	7	Post emergence
Trifluralin	4	4	1	10	1	1	1	1	1	1	10	2	Pre plant
Trifluralin	8	8	2	10	7	7	7	2	6	6	10	2	Post plant
Eptam	3	3	2	10	1	1	2	1	5	5	1	1	Pre plant
Avadex	1	1	3	5	1	1	1	1	5	5	1	1	Pre plant
Dacthal	12	12	1	10	4	1	1	1	4	4	2	4	Post plant
Check	0	0	1	1	1	1	1	1	1	1	1	1	Post plant

- 1 1 - no control
- 10 - complete control
- 2 1 - no injury
- 10 - killed
- 3 All except Banvel D and T which were applied May 30, 1962.

Table XV. Effect of herbicides on Yellow Mustard (Commercial) grown for seed at Creston, Montana in 1962. Four row plots, three replications.

Date Seeded: 5/15/62 Date Harvested: 8/27/62 Size of Plot: 32 sq. ft.

Herbicide	Lbs. per Acre	Weed Score 1-10	Plot Yield in grams			Total Grams	Ave. Lbs. per Acre	Method of Application
			I	II	III			
Avadex	.5	1	300	451	440	1191	1191	Pre plant
Avadex	1.0	3	367	465	324	1156	1156	Pre plant
Avadex	1.5	2	425	345	421	1191	1191	Pre plant
Trifluralin	.5	2	443	505	445	1398	1399	Pre plant
Trifluralin	1.0	2	400	410	515	1325	1325	Pre plant
Trifluralin	2.0	4	484	485	435	1404	1405	Pre plant
Eptam	1.0	3	415	405	395	1215	1215	Pre plant
Eptam	3.0	7	410	341	302	1053	1053	Pre plant
Eptam	4.0	7	405	445	449	1299	1299	Pre plant
Dacthal	8.0	2	424	405	320	1149	1149	Post plant
Dacthal	12.0	2	468	410	355	1233	1233	Post plant
Dacthal	14.0	2	460	405	335	1200	1200	Post plant
Banvel D	$\frac{1}{2}$	5	520	547	365	1432	1433	Post emergence
Banvel D	$\frac{1}{2}$	8	500	410	400	1310	1310	Post emergence
Banvel D	1.0	10	275	365	326	966	966	Post emergence
Banvel T	$\frac{1}{2}$	6	522	384	370	1276	1276	Post emergence
Banvel T	$\frac{1}{2}$	8	390	360	520	1270	1270	Post emergence
Banvel T	1.0	9	365	377	472	1214	1214	Post emergence
Check	0.0	1	449	365	465	1279	1279	-----

NOTE: All preplant applications were incorporated in the soil.

\bar{x} 1239
S.E. \bar{x} . .. 106.22
C.V. 8.56 %

$\frac{1}{2}$ 1 - no injury
10 - complete kill

$\frac{2}{2}$ Harvested September 9, 1962

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	1858.02	-----
Treatments	18	4466.31389	1.19
Error	36	3761.03611	
Total	56		

Table XVI . Observation of herbicide plots on field bind weed (Convolvulus arvensis).

Date Applied: 8/30/62

Date Observed: 9/8/62

Herbicide	Rate #/A Acid	Remarks
Tryben 200 (Dimethylamine salt of trichlorobenzoic acid)	15	Evidence of good control
2,4-D amine (2,4-dichlorophenoxyacetic acid)	4	Little evidence of control
2,4-LVD (2-Ethyl hexyl ester 2,4-dichlorophenoxyacetic acid)	4	Evidence of some control, some plants still green
Weedone 638	4	Browning of plants, some green plants still evident
Emulsamine E-3 (2,4-dichlorophenoxy acetic acid, tertiary dodecyl primary amine salt)	4	Where stand of bind weed is heavy plants are brown, some green plants are evident also

TITLE: Forage Investigations (Annual)

PROJECT NO.: 5022

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

FUNDS: State - \$803.33

LOCATION: Northwestern Montana Branch Station in field numbers Y-1 and Y-8

DURATION: Three years

OBJECTIVES:

1. To study seeding techniques that will give maximum production of corn silage
2. To determine the adaptability of certain commercial and corn varieties
3. To study several annual crops for use as forage crops
4. To determine the optimum time for harvesting annual forages.

EXPERIMENTAL DATA:

INTRODUCTION

Work in annual forages this past season was done on corn silage and cereal crops for annual hay. Five corn varieties were tested and a cultural study conducted with silage corn. The annual hay study was conducted in cooperation with other workers in the Experiment Station system.

MATERIALS AND METHODS

Corn Silage

Corn silage varieties, five in number, were grown in four row plots with rows being spaced forty inches. Seeding rate used was 30,000 plants per acre in four replications with one replication seeded at the 80,000 plants per acre.

The cultural study on corn consisted of solid versus row planting. Seeding was done in seven, fourteen, and forty inch rows. Populations were to be the same in each planting, however, this was not accomplished with the equipment used.

P.A.G. 55 was the variety used in the cultural study. Entries in the variety nursery are found in Table XVII.

The area for both silage studies was sprayed with Avadex and Avadex EW to control wild oats.

Two irrigations were made during the growing season. Three hundred pounds of 27-14-00 were applied per acre before seeding.

RESULTS AND DISCUSSION

Corn Silage

Temperatures were below normal during the 1962 growing season and an early frost contributed to the low yields of corn silage this season. Only one of the varieties tasseled before the frost.

There were not any significant differences in yields in the variety study. The mean for population was 91.6 percent of the seed planted for the 30,000 plant rate and 76.7 percent for the 80,000 plant rate. Data from this study is found in Table XVII.

Plant populations in the cultural study were to have been 80,000 plants per acre. This was to have been obtained by planting double with an INC corn planter, however, it did not drop as many kernels as was calculated. The fourteen inch rows were seeded light because the grain drill used was set for a much lower rate of seeding. Only the seven inch row spacing was near the desired seeding rate.

These data are recorded in Table XVIII. This table gives plant populations of each planting technique and tons per acre of forage.

MATERIALS AND METHODS

Annual Hay

The small grain hay trial was grown in four row plots ten feet long and replicated three times. It was grown under dryland conditions. Samples for nitrate composition were taken as follows during the growing season:

- a. 1st harvest (constant date). When the first spikelet emerges from the flagleaf of Gopher Oats harvest sample from all crops.
- b. 2nd harvest (by maturity). Harvest a sample from each crop as the 1st spikelet emerges.
- c. 3rd harvest (constant date). When the 1st spikelet of Gopher Oats turns color harvest sample from all crops.
- d. 4th harvest (by maturity). Harvest a sample from each crop as the 1st Spikelet turns color.

These samples were sent to Montana State College for chemical analysis.

Sixteen square feet were harvested from the two center rows and bundle weights were taken after allowing bundles to air dry in the field for nineteen days. Plots were threshed and grain yields and grain-straw ratios calculated.

RESULTS AND DISCUSSION

Annual Hay

Horsford barley produced the highest grain yield, and has the lowest straw-grain ratio. Although the yields of total bundle weights were non-significant statistically the oat entries were highest in total forage yield. See Table XIX.

Chemical data are not available at this writing.

Table XVII. Agronomic data from corn silage variety trial grown at Creston, Montana in 1962. Four row plots, three replications.

Variety	Ht. in	Date Seeded: May 23, 1962		Date Harvested: September 4, 1962		Size of Plot: 106.67 sq. ft.		Oven Dry Weights									
		Plants per		Flant Population of		Percent		30,000 Plants per Acre		80,000 Plants/A							
		I	II	III	IV	1-2-3	Reps.	30,000 Seeded	80,000 Seeded	Percent Seeded	Total	Tons					
P. A. G. 323	51	61	74	73	161	208	28,314	65,748	94.4	82.2	10.43	11.04	13.66	35.13	2.39	18.37	3.75
Haapala SD-50	65	71	59	76	137	205	27,906	55,947	93.0	69.9	12.59	15.29	14.53	42.41	2.89	24.00	4.90
P. A. G. 434	61	66	59	72	134	197	26,817	54,722	89.4	68.4	11.48	15.00	12.61	39.09	2.66	17.79	3.63
Dekalb 238	67	62	80	51	146	193	26,215	59,623	87.4	74.5	16.31	16.60	9.90	42.81	2.91	18.20	3.71
Dekalb 633	57	64	73	70	174	207	28,178	71,057	93.9	88.8	12.50	12.67	21.50	46.67	3.18	17.50	3.57

\bar{x} 2.80
 S.E. \bar{x}39304
 C.V. 14.00 %

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	4.49120	-----
Varieties	4	6.27264	-----
Error	8	11.11636	
Total	14		

Table XVIII. Yield data from corn cultural study grown at Creston, Montana in 1962. Field number Y-8.

Date Seeded: May 24, 1962 Date Harvested: September 4, 1962

Row Spacing in Inches	Plant Population Per Acre				Total	Average Plants Per Acre				Average Tons Per Acre		
	I	II	III	IV		I	II	III	IV	Total	Per Acre	
40	20,010	22,052	26,176	32,262	102,502	25,626	2,05	2.44	3.49	2.88	10.86	2.71
14	17,112	25,669	20,224	24,891	87,896	21,974	3.97	3.65	2.76	4.50	14.88	3.72
7	72,600	87,120	82,280	77,440	319,440	79,860	7.62	8.17	6.00	7.09	28.88	7.22

Analysis of Variance

\bar{x}	4.55
S.E. \bar{x}.....	.42373
L.S.D. (.05).....	1.47
C.V.	9.31 %

Source	D.F.	Mean Square	F
Replications	2	.50075	
Varieties	3	14.91335	20.76 **
Error	6	.71823	
Total	11		

Table XIX. Agronomic data from small grain hay study grown under dryland conditions at Creston, Montana in 1962. Field no. Y-1, four row plots, three replications.

Date Seeded: 5/3/62 Date Harvested: 8/3/62 Size of Plot: 16 square feet

Variety	Plot Yield in Grams			Total Grams	Lbs. per Acre	Bu. Wt. in Pounds	Total Weight Grain & Straw	Straw- Grain Ratio
	I	II	III					
Side Oats (Havre)	318	351	420	1089	2179	31.0	8905	3.09
Rodney	516	470	409	1395	2791	35.8	8451	2.03
Basin	345	440	340	1125	2251	35.9	6920	2.07
Improved Garry	410	515	480	1405	2811	34.5	8848	2.15
Park	441	402	454	1297	2595	34.9	7714	1.97
Gopher	395	359	245	999	1999	34.4	6976	2.49
Mission	445	450	405	1300	2601	35.2	7657	1.94
Bridger	430	525	330	1285	2571	36.0	7941	2.09
Horsford	536	505	590	1631	3263	49.5	7147	1.19
Belford	535	490	460	1485	2971	47.5	6636	1.23
Ceres	290	294	325	909	1819	56.5	7373	3.05
Spring Rye Prolific	320	317	190	827	1654	51.5	7147	3.32
Piper Sudan	15	25	5	45	90	---	---	---

\bar{x} 2277
 S.E. \bar{x} 181.71
 L.S.D. (.05)..... 529
 C.V. 7.98 %

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	4863.565	
Varieties	12	53878.65833	19.60
Error	24	2749.11958	
Total	38		

Table XIXa . Bundle weight data from small grain hay study grown under dryland conditions. Creston, Montana 1962. Field no. Y-1, four row plots, three replications.

Date Seeded: 5/3/62 Date Harvested: 8/3/62 Size of Plot: 16 square feet

Variety	Plot Yield in Ozs.			Total Ounces	Average Ounces	Grain & Straw Ave. Lbs./Acre
	I	II	III			
Side Oats (Havre)	48	47	62	157	52.3	8905
Rodney	53	49	47	149	49.7	8451
Basin	36	46	40	122	40.7	6920
Improved Garry	40	54	62	156	52.0	8848
Park	45	44	47	136	45.3	7714
Gopher	47	46	30	123	41.0	6976
Mission	45	49	41	135	45.0	7657
Bridger	46	59	35	140	46.7	7941
Horsford	42	38	46	126	42.0	7147
Belford	44	39	34	117	39.0	6636
Ceres	42	42	46	130	43.3	7373
Spring rye Prolific	46	49	31	126	42.0	7147

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	36.58334	---
Varieties	11	59.70455	---
Error	22	53.21970	
Total	35		

\bar{x}	7642
S.E. \bar{x} ..	716.6777
L.S.D. ..	NS
C.V.	9.38 %

TITLE: Small Grain Investigations

PROJECT NUMBER: 5023 (Spring Barley)

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

FUNDS: State - \$ 723.33

LOCATION: Northwestern Montana Branch Station - field numbers X-4, Y-1, Y-7, Y-8

DURATION: Indefinite

OBJECTIVES:

1. To determine the adaptation of new and introduced barley varieties and selections
2. To maintain a pure genetic varietal seed source of recommended spring barley.

EXPERIMENTAL DATA:

INTRODUCTION

The spring barley project was reduced again this year because of fund limitations and it was felt other areas should be emphasized at this time.

The testing of barley varieties was the only item in the barley project.

Line row and approved seed production are included in the report but are not research projects.

MATERIALS AND METHODS

A complete description of procedure and design for variety testing and seed production are found on page seventy of the 1961 Annual Report of the Northwestern Montana Branch Station.

Only the irrigated intrastate and Station nursery was grown in 1962. It contained twenty-four entries and was grown in field number Y-7.

RESULTS AND DISCUSSION

The irrigated intrastate and Station yield nursery was used this season because of wanting the entries in this nursery. In most seasons, rainfall at the Station will produce yields equal to irrigated yields in other locations. This season the rainfall was several inches below normal. In spite of the reduced precipitation, the mean yield was 73.0 bushels per acre and the range 63.2 to 86.5. It is interesting to note that there was no significant differences in varieties this year. Complete agronomic data for this study are found in Table XX.

Table XXI is a summarization of annual and yearly data of barley yield nurseries for the years 1953 to 1962 inclusive.

Foundation Ingrid was grown in field number Y-7. Foundation Freja was grown in Y-1. Approved Ingrid was grown in field X-4.

<u>Association Number</u>	<u>Variety</u>	<u>Generation</u>	<u>Field Inspection</u>	<u>Seed Produced</u>
621-1313	Ingrid	Foundation	Passed	1120 Lbs.
No number	Ingrid	Approved	Passed	160 Bu.
No number	Freja	Foundation	Passed	350 Lbs.

Table XX. Agronomic data from the irrigated $\frac{1}{2}$ intrastate and Station yield nursery, Creston, Montana in 1962.

Four row plots, five replications, field number Y-7.
 Date Sowed: April 30, 1962 Date Harvested: August 16, 1962 Size of Plot: 16 square feet

Variety	C. I. No.	In g Date	In. In.	In g %	Grams Per Plot					Lbs. Bu.		Plumps 2 Average			
					I	II	III	IV	V	Total Grams	Per Acre		Thins 2 Average		
Jubilee	Can. 263	6-29	34	0.0	620	521	575	590	552	2858	3430	71.5	19.5	29.0	71.0
Palliser	10860	6-29	32	11.2	651	526	535	561	600	2873	3446	71.8	48.7	8.6	91.4
Piroline	9536	6-28	28	0.0	650	650	590	460	530	2880	3456	72.0	53.9	5.8	94.2
Glacier x Manchuria	58-5614	6-22	33	3.0	650	550	634	550	520	2904	3485	72.6	46.9	10.6	89.4
Glacier x Manchuria	58-5630	6-26	36	1.0	515	664	560	619	549	2907	3488	72.7	47.6	6.2	93.8
Glacier x Manchuria	58-5724	6-25	37	2.0	603	591	566	549	555	2864	3437	71.6	47.5	7.2	92.8
Glacier x Manchuria	58-5725	6-26	37	1.0	610	645	618	625	535	3033	3640	78.3	47.4	6.0	94.0
Glacier x Manchuria	58-5897	6-24	36	4.0	694	595	885	626	660	3460	4152	86.5	50.0	11.0	89.0
Lico x Ogalitsu	56-7570-19	6-24	34	3.0	665	530	624	635	608	3062	3674	76.6	46.5	6.4	93.6
Freja	7130	6-29	27	6.4	559	620	565	560	540	2844	3413	71.1	51.4	8.6	91.4
Gen	7243	6-23	34	1.0	609	655	485	655	635	3039	3647	76.5	46.2	2.4	97.6
Larker	10648	6-25	35	1.0	549	571	625	579	550	2874	3449	71.9	52.2	11.8	88.2
Glacier x Compana	Moc. 75	6-25	33	.02	635	640	576	440	600	2891	3469	72.3	49.9	1.8	98.2
Unitan	10421	6-26	37	2.4	602	665	645	590	555	3057	3668	76.4	47.4	17.0	83.0
Trophy	10647	6-27	33	1.0	615	544	453	475	604	2691	3229	67.3	51.3	14.2	85.8
Ingrid	10083	7- 2	29	0.0	670	570	565	440	585	2830	3396	70.8	51.5	10.2	89.8
Foma	11333	6-26	28	0.0	595	636	559	553	600	2943	3532	73.6	52.6	6.4	93.6
Svalof 50-109	10524	7- 1	26	0.0	635	650	465	585	584	2919	3503	73.0	52.5	12.8	87.2
Compana	5438	6-26	28	46.0	550	649	420	660	569	2848	3418	71.2	50.3	3.2	96.8
Betses	6398	6-28	29	0.0	659	670	370	610	610	2919	3503	73.0	51.6	5.4	94.6
Dekap	3351	6-27	28	38.4	600	650	591	424	619	2884	3461	72.1	52.3	11.2	88.8
Betses Erectoides	10871	6-29	29	0.0	574	645	340	461	509	2529	3035	63.2	51.5	9.2	90.8
Traill	9538	6-28	34	2.0	572	643	631	481	535	2862	3434	71.6	49.1	30.0	70.0
Vantage	7324	6-27	36	0.0	581	574	670	735	566	3126	3751	78.2	51.2	6.0	94.0

$\frac{1}{2}$ This was designed as an irrigated study but no irrigations were made during the growing season.

$\frac{2}{2}$ Plumps = kernels on top a 6/64 x 3/4 sieve.

Thins = kernels through a 6/64 x 3/4 sieve.

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	4	14632.0975	3.04 *
Varieties	23	5596.7913	1.16 *
Error	92	4806.1088	
Total	119		

\bar{x}	3505	73.0
S.E. \bar{x} ..	186.03	3.875
L.S.D. ..	NS	NS
C.V.	5.31%	5.31%

TITLE: Small Grain Investigations

PROJECT NUMBER: 5023 (Winter Barley)

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

FUNDS: State - \$ 516.66

LOCATION: Northwestern Montana Branch Station in field number R-5c and several off-station locations

DURATION: Indefinite

OBJECTIVES:

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

EXPERIMENTAL DATA:

INTRODUCTION

Olympia and Alpine were recommended for western Montana in 1962. These varieties have been the most consistent of any varieties tested in western Montana. Considerable work still needs to be done to find winter hardiness equal that of winter wheat.

MATERIALS AND METHODS

A complete description of technique and procedures in small grain research can be found on page seventy of the 1961 Annual Report of the Northwestern Montana Branch Station.

Winter barley work in 1961-62 consisted of the intrastate nursery, two row nursery, six off-station nurseries, and field plots. The intrastate nursery had fourteen entries and was grown in field number R-5c. The two row nursery had six entries, two of which were six row checks and one Winter Emmer entry. The off-station nurseries contained thirteen entries of barley and one of Winter Spelts. Locations and names of off-station cooperators are found in the tabulated data. Field plots were made up of three varieties which had shown promise in earlier varietal testings.

RESULTS AND DISCUSSION

The mean yield for the intrastate nursery was 53.1 bushels per acre which would be considered good for the area in which it was grown. Ellis and Alpine were significantly higher in yield than the check Olympia. Test weights were fair to good. See Table XXII for details of this study. Grain straw ratio are found in Table XXIII.

The yield data was non-significant from the two row nursery. Stands were good except in Pioneer which was not harvested because there was no survival of any plants. Complete data of this study are found in Tables XXIV and XXV.

Off-station

The six off-station nurseries will be discussed by counties.

Missoula - This nursery was located on the County Airport. It was a poor location for winter grain. The area was very dry when seeded and there was little or no tillering. Stand estimates were the only data obtained. This information is recorded in Table XXVI.

Ravalli - This nursery completely winter killed except for Winter Spelts. Samples of Spelts were harvested and a yield calculated. The mean for the plots was 2816 pounds per acre.

Lake - Ice covered this nursery and a total loss of the nursery resulted.

Sanders - All entries in the winter barley nursery in this location were lost during the winter.

Mineral - Partial stands in two replications lived through the winter in this nursery. Most entries of winter barley were lost in part because of winter kill. Only data secured from this nursery was the average yield of Spelts which came through the winter in good stands. No winter barley data was obtained because of the unevenness of stand. The average of Spelts was 2797 pounds per acre.

Lincoln - Yields were the highest in Lincoln County that have ever been recorded in winter barley research work in that location. Spelts produced the most material per acre and Chase was the only entry significantly higher in yield than Olympia. It is difficult to account for the high C. V. in this study. See Table XXVII for details of this study.

Field plots were grown in three drill width strips about 600 feet long. Samples were taken with a self propelled combine harvesting an area of 439.7 square feet for each sample. Four such samples were taken from each of the three entries.

Yields of each variety are as follows:

Svalof 42-7	-	1214 pounds per acre
Alpine	-	1932 pounds per acre
Kty. 56-74	-	1350 pounds per acre.

Table XXVIII is a summary of winter barley yield at Creston, Montana for the years listed. They are given in percent of Winter Club.

Table XXII. Agronomic data from dryland intrastate winter barley nursery grown at Creston, Montana in 1961-62. Four row plots, three replications, field number R-5c. Date Seeded: September 21, 1961 Date Harvested: August 3, 1962 Size of Plot: 32 sq. ft.

Variety	C. I. No.	Head- ing Date	Height in Inches	Lodg- ing %	Grams per plot			Total Grams	Ave. Lbs./ Acre	Bu. per Acre	Bu. Wt.
					I	II	III				
Svalof 42-7	7187	6-13	34	13.3	798	890	880	2568	2569	53.5	48.0
Kearney	7580	6-6	30	13.7	509	721	643	1873	1874	39.1	49.2
Chase (Neb. 52434)	9581	6-3	33	11.7	870	540	879	2289	2290	47.4	52.5
Killis	9529	6-13	31	15.0	1032	1205	805	3042	3043	63.4*	49.9
Alpine	9578	6-24	32	---	990	1130	1215	3335	3336	69.5*	47.0
Winter Club	592	6-20	32	1.7	624	760	635	2019	2020	42.1	46.7
Olympia	6107	6-11	31	12.3	774	1016	539	2329	2330	48.5	48.3
GCX - 242	9176	6-13	29	9.3	1143	1025	1005	3171	3172	66.1	48.4
Va. 59-37-3	10658	6-8	33	15.0	543	775	930	2248	2249	46.9	47.8
GCX - 54 - 3	---	6-9	37	22.5	1000	955	955	2910	2911	60.6	50.1
GCX - 55 - 8	---	6-12	32	8.3	966	750	850	2566	2567	53.5	44.4
GCX - Bulk	6625	6-17	30	---	840	717	501	2058	2059	42.9	47.0
Kty. 56-74	10542	6-8	30	13.3	744	817	781	2342	2343	48.8	48.5
Kty. 50-5400	10294	6-13	32	6.7	1108	870	955	2933	2934	61.1	49.1

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

Source	D.F.	Mean Square	F
Replications	2	6492.705	
Varieties	13	70629.81	3.51 **
Error	26	20125.586	
Total	41		

x.....	2550	53.1
S.E.X.	245.8	5.1207
L.S.D. (.05).....	716	14.9
L.S.D. (.01).....	966	20.0
C.V.	9.64%	9.64%

Table XXIII . Bundle weight and grain straw ratio from the intrastate winter barley nursery at Creston, Montana in 1961-62.

Date Seeded: 9/21/61 Date Harvested: 8/3/62 Size of Plot: 32 square feet

Variety	C. I. No.	Ounces per plot			Total Ounces	Ave. Lbs. /Acre	Grain Yield #/Acre	Grain Straw Ratio
		I	II	III				
Svalof 42-7	7187	71	67	72	210	5955	2569	1.318
Kearney	7580	48	75	60	183	5190	1874	1.769
Chase (Neb. 52434)	9581	72	46	63	181	5133	2290	1.242
Ellis	9529	82	81	65	228	6466	3043	1.125
Alpine	9578	91	101	105	297	8423*	3336	1.526
Winter Club	592	72	64	70	206	5842	2020	1.892
Olympia	6107	72	81	58	211	5984	2330	1.568
CGX - 242	9176	83	76	88	247	7005	3172	1.208
Va. 59-37-3	10658	79	60	82	221	6268	2249	1.787
CGX - 54-3	-----	89	68	60	217	6154	2911	1.115
CGX - 55-8	-----	80	64	62	206	5824	2567	1.269
CGX - Bulk	6625	91	78	72	241	6835	2059	2.319
Kty. 56-74	10542	72	64	67	203	5757	2343	1.458
Kty. 50-5400	10294	86	63	72	221	6267	2934	1.140

* Varieties yielding significantly more than Olympia (.05).

\bar{X}	6223
S.E. \bar{X}	470.079
L.S.D.(.05).....	1370
L.S.D.(.01).....	1848
C.V.	7.56%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	220.57145	2.42
Varieties	13	280.03663	3.08
Error	26	91.05861	
Total	41		

Table XXIV. Agronomic data from two row dryland winter barley nursery at Creston, Montana in 1961-62. Four row plots, three replications, field number R-5c.

Date Seeded: 9/21/61 Date Harvested: 8/3/62 Size of Plot: 16 sq. ft.

Variety	C.I. No.	Head- ing Date	Ht. in In.	Grams per plot			Total Grams	Lbs. per Acre	Bu. per Acre	Bu. Wt.
				I	II	III				
Alpine	9578	6-25	33	1186	715	940	2841	2842	59.2	47.5
Garstens		6-11	31	740	830	975	2545	2546	53.0	52.0
Tschermaks		6-6	30	605	574	670	1849	1850	38.5	51.8
Winter Emmer		6-21	43	1004	1185	1060	3249	3250	108.7	29.9
Ellis	9529	6-13	32	1025	934	665	2624	2625	54.7	48.0

Analysis of Variance				\bar{x}	2623	54.6
Source	D.F.	Mean Square	F	S.E.R.	287.15	5.9823
Replications	2	5712.27	---	L.S.D.	NS	NS
Varieties	4	87045.94	3.16	C.V.%.....	10.95	10.95
Error	8	27467.6825				
Total	14					

Table XXV. Bundle weights and grain straw ratio from two row dryland winter barley nursery at Creston, Montana in 1961-62.

Date Seeded: 9/21/61 Date Harvested: 8/3/62 Size of Plot: 32 sq. ft.

Variety	C.I. No.	Ounces Per Plot			Total Ounces	Lbs. per Acre	Grain Yield #/Acre	Grain Straw Ratio
		I	II	III				
Alpine	9578	95	65	82	242	6862	2842	1.415
Garstens		69	88	87	244	6920	2546	1.718
Tschermaks		60	65	70	195	5530	1850	1.989
Winter Emmer		82	97	86	265	7515	3250	1.312
Ellis	9529	73	67	46	186	5275	2625	1.010

Analysis of Variance				\bar{x}	6421
Source	D.F.	Mean Square	F	S.E.R. ...	611.8011
Replications	2	6.46667	---	L.S.D. ...	NS
Varieties	4	388.43333	2.50	C.V. ...	9.52%
Error	8	155.13333			
Total	14				

Table XXVI. Stand data obtained from dryland winter barley nursery grown in Missoula County on the County Airport, Missoula, Montana in 1962.

Date Seeded: September 14, 1961

<u>Variety</u>	<u>C. I. No.</u>	<u>Percent Stand</u>
Svalof	7187	30.0
Kearney	7530	27.8
Boz cc x 242	9176	21.3
Boz cc x 349-9	-----	27.5
Ellis	9529	23.8
Boz cc x 54-3	-----	25.5
Alpine	9578	21.3
Ohio Winter	7072	20.0
Olympia	6107	45.0
Kty. 56-74	10542	4.0
Dicktoo	-----	15.0
Va. 59-37-3	10658	36.5
Chase	9581	44.5
Spelts	-----	78.8

Table XXVII. Agronomic data from off-station dryland winter barley grown in Lincoln County on the Dick Britton ranch at Eureka, Montana in 1961-62. Single row plots, four replications. Date Seeded: September 22, 1961. Date Harvested: July 26, 1962. Size of Plot: 16 sq. ft.

Variety	C. I. No.	Height in Inches	Grams Per Plot				Total Grams	Lbs. Per Acre	Bu. Per Acre
			I	II	III	IV			
Stalof	7187	31	370	319	345	404	1438	2158	45.0
Kearney	7530	31	335	420	500	315	1570	2356	49.1
Bsz cc x 242	9176	32	430	286	560	470	1746	2620	54.6
Bsz cc x 349-9		33	556	417	215	310	1498	2248	46.8
Ellis	9529	32	399	375	485	410	1669	2504	52.2
Bsz cc x 54-3		32	496	459	435	375	1765	2648	55.2
Alpine	9578	33	505	259	345	235	1344	2017	42.0
Ohio Winter	7072	33	490	462	586	316	1854	2782	58.0
Olympia	6107	32	580	410	226	105	1321	1982	41.3
Kty. 56-74	10542	28	410	371	308	359	1448	2173	45.3
Dicktoo		30	400	176	208	164	948	1422	29.6
Va. 59-37-3	10658	35	236	315	320	354	1225	1838	38.3
Chase	9581	31	365	545	505	534	1949	2925	60.9 *
Spelts		42	575	892	581	478	2526	3790	129.4 **

Note: Olympia is used as a check in this nursery.
 1. Calculated missing plot.
 * Varieties yielding significantly more than the check (.05)
 ** Varieties yielding significantly more than the check (.01)

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	21787.666	1.81
Varieties	13	35955.05761	2.98 **
Error	38	12049.9145	
Total	54		

\bar{x} 2390 49.8
 S.E.X. 329.425 6.86295
 L.S.D. (.05) 94.1 19.6
 L.S.D. (.01) 1258 26.2
 C.V. 13.78% 13.78%

Table XVIII. Summary of winter barley varieties grown at Creston, Montana in 1951 to 1962. Yields reported in percent of Winter Club.

Variety or Cross	C.I. or Sel. No.	Average Yield for year as percent of Winter Club										Number of Station Years	Average % of Winter Club		
		1951	1952	1953	1954	1955	1957	1960	1961	1962					
Alpine	9578						121				111	99	165	4	124
Chase	9581												113	1	113
CCX-242	9176	125	51	92	66	154	98				88	121	157	9	106
CCX-54-3											108	112	149	3	123
CCX-55-8													127	1	127
CCX-Bulk	6625										99		102	2	101
Killis	9529		101	79	80	193	98				121	104	151	8	116
Kearney	7530						60				90	91	93	4	84
Kty. 56-74	10542										109	90	116	3	105
Kty. 50-5400	10294												145	1	145
Olympia	6107										112	118	115	4	118
Va. 59-37-3	10658												111	1	111
Svalof 42-7	7187										108	126	127	3	120
Winter Club	592 *	144.8	41.3	74.0	80.0	52.0	61.6	56.0	63.6	42.1				9	100

* Yields in bushels per acre or 100%.

TITLE: Small Grain Investigations

PROJECT NUMBER: 5023 (Oats)

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

FUNDS: State - \$ 391.66

LOCATION: Northwestern Montana Branch Station in field number Y-7

DURATION: Indefinite

OBJECTIVES: To determine the adaptation of new and introduced oat varieties and selection by comparison with recommended varieties.

EXPERIMENTAL DATA:

INTRODUCTION

There has been a reduction in the number of acres of oats grown in western Montana the past few years. There is a need for more production to meet the demand.

Root rots in oats have presented a problem when oats are grown on corn stubble.

MATERIALS AND METHODS

A complete description of techniques and procedures in small grain research may be found on page seventy of the 1961 Annual Report of the Northwestern Montana Branch Station.

Thirty entries made up the dryland oat nursery, the only one grown in 1962. Twenty-four were the same as those in the Uniform Northwest oat nursery. The other six were Montana entries.

RESULTS AND DISCUSSION

The mean yield of the dryland nursery was 81.7 bushels per acre. Park was used as a check and although some varieties were higher in yield than the check, none were significantly higher. Several entries were significantly lower in yield than Park.

Lodging was quite severe for oats in this area. This was due in main to the root rot that develops when oats are grown on corn stubble, here on the Station. Table XXIX shows the agronomic data from this nursery.

Table XXX is a ten year summary of several oat varieties grown at Creston, Montana.

Table XXIX. Agronomic data from dryland oat nursery grown at Creston, Montana in 1962. Four row plots, three replications, field no. Y-7.
Date Seded: May 30, 1962 Date Harvested: August 16, 1962 Size of Plot: 16 square feet

Variety	C.I. No.	Head- ing Date	Height in Inches	Lodg- ing %	Grams Per Plot			Total Grams	Yield in Bu./A.	Bu. Wt.
					I	II	III			
(Roxton x R.L. 1276) x (Ajax x R.L. 1276)	5958	7-3	35	21.7	505	466	420	1391	87.0	32.9
Clinton 59	4259	6-29	36	11.7	135	165	230	530	33.2 **	29.4
Markton	2053	7-8	37	68.3	430	385	380	1195	74.7	32.5
Garry, Improved	6662	7-4	40	43.3	420	474	510	1404	87.8	33.8
Park	6611	7-9	35	11.7	472	505	455	1432	89.5	34.6
Victory	1145	7-12	38	65.0	430	480	351	1261	78.8	35.0
58 ab 2761	7572	7-11	39	20.0	400	473	455	1328	87.4	32.5
Bannock	2592	7-12	38	53.3	461	560	395	1416	88.5	32.4
56 ab 6538	7594	7-13	40	66.7	420	440	500	1360	85.0	35.5
58 ab 2782	7573	7-12	37	15.0	454	545	475	1474	92.2	33.0
58 ab 2784	7575	7-12	36	18.3	431	485	532	1448	90.5	31.4
58 ab 2773	7588	7-12	38	23.3	414	470	560	1444	90.3	31.0
58 ab 2777	7591	7-12	39	15.0	335	495	439	1269	79.3	32.4
58 ab 2787	7578	7-12	36	13.3	465	484	470	1419	88.7	31.0
58 ab 2786	7577	7-13	38	15.0	500	406	554	1460	91.3	32.1
58 ab 2779	7593	7-13	38	16.7	499	475	469	1443	90.2	31.4
Overland	4181	7-4	34	10.0	506	437	511	1454	90.9	35.2
47 ab 2685	---	7-4	39	60.0	474	495	516	1485	92.8	32.5
Russell	7557	7-6	37	45.0	576	449	465	1490	93.2	34.0
Ianster	7476	7-5	40	40.0	570	504	515	1589	99.3	35.5
R.L. 2123.50	---	7-7	37	51.7	445	351	270	1066	66.6 **	33.9
R.L. 2123.10	---	7-7	39	70.0	400	360	415	1175	73.5 *	34.4
R.L. 2123.9	---	7-9	37	76.7	376	334	365	1075	67.2 **	33.2
R.L. 2123.6	---	7-9	39	68.3	495	397	430	1322	82.7	34.8
Mission	2588	7-3	40	56.7	456	418	360	1234	77.2	35.0
Gopher	2027	7-1	36	23.3	295	315	375	985	61.6 **	29.9
Bridger	2611	7-13	38	48.3	461	455	552	1468	91.8	33.2

Continued ---

Table XXIX. (Continued)

Variety	C.I. No.	Head- ing Date	Height in Inches	Lodg- ing %	Grams Per Plot			Total Grams	Yield in Bu./A.	Bu. Wt.
					I	II	III			
Basin	5346	7-10	37	35.0	475	485	471	1431	89.5	33.9
Rodney	6661	7-10	39	61.7	430	466	460	1356	84.8	34.5
Andrew x Mission	50-12-18	6-28	40	31.7	226	364	205	795	49.7 **	24.7

Note: Park is used as a check in this nursery.

- * Varieties yielding significantly less than the check (.05).
- ** Varieties yielding significantly less than the check (.01).

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	313.45	
Varieties	29	17227.04827	6.33 **
Error	58	2722.57068	
Total	89		

\bar{x} 81.7
 S.E. \bar{x} 5.6501
 L.S.D. (.05) 16.0
 L.S.D. (.01) 21.3
 C.V. 6.92%

Table XXX. Summary of yields in the dryland oat yield nurseries, 1953-1962 inclusive at Creston, Montana. Yields reported as a percentage of Park.

Variety or Cross	C.I. or Sel. No.	Average yield for years as a percent of Park										No. of Station Years	Ave. % of Park
		1953	1954	1955	1956	1957	1958	1959	1960	1961	1962		
Park Bu/Acre	66EE	157.4	154.3	149.8	112.1	46.3	63.5	99.4	17.5	64.3	89.5	10	95.4
Bannock	2592	84	95	78	100	136	121	102	97		93	9	101
Basin	5346	80	95	97	110	110			86	92	100	8	96
Bridger	261				109	107					103	3	106
Clinton 59	4259			67	78	70	95	74	79		37	7	71
Copher	3027			73	59	65		50	61	81	69	7	65
Garry (Improved)	6662		84	81	87	101	85	113	66	84	98	9	89
Lanster	7476										111	1	111
Markton	2053	85	96	70	102	102	83	90	97		84	9	90
Mission	2588				67	121	78	84	81		86	6	86
Overland	4181	76	108	98	102	148	136	101	82		102	9	106
Park	6611	100	100	100	100	100	100	100	100	100	100	10	100
Rodney	6661	92	97	81	87	67	22	52	91		95	9	76
Russell	7557										104	1	104
Victory	1145		96	79	110	140	78	93	103		88	8	98
R. L. 2123. 6											92	1	92
R. L. 2123. 9											75	1	75
R. L. 2123.10											82	1	82
R. L. 2123.50											74	1	74
47 ab 2685											104	1	104
56 ab 6538									86		95	2	91
58 ab 2773	7588								84		101	1	101
58 ab 2777	7591										87	2	86
58 ab 2779	7593										101	1	101
58 ab 2781	7572										101	1	101
58 ab 2782	7573									98		1	98
58 ab 2784	7575								91	103		2	97
58 ab 2786	7577								87	101		2	94
58 ab 2787	7578										102	1	102
Andrew x Mission	50-12-18								121		99	1	99
(Boxton x R.L. 1276)x	5958										56	2	89
(Ajax x R.L. 1276)											97	1	97

TITLE: Small Grain Investigations

PROJECT NUMBER: 5023 (Spring Wheat)

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

FUNDS: State - \$ 441.66

LOCATION: Northwestern Montana Branch Station in field number Y-7

DURATION: Indefinite

OBJECTIVES:

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

EXPERIMENTAL DATA:

INTRODUCTION

Spring wheat yields have been quite low in western Montana under dryland conditions the past three seasons. The yield variations between winter and spring wheat have been much greater the past three years than in previous years.

Spring wheat work this past season was limited to two nurseries grown under non-irrigated conditions.

MATERIALS AND METHODS

The two nurseries grown this season are described below. The advanced yield nursery had four durum wheat entries and twenty hard red entries. It was grown in four row plots replicated four times. The Uniform Western Regional white wheat nursery had twenty-four entries and Thatcher is included as a hard red variety. This nursery was grown in three replications.

RESULTS AND DISCUSSIONS

Yields were very good in this nursery in spite of the low rainfall. B 59-1 was the highest yielding entry with 71.2 bushels per acre. All entries with Norin 10 parentage were significantly higher in yield than Thatcher. Lakota durum also was very good in yield being significantly higher in yield than Thatcher. Stripe rust was noted on several entries. The entries with Norin 10 parentage had the highest rust reading. See Table XXXI for complete agronomic data.

The mean of the white wheat nursery was somewhat lower than the hard red nursery. Onas 53 was the only entry that was significantly better in yield than Lemhi. Stripe rust infection rates are quite variable between entries with some of them showing considerable resistance. Those entries with Idaed parentage all show good to moderate resistance to stripe rust. See Table XXXII for complete agronomic data.

Table XXXI. Agronomic data from Advanced Yield spring wheat nursery at Creston, Montana in 1962. Four row plots, four replications.

Variety	C. I. Number	Ing Date	Ht. In.	Lodg- ing %	Stripe Rust	Grams per Plot				Total Grams	Yield in Bu/Acre	Bu. Wt. in Pounds
						I	II	III	IV			
Nrn-10-Evr 14 x Cnt. B59-3	13587	7-5	38	0	3.7	774	655	450	754	2633	65.8 **	60.5
Mindum (durum)	5296	7-6	50	12.5	2.0	586	570	476	314	1946	48.7	64.0
Chinook	13220	7-2	47	10.0	.3	420	450	445	360	1675	41.9	60.4
Langdon (durum)	13165	7-2	48	0	2.0	521	486	450	465	1922	48.1	62.5
Centana	12974	7-5	45	0	1.0	554	665	625	521	2365	59.1	61.0
K 338 x Lee	B61-88	6-29	43	0	.7	569	588	710	726	2593	64.8 **	60.5
Sawtana	13304	7-7	46	0	1.0	478	465	450	410	1803	45.1	61.1
Justin (ND 102)	13462	7-4	42	0	0	560	535	293	415	1803	45.1	60.4
Hartman Sel. 15		7-6	46	1.3	3.0	584	422	481	524	2011	50.3	60.0
Nrn-10-Evr 14 x Cnt.	B59-1	7-4	38	0	3.3	737	715	565	831	2848	71.2 **	60.2
Selkirk	13100	7-2	42	0	0	547	465	501	574	2087	52.2	58.5
Minn. II-53-404	13465	6-29	43	0	.7	513	539	405	495	1952	48.8	60.1
II-50-17 x Pilot B61-95	13586	7-2	48	0	0	619	665	545	545	2374	59.4	60.9
Rescue	12435	7-4	43	12.5	.3	436	382	365	460	1643	41.1	60.0
Hartman Sel. 19	13463	7-5	43	0	2.7	524	570	500	644	2238	56.0	59.9
Lee ² x K.F., R.L. 2938	13332	6-28	42	0	1.3	614	695	482	550	2341	58.5	60.6
Pembina	13333	7-1	41	0	.3	469	535	482	486	1972	49.3	60.0
Wells (durum)	10003	7-1	42	0	1.7	461	611	525	495	2102	52.6	62.0
Thatcher	13762	7-3	45	0	.3	550	555	395	489	1989	49.7	59.9
B49-102 x K338-B61-18	13457	7-2	43	0	1.7	645	405	519	710	2279	57.0	60.5
Lathrop	6900	7-4	45	5.0	2.7	544	582	570	570	2266	56.7	60.1
Ceres	B59-10	7-2	34	0	3.3	490	535	325	379	1729	43.2	60.5
Nrn 10-Er 14 x Cnt.	13335	7-2	43	0	2.0	660	760	659	681	2535	63.4 *	59.0
Lakota (durum)		7-2	43	0	2.0	680	760	523	634	2597	64.9 **	61.6

\bar{x} 53.8
 S.E. \bar{x} 3.9439
 L.S.D. (.05) 11.2
 L.S.D. (.01) 14.8
 C.V. 7.33 %

1. Calculated missing plot
 Note: Thatcher is used as a check in this nursery
 * Varieties yielding significantly more than the check (.05).
 ** Varieties yielding significantly more than the check (.01).

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	27408.65	4.41 **
Varieties	23	27736.8783	4.45 **
Error	64	6221.67734	
Total	90		

Table XXXII. Agronomic data from Uniform Western Regional white wheat nursery (dryland) at Creston, Montana in 1962. Four row plots, three replications. Date Seeded: April 30, 1962 Date Harvested: September 5, 1962 Size of Plot: 16 square feet

Variety	C. I. Number	Ing Date	Stripe Rust	Ht. in	Grams Per Plot			Total Grams	Yield in Bu/A	Bu. Wt. in Pounds
					I	II	III			
Kenhi	13268	7-1	3.3	38	474	506	1422	47.4	58.0	
Idaed	11706	6-27	1.7	40	599	578	1778	59.2	59.9	
Burt x Kenya F.	13641	7-12	1.3	36	588	520	1551	51.7	61.0	
Fullman Sel.	13638	7-4	2.3	39	540	450	1461	48.7	60.4	
Onas 53	13257	7-6	4.0	34	665	613	1878	62.6 *	59.0	
Fullman Sel.	13639	7-1	3.0	37	485	535	1560	52.0	60.5	
Idaed x Burt 42-5	13722	7-1	1.7	36	520	541	1566	52.2	60.0	
Baart	1697	7-2	4.0	46	476	447	1253	41.8	61.0	
Lemhi 53	13258	7-4	4.0	36	486	555	1471	49.0	58.9	
Burt x Kenya F.	13640	7-4	2.0	33	515	440	1490	49.7	61.5	
Idaed x Burt 19-1	Fend.	6-30	1.7	33	560	561	1637	54.6	60.4	
Kenya x Lemhi 6	13630	7-3	4.0	39	421	520	1497	49.9	59.5	
Eureka -LMH x Idd 2	13636	6-28	1.3	38	515	510	1495	49.8	59.5	
Onas 52 x Idaed 2	13635	6-29	2.0	43	469	635	1634	54.5	60.5	
Idaed 59	13631	6-28	2.0	35	471	577	1564	52.1	59.6	
Federation	4734	7-7	4.0	35	343	484	1322	44.1	58.0	
Premier x Federation	13650	7-7	2.3	35	445	499	1410	47.0	59.4	
Lemhi	11415	7-1	4.0	37	614	430	1573	52.4	58.5	
Premier-Fed. x Idd. 2	13720	6-27	1.0	38	440	530	1500	50.0	59.0	
Lemhi 62	13435	7-6	4.0	38	477	521	1509	50.3	59.0	
Thatcher	10003	6-29	0.0	40	555	541	1508	50.3	58.5	
Gabo x Idaed 3	13637	6-27	1.0	38	466	510	1456	48.5	59.5	
Onas 52 x Idaed 18-1	13721	7-10	3.0	33	612	590	1692	56.4	59.2	
Onas	6221	7-7	4.0	34	559	570	1639	54.6	58.8	

Note: Lemhi is used as a check.

1 Calculated missing plot

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

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	5939.04	1.96
Varieties	23	5969.3622	1.98 *
Error	43	3032.69744	
Total	68		

Yield in Bu/A

Total Grams

Grams Per Plot

III

II

I

Stripe Rust

Ht. in

Ing Date

C. I. Number

Analysis of Variance

S.E._x.....

L.S.D. (.05).....

C.V.

TITLE: Small Grain Investigations

PROJECT NUMBER: 5023 (Winter Wheat)

PERSONNEL: Leader - Vern E. Stewart
Cooperators - E. R. Hehn, J. A. Hoffmann*, E. L. Kendrick*,
and H. Purdy* (* USDA)

FUNDS: State - \$ 2956.67

LOCATION: Northwestern Montana Branch Station in field number E R-3, and off-station locations in several Northwestern Montana counties.

PROBABLE DURATION: Indefinite

OBJECTIVES:

1. To obtain the information necessary for making varietal recommendations 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 cultural practices that will return the highest yields per acre and the highest quality wheat.
4. To maintain a pure genetic varietal seed source of recommended winter wheat.

EXPERIMENTAL DATA:

INTRODUCTION

Dwarf bunt and stripe rust are the two major disease problems in winter wheat production in western Montana, and no doubt, the major factor affecting wheat production in this area. Quality, the lack of it, can also be added as one of the major problems.

Variety testing, a breeding program, cultural studies, and a cooperative program with the Regional Smut Control Laboratory in Pullman, Washington combine to make the winter wheat project at the Northwestern Montana Branch Station.

Growing of foundation and certified seed is included in the project report, however, it is not a research problem.

Irrigation versus dryland wheat production study was conducted on the Station this year in a field type study.

MATERIALS AND METHODS

A complete description of procedure and design are found on page seventy of the 1961 Annual Report of the Northwestern Montana Branch Station of technique used in variety testing and seed production.

Four nurseries were seeded in the fall of 1964 on the Station and in the dwarf smut area northwest of Kalispell, Montana. Six offstation nurseries were seeded in the fall of 1964, one each in Missoula, Ravalli, Lake, Sanders, Mineral, and Lincoln Counties. The Intrastate hard red winter wheat nursery contained twenty-five entries and was grown on the Station in field number E-1. The Western Regional Nursery containing thirty entries was seeded on the Howard Braaten farm northwest of Kalispell nine miles in a dwarf smut area. Sixteen entries were placed in the short straw nursery and grown on the Station in field number E-1. The Western Regional white wheat nursery contained nineteen entries and was grown in field number E-1 on the Station. The off-station nurseries grown in single row plots and replicated four times consisted of sixteen entries. The location, grower, and address are found in the tabulated data included later in this report.

The breeding plots were located on the Howard Braaten farm nine miles northwest of Kalispell. 544 rows of bulk, head rows, and plant rows were seeded and observed during the growing season for dwarf bunt, stripe rust, and other agronomic characteristics. Mr. Bruce McCallum grew several selections for winter hardiness at the North Montana Branch Station at Havre.

RESULTS AND DISCUSSIONS

Each nursery as presented above will be discussed separately in this report.

Intrastate Hard Red Winter

Material in this nursery is grown throughout the state of Montana in cooperation with other Agronomists of the Experiment Station system. This nursery was located in field number E-1.

Table XXXIII presents the data from this nursery. Rodco was the lowest yielding entry and had the highest level of dwarf bunt (Tilletia contraversa) infection. Stripe rust (Puccinia striiformis) was not a factor in the nursery this season. The taller variety, generally, lodged considerably more than the shorter strawed varieties. Westmont was used as a check in this nursery and in no case was there any variety significantly higher in yield. Yields were about average for this rotation.

Western Regional Hard Red Winter

This nursery is grown throughout the western states. In 1961 this nursery was seeded on the Howard Braaten farm in an area known to be infected with dwarf bunt (Race D-3). The nursery was located in an area in the field so that there was low areas in the center of the nursery. This caused a poor stand and uneven growth. Because of this no yield data was secured from the study. However, good smut data was obtained from the nursery and are shown in Table XXXIV. Only six entries of the thirty entries had smut readings under fifty percent. California 6097 showed only a trace of smut. Those entries with Wasatch parentage tended to have lower readings, that is, below fifty percent as did Wasatch. Two Utah lines, G.I. 13673 and 13676, were also below fifty percent. Delmar, a variety showing resistance in other areas, had an infection rating of sixty percent.

Short Straw

The short straw nursery consisting of sixteen entries was grown in field E-1 on the Station. Agronomic data includes grain straw ratio this year as was done in 1961. Two hard red and two soft wheat varieties were included as checks in the nursery. The rest of the entries were semi-dwarf lines.

(Y-8 x N/B-17-8)-16-2 was the only line that was significantly better in yield than Westmont, but it was equal to the yield of Burt. Considerable dwarf smut was observed in the nursery and is recorded in Table XXXV. Little difference was found between the checks and the semi-dwarf in grain-straw ratios. Tables XXXV and XXXVI present the data for this nursery.

Western Regional White Wheat

This nursery grown throughout the western states by many workers was grown on the Station in field E-1. Nineteen entries were grown including Kharkof, which is a hard red winter, used as a check.

Brevor was the highest yielding line in the nursery but not significantly higher than C.I. 13438. These data would also indicate that C.I. 13438 is superior to the yield of Gaines, C.I. 13448. Dwarf smut was found in all entries with C.I. 13649 having the least amount. Table XXXVII gives data from this nursery.

Offstation

Growing condition results and other information about each nursery will be discussed under the individual county heading.

Missoula County - Stands were quite uniform throughout the nursery. Precipitation was lower than normal during the growing season and, no doubt, accounts for the low yields. Only three replications were harvested because of dry conditions in the first replication. Protein levels were very low for all the hard red entries. Complete data is shown in Table XXXVIII.

Ravalli County - Soil moisture was low at seeding time near Stevensville in the winter wheat region of Ravalli County. Good stands were obtained, however, and were uniform throughout the nursery. The mean of 25.9 bushels per acre is low for this area. Tendoy was the highest yielding variety but the results were not statistically significant and a high C.V. was obtained, therefore, little reliability can be placed on these data. Protein levels were fair except for Rego which was quite low - 10.5%. See Table XXXIX for complete details.

Lake County - The nursery seeded in this county was not harvested because of winter kill. Seventy-five percent of the nursery completely killed.

Sanders County - Moisture was a limiting factor in this nursery. Stands were very uneven within a variety from one replication to another. Burt and Omar were very poor in stand. During the growing season, Tendoy and Cheyenne appeared to be outstanding in the nursery. Cheyenne, Tendoy, and

(Yogo x Wasatch-3) Cheyenne 56-6-5 were significantly better in yield than Westmont. Table XL presents complete data from this nursery. Protein levels are very good in this study with (Itana #6 x K-17-7-3)-1-26-1 being the highest.

Mineral County - A poor location and stubbling in this nursery help account for the high C.V. of 18.00% in this nursery. When analyzed statistically the results were found to be non-significant. Stands were variable with the white wheat entries having the poorer stands. Dwarf bunt in many varieties was recorded which is believed to be Race D-3. Table XLI shows complete data for this study.

Lincoln County - This study was located on soil plowed out of hay the previous summer. Yields were considerably above the average for this area. Cheyenne was the only variety that was significantly less in yield than the check. The white wheats in this nursery were equal to the hard reds in most cases. Protein levels were fair. See Table XLII for complete tabulations of data.

Breeding Material

The breeding material this past season was grown in an area known to be infected from Race D-3 of dwarf bunt. The material used was from selections made in 1961.

A total of 544 rows were planted in the fall of 1961 from the above selections. During the growing season these plantings were observed for dwarf smut and stripe rust. There was no infection of stripe rust in this area in 1962 so no selection was made on this basis in 1962. All rows containing any dwarf smut were discarded at harvest time. Other selections were made on the basis of acceptable agronomic characteristics. The bulk rows selected, of which there were twenty-six, were checked for winter hardiness by Bruce McCallum at Havre. The bulk rows were also checked for yield on the Station at Creston. In addition to the above mentioned material, twenty-four rows of F₂ population material were planted on October 6 to observe for dwarf smut. Because of the late planting, poor stands were obtained and this material was not studied further.

The bulks sent to Mr. McCallum all winter killed at the Havre Station. Of the twenty-six bulks planted, seven were harvested and checked for yield, straw strength, and smut resistance. See Table XLIII for yield and other data.

Rows selected and bulked in 1962 totaled seventy-seven. Plant selections made totaled 208. These were selected from sixteen individual rows and thirteen rows that were grown by crosses. Tables XLIV and XLV are made as a record of selections made in 1962 of bulk rows and plant selection.

Plant Pathology

Dr. James Hoffmann continued his basic studies on dwarf bunt. The staff aided him during the winter months in removing plant material from the plots each month during the winter months. Dr. Purdy continued the chemical studies and Dr. Kendrick the race studies of dwarf smut. Complete report of their work may be found in the Regional Smut Control Laboratory Annual Report of 1962.

Cultural Studies

Irrigation versus dryland winter wheat production was the purpose of this study. Winter wheat (Westmont) was seeded on a land from which a red clover seed crop was harvested. This area contained 1.75 acres. One-half was irrigated May 31, 1962. Two inches of water was applied. Table XLVI shows yield and protein data.

Seed Production

Foundation Westmont was grown from line row seed. This was produced in field number E-4. A total of 536 pounds of clean seed was produced.

Certified Westmont production amounted to approximately thirty bushels. This is First Generation certified seed and was grown in field number R-3c.

Table XXXIII Agronomic data from dryland intrastate winter wheat nursery grown at Creston, Montana in 1961-62. Four row plots, four replications, field no. E-1. Date Seeded: September 20, 1961 Date Harvested: August 13, 1962 Size of Plot: 32 sq. ft.

Variety	C.I.No.	Head- ing Date	Sm't %	Height in Inches	Lodg- ing %	I	II	III	IV	Total Grams Acre	Ave. Bu/ Acre	Bu. Mt.
Cheyenne	8885	6-15	28.8	41	23.3	1228	900	1005	1303	4436	55.5	60.0
Karmon	6700	6-14	23.8	44	48.3	1005	925	1011	1089	4030	50.4	60.0
Rogo	13181	6-13	3.0	44	50.0	1246	1231	1220	1150	4847	60.6	58.5
Newturk	6935	6-14	31.3	42	56.7	754	786	1040	1210	3790	47.4	59.2
Itana	12933	6-15	43.8	41	---	789	1049	1095	1089	4022	50.3	60.5
Westmont	12930	6-10	35.0	37	1.7	860	1075	1165	1479	4579	57.2	61.3
Tendoy	13426	6-14	27.5	43	13.3	920	995	1175	1245	4335	54.2	59.8
Triplet	5408	6-12	31.3	41	8.3	915	1179	1114	1260	4468	55.9	59.4
Rodeo	---	6-9	56.3	40	36.7	702	730	605	1045	3082	38.5*	59.9
Wasatch	11925	6-14	7.8	45	25.0	1065	1073	984	925	4047	50.6	59.7
Yogo x (Turkey/Oro-221)-117	13542	6-16	20.0	43	50.0	874	935	939	1150	3898	48.7	60.4
Yogo/Wasatch-3 x Cheyenne 56-10-1	19633	6-13	8.8	45	11.7	910	980	1180	970	4040	50.5	60.0
Yogo/Wasatch-3 x Cheyenne 56-6-5	---	6-12	9.8	41	1.7	1085	1085	1000	924	4094	51.2	61.4
Yogo/Wasatch-3 x Cheyenne 56-5-3	---	6-14	7.5	44	25.0	870	815	1225	1000	3910	48.9	59.6
(Itana #6 x K-17-7-3)-1-26-1	---	6-13	17.5	45	1.7	880	939	1089	1459	4367	54.6	60.2
(Itana #6 x K-17-7-3)-1-26-2	---	6-15	38.8	44	1.0	840	865	976	1309	3990	49.9	60.0
(Itana #6 x K-17-7-3)-1-26-4	---	6-15	33.3	40	---	826	710	1070	1045	3651	45.6*	59.6
(Itana #6 x K-17-7-3)-1-26-5	---	6-14	41.3	42	7.7	802	910	1070	1410	4192	52.4	61.0
(K-17-7-4 x Mas.-6)-1-10-5	---	6-16	4.0	47	30.0	884	1181	905	1095	4065	50.8	60.1
(Mas. 2 x K-17-7-2)-1-8-5	---	6-16	8	43	40.0	999	985	975	615	3574	44.7*	60.5
(Mas. 3 x Itana-6)-2-10-5	---	6-17	21.3	48	5.0	1126	1158	966	1106	4356	54.5	61.0
Pelmar	13442	6-16	16.3	40	---	1171	1050	1145	1060	4426	55.3	59.5
Wasatch x (Yogo x Rescue-21)-11	---	6-12	11.3	40	61.7	1040	1089	1115	1184	4428	55.4	59.5
(Yogo x Rescue-21) x Marmin-1065	---	6-16	21.3	46	50.0	910	1150	1105	1149	4314	53.9	60.9
Wasatch x (Yogo x Rescue-21)-12	---	6-15	13.8	43	30.0	1155	1250	1100	1060	4565	57.1	60.9

Note: Westmont is used as a check in this nursery. * Varieties yielding significantly less than the check (5%).

Σ 51.7
S.E.X. 3,56717
L.S.D. (.05) 10.0
C.V. 6.89%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	146085.1667	7.18**
Varieties	24	35312.94167	1.74*
Error	72	20351.3819	
Total	99		

Table XXXIV. Heading dates and dwarf smut percentage from the Western Regional hard red winter wheat nursery grown on the Howard Branton farm at Kalispell, Montana in 1961-62.
Date Seeded: September 18, 1961

Variety	C. I. No.	Heading Date	Percent Smut
Columbia	12928	6-20	85.0
Westmont	12930	6-20	89.3
Itana	12933	6-22	77.5
Kharkof	1422	6-23	77.5
Rio	10061	6-22	73.8
Burt	12696	6-23	88.5
Wasatch	11925	6-23	48.8
Cheyenne	8885	6-23	76.3
Tendoy	13426	6-23	72.5
Delmar	13442	6-23	60.0
Yogo x Turkey/Oro-117	13542	6-23	92.5
Yogo/Wasatch-3 x Cheyenne-56-10-1	13633	6-22	50.0
Winalta	13670	6-20	90.0
California 6097	13671	6-25	T
231-4-1-13 Utah	13673	6-24	35.0
226-173-11 Utah	13672	6-24	36.3
Pope Alice-Res-P80 x Cheyenne ²	13676	6-25	68.8
Pope Res-Rio x Cheyenne ⁵	13675	6-23	87.3
Pope (Res-Rio x Cheyenne ²) x Turkey ²	13674	6-21	73.8
(Itana #6 x K-17-7-3)-1-26-1		6-23	70.0
(Itana #6 x K-17-7-3)-1-26-2		6-22	75.0
(Itana #6 x K-17-7-3)-1-26-4		6-22	70.0
(Itana #6 x K-17-7-3)-1-26-5		6-22	80.0
(K-17-7-4 x Was.-6)-1-10-5		6-23	26.3
(Was.-2 x K-17-7-2)-1-8-5		6-23	15.0
(Was.-3 x Itana-6)-2-10-5		6-24	50.0
(Yogo x Wasatch-3) x Cheyenne-56-6-5		6-21	45.0
(Yogo x Wasatch-3) x Cheyenne-56-5-3		6-21	50.0
(Yogo x Rescue-21) x Marain-1065		6-22	52.5
Wasatch x (Yogo x Rescue-21)-11		6-21	60.0

Table XXXV. Agronomic data from dryland short straw nursery grown at Creston, Montana in 1961-62. Four row plots, four replications, field no. E-1. Date Seeded: September 21, 1961 Date Harvested: August 14, 1962 Size of Plots: 32 square feet

Variety	C.I.No.	Head- ing Date	Smit %	Height in Inches	Lodg- ing %	Grams per plot				Total Grams	Bu. per Acres
						I	II	III	IV		
Itana	12933	6-14	33.8	42	6.7	1000	1025	1055	985	4065	50.8
(B-17-6 x Y-13)-16-1		6-14	27.5	43	---	1125	1140	1045	1020	4330	54.1
(Y-2 x H/B-17-2)-7-4		6-9	16.3	34	---	1240	1165	1264	1205	4874	60.9
(Y-8 x H/B-17-8)-16-2		6-10	26.3	33	---	1225	1430	1385	1325	5345	66.8
Westmont	12930	6-10	27.5	36	---	1170	975	1055	1220	4420	55.3
(Y-4 x H/B-17-4)-1-1-2		6-10	33.8	27	---	1215	890	1180	880	4165	52.1
(Huntley 5 B x 130A)-57-7A		6-9	13.8	32	5.0	1060	1124	1145	1210	4539	56.7
Durb	12696	6-13	11.0	37	---	1205	1174	1386	1556	5321	66.5
(Huntley 5 B x 103A)-57-22A		6-10	23.8	37	18.3	1235	1075	1225	1050	4585	57.3
Deb. Sel. No. 59407		6-7	46.3	32	---	980	936	1266	885	4067	50.8
Delmar	13442	6-15	8.3	37	---	1259	1084	1160	1216	4719	59.0
Deb. Sel. No. 391-56-14		6-10	47.5	37	---	855	755	1025	915	3550	44.4
Deb. Sel. No. 391-56-18		6-8	45.0	30	---	745	615	900	770	3030	37.9
Deb. Sel. No. 59590		6-7	51.3	28	---	945	900	1245	820	3910	48.9
Deb. Sel. No. 533211		6-10	32.8	39	3.3	1115	1085	1170	1205	4575	57.2
Deb. Sel. No. 551556		6-7	60.0	31	---	685	630	960	1035	3308	41.4

S.E. 53.8
 L.S.D. (.05) 2.71054
 L.S.D. (.01) 7.7
 C.V. 10.3
 5.045

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	64848.9333	5.52 **
Varieties	15	105134.6066	8.95 **
Error	45	11750.5111	
Total	63		

Table XXXVI. Bundle weights and grain straw data from the dryland short straw nursery grown at Creston, Montana in 1961-62. Four row plots, four replications, field number E-1. Date Seeded: September 21, 1961 Date Harvested: August 14, 1962 Size of Plot: 32 square feet

Variety	C. I. Number	Plot Yields in Ounces				Total	Yields in Lbs. per Acre	Grain Yields Lbs./Acre	Grain Straw Ratio
		I	II	III	IV				
Itana	12933	86	82	89	80	337	7168	3050	1.350
(/B-1.7-6 x Y-1.8)-1.8-1		96	111	96	92	395	8402	3249	1.586
(Y-2 x N/B-1.7-2)-7-4		91	97	94	85	367	7806	3658	1.134
(Y-3 x N/B-1.7-8)-1.6-2		94	115	115	117	441	9380	4010	1.339
Westmont	12930	91	82	88	106	367	7806	3316	1.354
(Y-4 x N/B-1.7-4)-1-4-2		90	75	102	80	347	7381	3125	1.362
(Huntley 5 B x 130A)-57-74		79	84	94	97	354	7529	3405	1.211
Hurt	12696	88	88	113	127	416	8848	3992	1.216
(Huntley 5 B x 103A)-57-224		100	88	95	87	370	7870	3440	1.287
Meb. Sel. No. 59407		88	84	104	77	353	7508	3051	1.461
Delmar	13442	99	89	92	99	379	8061	3540	1.277
Meb. Sel. No. 391-56-D4		75	68	101	76	320	6806	2663	1.556
Meb. Sel. No. 391-56-D8		64	55	80	62	261	5551	2273	1.442
Meb. Sel. No. 59590		83	74	107	70	334	7104	2933	1.422
Meb. Sel. No. 533211		98	90	101	109	398	8465	3433	1.466
Meb. Sel. No. 551556		65	56	82	95	298	6338	2482	1.554

\bar{x} 7627
 S.E.X. 429.697
 L.S.D. (.05) 1221
 L.S.D. (.01) 1635
 C.V. 5.63 %

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	546.05767	5.35 **
Varieties	15	493.26567	4.83 **
Error	45	102.03504	
Total	63		

Table XXXVII. Agronomic data from dryland Western Regional white winter wheat nursery grown at Creston, Montana in 1961-62. Four row plots, four replications, field no. E-1. Date Seded: September 21, 1961 Date Harvested: August 14, 1962 Size of Plot: 32 square feet

Variety	C.I.No.	Head- ing Date	Smut %	Ht. in.	Lodg- ing %	I	II	III	IV	Total Grams	Yield in Bu./A.	Bu. Wt.
Kharkof	1442	6-14	23.7	40	61.7	1015	1015	1085	790	3905	48.8	60.3
Golden	10063	6-15	28.8	42	6.7	1060	1115	1020	850	4045	50.6	59.5
Omar	13072	6-16	14.8	39	3.3	1268	1156	1365	1025	4814	60.2	60.5
Brevor	12385	6-15	4.5	35	---	1351	1421	1310	1395	5477	68.5	61.5
Triplet	5408	6-12	13.8	39	18.3	1085	970	1210	752	4017	50.2	61.5
Elgin	11755	6-16	26.3	36	---	1361	1045	1325	1010	4741	59.3	60.5
Burt	12696	6-12	21.3	36	---	1255	1235	1220	1086	4796	60.0	61.5
(Rio-Rex x Athena) x Orfed	13446	6-9	28.8	31	---	855	755	945	890	3445	43.1	61.0
(14 x 50-3) x Burt, Sel. 9	13448	6-15	13.5	30	---	1040	1125	1235	1105	4505	56.3	59.8
(Elgin-19 x Elmar)-114 x 1889	13644	6-14	26.3	36	---	953	884	1060	805	3702	46.3	59.1
(Elgin-19 x Elmar)-111 x 1813	13645	6-16	17.5	32	1.7	1292	1115	1200	985	4592	61.9	57.0
Omar x 1834	13646	6-17	1.3	28	---	975	880	980	885	3720	46.5	56.7
Rex-Rio x Golden 4, Sel. P-11	13647	6-15	23.8	39	1.7	1005	1015	1120	990	4130	51.6	59.0
(Fed. 41M x Golden 4) x (Rio x Golden 4) Sel. B 59	13648	6-14	18.3	39	5.0	1210	1140	1430	1040	4820	60.3	59.0
Hussar-Hohenheimer x Triplet ⁵	13649	6-16	3.3	39	5.0	1105	1015	1250	982	4352	54.4	59.3
Awmed Elgin ⁶	13450	6-16	36.3	38	---	1110	1020	995	1105	4230	52.9	59.5
Rex-Rio x Golden 4 B-64	-----	6-15	35.0	40	2.3	1095	957	1040	1095	4187	52.3	58.0
Orfed-Elgin x Elmar, 422	13440	6-15	26.3	35	---	1335	1075	1120	999	4529	56.6	59.8
14 x 53, Sel. 101	13438	6-12	10.0	31	---	1484	1310	1240	1145	5179	64.7	60.2

\bar{x} 54.7
 S.E. \bar{x} 2.2963
 I.S.D.(.05)..... 6.5
 I.S.D.(.01)..... 8.7
 C.V..... 4.19%

Analysis of Variance
 Source D.F. Mean Square F
 Replications 3 117895.2 13.98 **
 Varieties 18 69055.7388 8.19 **
 Error 54
 Total 75

Table XXXVIII Agronomic data from dryland off-station winter wheat nursery grown in Missoula County at the Missoula County Airport, Missoula, Montana in 1961-62. Single row plots, three replications. Date Seeded: September 14, 1961 Date Harvested: August 6, 1962 Size of Plot: 16 square feet

Variety	C.I.No.	Height			Grams per plot			Total Grams	Average Bu/Acre	Protein Percent
		Inches	I	II	III	I	II				III
Westmont	12930	20	120	104	46	270	9.0	9.9		
Gaines	13448	16	130	110	65	305	10.2	9.6		
Itana	12933	23	120	111	70	301	10.0	9.4		
Cheyenne	8885	20	145	110	65	320	10.7	8.8		
Triplet	5408	22	165	125	65	355	11.8	10.0		
Yogo x Turkey/Oro-117	13542	25	140	140	65	345	11.5	9.6		
(Yogo x Wasatch-3) x Cheyenne-56-10-1	13633	22	115	105	180	400	13.3	10.0		
Omar	13072	19	135	155	101	391	13.0	9.6		
Rego	13181	21	130	120	55	305	10.2	9.0		
Tendoy	13426	19	170	112	70	352	11.7	9.3		
Burt	12696	21	130	127	80	337	11.2	10.5		
Delmar	13442	21	135	126	160	421	14.0	10.5		
Wasatch	11925	22	126	140	75	341	11.4	10.5		
(Yogo x Wasatch-3) x Cheyenne-56-6-5	-----	21	120	135	90	345	11.5	10.5		
(Yogo x Wasatch-3) x Cheyenne-56-5-3	-----	22	120	130	65	315	10.5	9.6		
(Itana #6 x K-17-7-3)-1-26-1	-----	23	130	120	90	340	11.3			

1 - Calculated missing plot

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	10862.77	16.54
Varieties	15	513.032	-----
Error	29	656.70552	
Total	46		

\bar{x} 11.4
 S.E. \bar{x} 1.4795
 L.S.D. NS
 C.V. 13.05%

Table XXXIX. Agronomic data from dryland off-station winter wheat nursery grown in Ravalli County on the I. B. McFadgen farm at Stevensville, Montana in 1961-62. Single row plots, four replications. Date Seded: September 14, 1961 Date Harvested: August 7, 1962 Size of Plot: 16 square feet

Variety	C.I.No.	Head- ing Date	Ht. in.	Stand %	Grams per plot				Total Grams	Yields in Bu/A.	Protein Bu. Percent Wt.
					I	II	III	IV			
Westmont	12930	6-8	33	98.8	150	265	276	381	1072	26.8	13.8
Gaines	13448	6-14	24	75.0	110	215	250	224	799	20.0	---
Itana	12933	6-13	39	98.8	125	240	251	365	981	24.5	11.7
Cheyenne	8885	6-13	37	97.5	150	260	320	540	1270	31.8	12.5
Tripлет	5408	6-13	38	77.5	99	489	205	165	958	24.0	---
Yogo x Turkey/Oro-117	13542	6-13	38	100.0	236	300	526	265	1327	33.2	14.2
(Yogo x Wasatch-3) x Cheyenne-56-10-1	13633	6-11	41	95.0	200	281	296	340	1117	27.9	13.0
Omar	13072	6-19	34	65.0	100	185	260	215	760	19.0	---
Rego	13181	6-13	39	91.3	237	240	345	190	1012	25.3	10.5
Tendoy	13426	6-14	34	96.3	188	320	304	504	1316	32.9	13.4
Burt	12696	6-13	35	96.3	205	260	290	250	1005	25.1	---
Delmar	13442	6-15	37	92.5	132	281	315	270	998	25.0	13.9
Wasatch	11925	---	39	90.0	180	167	175	319	841	21.0	---
(Yogo x Wasatch-3) x Cheyenne-56-6-5	---	6-11	35	96.3	185	259	304	166	914	22.9	12.8
(Yogo x Wasatch-3) x Cheyenne-56-5-3	---	---	39	95.0	158	240	225	286	909	22.7	13.3
(Itana #6 x K-17-7-3)-1-26-1	---	6-12	37	98.8	440	279	230	379	1328	33.2	14.5

\bar{x} 25.9
 S.E. \bar{x} 4.229
 L.S.D. NS
 C.V. 16.29%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	47352.8933	6.62 **
Varieties	15	8739.516	1.22
Error	45	7153.92377	
Total	63		

Table XL. Agronomic data from dryland off-station winter wheat nursery grown in Sanders County on the Sid Cross farm at Camas Prairie, Montana in 1961-62. Single row plots, four replications. Date Seeded: September 14, 1961 Date Harvested: August 6, 1962 Size of Plot: 16 square feet

Variety	C.I.No.	Height Stand				Grams per plot				Total Yields Bu/A.	Protein Percent	Bu. Wt.
		Inches	%	I	II	III	IV	Grams	Bu/A.			
Westmont	12930	19	50.0	185	84	54	65	388	9.7	14.8	---	
Gaines	13448	18	51.3	140	55	113	165	473	11.8	---	---	
Itana	12933	23	71.3	220	139	85	103	547	13.7	14.3	---	
Cheyenne	8885	21	80.0	259	248	144	117	768	19.2**	14.1	---	
Triplet	5408	22	68.8	205	115	96	115	531	13.3	---	---	
Yogo x Turkey/Oro-117	13542	24	67.5	134	220	155	145	654	16.4*	14.0	---	
(Yogo x Wasatch-3) x Cheyenne-56-10-1	13633	24	57.5	185	110	95	65	455	11.4	15.6	---	
Omar	13072	17	13.8	35	110	30	42	217	5.4	---	---	
Rego	13181	25	43.8	145	109	90	151	495	12.4	13.5	---	
Tendoy	13426	23	71.3	395	206	151	235	987	24.7**	14.1	61.9	
Burt	12696	18	10.0	35	30	10	55	130	3.3	---	---	
Delmar	13442	21	33.8	130	159	92	40	421	10.5	14.5	---	
Wasatch	11925	23	57.5	151	154	111	92	508	12.7	---	---	
(Yogo x Wasatch-3) x Cheyenne-56-6-5	-----	23	60.0	105	205	280	190	780	19.5**	13.7	---	
(Yogo x Wasatch-3) x Cheyenne-56-5-3	-----	22	61.3	160	110	74	95	439	11.0	15.1	---	
(Itana #6 x K-17-7-3)-1-26-1	-----	22	40.0	93	85	45	56	279	7.0	16.0	---	

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} 12.6
 S.E.x. 2.3633
 L.S.D. (.05) 6.7
 L.S.D. (.01) 9.0
 C.V. 18.73%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	11748.75	5.26
Varieties	15	11752.23333	5.26
Error	45	2234.07222	
Total	63		

Table XLI. Agronomic data from dryland winter wheat nursery grown in Mineral County on the Charles Frey ranch at Tarkio, Montana in 1961-62. Single row plots, three replications. Date Seeded: September 14, 1961 Date Harvested: August 6, 1962 Size of Plot: 16 sq. ft.

Variety	C.I.No.	Dwarf Bunt %	Stand %	Height inches	Grams I	Grams II	Grams III	Total Grams	Yields Bu/Acre
Westmont	12930	37.3	76.3	25	112	215	200	527	17.6
Gaines	13448	.1	65.0	21	120	295	109	524	17.5
Itana	12933	28.0	72.5	30	211	285	104	600	20.0
Cheyenne	8885	17.5	80.0	30	125	335	128	588	19.6
Triplet	5408	37.5	88.8	30	125	226	205	556	18.5
Yogo x Turkey/Oro-117	13542	15.0	78.8	29	164	174	125	463	15.4
(Yogo x Wasatch-3) x Chbyenne-56-10-1	13633	1.0	71.3	32	150	326	110	586	19.5
Omar	13072	2.8	67.5	27	190	330	100	620	20.7
Rego	13181	14.5	88.8	29	284	241	296	821	27.4
Tendoy	13426	12.5	81.3	24	160	140	135	435	14.5
Burt	12696	2.0	72.5	29	190	355	155	700	23.3
Delmar	13442	2.3	83.8	29	165	230	160	555	18.5
Wasatch	11925	5.3	82.5	29	220	175	149	544	18.1
(Yogo x Wasatch-3) x Cheyenne-56-6-5	-----	8.0	77.5	25	165	209	133	507	16.9
(Yogo x Wasatch-3) x Cheyenne-56-5-3	-----	9.3	81.3	32	112	375	110	597	19.9
(Itana #6 x K-17-7-3)-1-26-1	-----	11.0	67.5	27	139	203	115	457	15.2

\bar{x} 18.9
 S.E. \bar{x} 3.40248
 L.S.D. NS
 C.V. 18.00%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	56807.585	16.36
Varieties	15	3021.8667	-----
Error	30	3473.05	-----
Total	47		

Table XLII. Agronomic data from dryland winter wheat grown in Lincoln County on the Dick Eritten Ranch at Bureka, Montana in 1961-62. Single row plots, four replications. Date Seeded: September 22, 1961 Date Harvested: August 8, 1962 Size of Plot: 16 sq. ft.

Variety	C. I.		Grams per plot				Total Grams	Yields Bu/Acre	Bu. Wt.	Protein Percent
	Number	In. Ht.	I	II	III	IV				
Westmont	12930	36	416	455	635	695	2201	55.0	61.9	14.1
Gaines	13448	24	751	805	520	410	2486	62.1	61.8	—
Itana	12933	38	535	555	465	480	2035	50.9	62.1	12.6
Cheyenne	8885	37	460	385	285	600	1730	43.3 *	—	12.9
Triplet	5408	39	491	535	551	560	2137	53.4	62.1	—
Yogo x Turkey/Oro-117	13542	42	553	436	619	640	2248	56.2	61.3	12.8
(Yogo x Wasatch-3) x Cheyenne-56-10-1	13633	41	575	469	575	509	2128	53.2	61.9	14.0
Omar	13072	33	629	641	639	640	2549	63.7	61.9	—
Rego	13181	41	435	439	544	358	1776	44.4	60.5	13.3
Tendoy	13426	40	765	640	505	550	2460	61.5	62.2	13.0
Eurt	12696	36	570	540	579	565	2254	56.4	61.9	—
Delmar	13442	39	540	593	499	416	2048	51.2	62.4	12.7
Wasatch	11925	43	595	500	590	395	2080	52.0	62.0	—
(Yogo x Wasatch-3) x Cheyenne-56-6-5	—	40	490	530	527	569	2116	52.9	62.1	13.9
(Yogo x Wasatch-3) x Cheyenne-56-5-3	—	39	625	620	711	525	2481	62.0	61.8	13.7
(Itana #6 x K-17-7-3)-1-26-1	—	38	412	485	501	425	1823	45.6	61.1	14.2

Note: Westmont is used as a check in this nursery.

* Varieties yielding significantly less than the check (.05).

\bar{x} 54.0
 S.E. \bar{x} 4.0341
 L.S.D.(.05). 11.5
 C.V. 7.47 %

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	29951.12333	4.60 **
Varieties	15	15881.3	2.44 *
Error	45	6509.55844	
Total	63		

Table XLIII . Agronomic data on Vogel bulk (Burt x 178383) selected in 1962.

1962 Row No.	Cross	Dwarf Smut		Straw Creston	Height Creston	Yields Bu/Acre Creston	Percent Survival Havre	Creston Number
		Creston	Braaton					
2	Burt x 178383	0	0	Good	38	43.5	0	C61- 2
3	Burt x 178383	0	0	Good	39	67.7	0	C61- 3
9	Burt x 178383	0	0	Fair	38	68.5	0	C61- 9
11	Burt x 178383	0	0	Fair	35	86.0	0	C61-11
22	Burt x 178383	0	0	Fair	40	60.0	0	C61-22
24	Burt x 178383	0	0	Fair	38	65.0	0	C61-24
26	Burt x 178383	0	0	Fair	--	58.0	0	C61-26

Table XLIV . Bulk row selection made on the Howard Braaton farm at Kalispell, Montana in 1962.

1962 Row No.	Montana Number	Cross
27	C62- 1	Burt x 178383
31	C62- 2	"
33	C62- 3	"
37	C62- 4	"
55	C62- 5	"
60	C62- 6	"
63	C62- 7	"
69	C62- 8	"
70	C62- 9	"
78	C62-10	"
85	C62-11	"
90	C62-12	"
91	C62-13	"
92	C62-14	"
93	C62-15	"
96	C62-16	"
98	C62-17	"
100	C62-18	"
109	C62-19	"
110	C62-20	"
111	C62-21	"
113	C62-22	"

Continued on -----

Table XLIV. (Continued)

1962 Row No.	Montana Number	Gross
115	G62-23	Burt x 178383
117	G62-24	"
121	G62-25	"
126	G62-26	"
127	G62-27	"
128	G62-28	"
137	G62-29	"
138	G62-30	"
140	G62-31	"
142	G62-32	"
153	G62-33	"
156	G62-34	"
161	G62-35	"
170	G62-36	"
179	G62-37	"
181	G62-38	"
183	G62-39	"
187	G62-40	"
188	G62-41	"
189	G62-42	"
192	G62-43	"
194	G62-44	"
196	G62-45	"
197	G62-46	"
198	G62-47	"
200	G62-48	"
201	G62-49	"
205	G62-50	"
211	G62-51	"
227	G62-52	"
243	G62-53	"
246	G62-54	"
252	G62-55	"
254	G62-56	"
256	G62-57	"
267	G62-58	"
272	G62-59	"
274	G62-60	"
286	G62-61	"
287	G62-62	"
296	G62-63	"
299	G62-64	"
300	G62-65	"
307	G62-66	"
308	G62-67	"
309	G62-68	"
332	G62-69	(IM462-N#10 x Itana 684 (16)) (P.I. 178383 #5 x OAV 25)
349	G62-70	"

Continued -----

Table XLIV . (Continued)

1962 Row No.	Montana Number	Cross
359	062-71	(IM 462-N#10 x Itana 684 (17)) (P.I. 178383 #9 x OAV 25)
414	062-72	(IM 462-N#10 x P.I. 178383 (36D)) (R1018M-N#10 #4 x C.I. 13273)
417	062-73	"
418	062-74	" (37)
434	062-75	(C.I. 13273 x Elk 70038 #1 (74)) (70060A #12 x P.I. 178383)
437	062-76	"
454	062-77	(P.I. 178383 x OAV 25 (82)) (Dewey 225A x Itana x 2423 #1)

Table XLV . Plant Selections made on the Howard Braaton farm at Kalispell, Montana in 1962.

1962 Row Number	Crosses	Number Plants Selected
321	(IM 462-N#10 x Itana 684 (15)) (P.I. 178383 # 9 x OAV 25)	3
333	" (16)	6
334	"	4
344	"	7
345	"	4
347	"	8
354	"	6
356	" (17)	12
358	"	5
387	(IM 462-N#10 x P.I. 178383 (31)) ?	4
389	"	6
393	"	4
395	"	5
416	(IM 462-N#10 x P.I. 178383 (36D)) (R1018M-N#10 #4 x C.I. 13273)	9
419	" (37D)	10
459-467	5722 x Wilhelmina	8
468-475	5686 x 5722	10
476-481	Carsten IV x P.I. 178383	12
482-488	Erotica x P.I. 178383	8
489-492	White Winter x 5722	3

Continued ———

Table XLV . (Continued)

1962 Row Number	Grosses	Number Plants Selected
493-494	5770 x 5722	6
495-499	5781 x 5772	8
499-501	5780 x 5772	3
502-509	Carsten V x 5722	7
510-517	5775 x 5783	11
518-520	5775 x 5772	5
521-526	(14) 563BC ₄ x 5789 and (15) 55108BC ₄ x 5772	15
527-531	5772 x 5778	6
532	(Pope) P.I. 178383 x Cheyenne	5
535	"	4
544	"	4

Code Number	Pedigree
5686	(Itana x Utah 175A-53) x Itana
5722	P.I. 178383 x (Norin 10 x Brevor)
5770	P.I. 178383 x Lemhi
5772	5686 x 5722
5781	Wilhelmina x 5686
5780	White Winter x 5686
5775	Gabo x Rio
5783	Carsten V x 5686
5778	(Rio-Rex x Cheyenne ² / x Turkey ³) x 5722
563BC ₄	(Rio-Rex x Cheyenne ²) x Comanche ⁴
55108BC ₄	(Rio-Rex x Cheyenne ²) x Turkey ⁴

Table XLVI . Yield and protein data from irrigated and dryland winter wheat grown at Creston, Montana in 1962. Field number X-1.
Date Seeded: 9/22/61 Date Harvested: 8/27/62 Size of Plot: 439.7 sq. ft.

Treatment	Plot Yields Bu/Acre				Protein Percent	Average Yield Bu/Acre	Bu. Wt. in Pounds
	I	II	III	IV			
Irrigated (2")	67.7	66.1	64.4	76.6	9.8	68.7	61.8
Dryland	73.4	69.3	67.7	63.6	11.7	68.5	62.1

TITLE: Preliminary Investigations

PROJECT NUMBER: 5028 (Root Rot on Cereals)

PERSONNEL: Leader - Vern R. Stewart
Cooperator - E. L. Sharp

FUNDS: State - \$ 366.66

LOCATION: Northwestern Montana Branch Station in field number R-2c

DURATION: Three to five years

OBJECTIVES:

1. To study the effects of cultural methods on fungi causing cereal root rots
2. To determine the effectiveness of seed treatment in the control of cereal root rots

EXPERIMENTAL DATA:

INTRODUCTION

Work on cereal root rots at the Northwestern Montana Branch Station began in 1959. This was a direct result of a serious condition in oats on the Station in 1958. Root rots in barley in other areas of the Valley have been noticed particularly in late seeded fields (after May 15).

MATERIALS AND METHODS

In cooperation with Dr. E. L. Sharp chemical and cultural studies have been conducted to determine ways to control this disease.

The cultural study consisted of tillage method, soil compaction, date and depth of seeding. These are discussed in the tabulated data. This part of the study was done using Freja barley. The entire plot was sprayed with Carbyne in an attempt to control the wild oats.

The chemical studies were conducted on Park oats and Compana barley. Treatment, chemicals, and rates are listed in the tabulated data.

All seeding was done with the belt seeder. Plots in general were handled much in the same manner as cereal research plots.

RESULTS AND DISCUSSIONS

Moisture was much below normal this season and temperatures cooler than normal. Tabl. XLVII shows a summary of data from the cultural study on spring barley (Freja). These data are very similar to the 1960 data. Plowing, early seeding, and non-packed soil gave the highest yield with disease having little effect on yield. In 1960 the three inch seeding gave the highest yields. In 1962 the one inch gave the highest yield.

Tables XLVII to L show complete data of this study. A statistical analysis was not available at the time this report was written.

The fungicide studies on barley and oats revealed no yield differences, because of treatment, that was statistically significant. In the oat study Ceresan 100 at one-half ounce did reduce the disease reading considerably below the check. In the barley study there were not any compounds that reduced the disease reading below the check that would be considered significant. See Tables LI and LII for details of these studies.

Table XLVII. Summary of disease rating and yield data from cultural practices study on Freja barley at Creston, Montana in 1962. Field no. R-2c.

Dates of Planting: April 27 (E) and May 11, (L) 1962 Date of Harvest: August 21, 1962
Size of Plot: 16 square feet

Comparison	Disease Rating	Yield in Bushels per acre
Tillage Method		
Stubble Mulch	20	13.2
Deep Plowing	19	20.7
Planting Date		
Early	21	18.7
Late	19	15.2
Soil Compaction		
Packed	20	16.7
Non-Packed	20	17.2
Seeding Depth		
1" Shallow	21	18.5
3" Deep	18	15.4

Table XLVIII . Comparison of packed and non-packed soil conditions.

Treatment	Packed Soil		Non-Packed Soil		
	Disease Rating	Yield in Bu/Acre	Disease Rating	Yield in Bu/Acre	
Planted April 27					
Stubble Mulch	1"	21	21.6	25	16.1
	3"	21	14.4	20	13.6
Flowing	1"	19	19.4	27	22.5
	3"	20	20.6	16	21.6
Planted May 11					
Stubble Mulch	1"	18	7.8	24	15.1
	3"	15	6.7	18	10.2
Flowing	1"	22	24.0	14	21.5
	3"	22	19.0	15	17.2
\bar{x}		20	16.7	20	17.2

Table XLIX . Comparison date of seeding.

Treatment	April 27		May 11		
	Disease Rating	Yield in Bu/Acre	Disease Rating	Yield in Bu/Acre	
Packed Soil					
Stubble Mulch	1"	21	21.6	18	7.8
	3"	21	14.4	15	6.7
Flowing	1"	19	19.4	22	24.0
	3"	20	20.6	22	19.1
Non-Packed Soil					
Stubble Mulch	1"	25	16.1	24	15.1
	3"	20	13.6	18	10.2
Flowing	1"	27	22.5	14	21.5
	3"	16	21.6	15	17.2
\bar{x}		21	18.7	19	15.2

Table L. Comparison of seeding depths.

Treatment	1"		3"	
	Disease Rating	Yield in Bu/Acre	Disease Rating	Yield in Bu/Acre
<u>Packed Soil</u>				
April 27				
Stubble Mulch	21	21.6	21	14.4
Flowing	19	19.4	20	20.6
May 11				
Stubble Mulch	18	7.8	15	6.7
Flowing	22	24.0	22	19.1
<u>Non-Packed Soil</u>				
April 27				
Stubble Mulch	25	16.1	20	13.6
Flowing	27	22.5	16	21.6
May 11				
Stubble Mulch	24	15.1	18	10.2
Flowing	14	21.5	15	17.2
\bar{x}	21	18.5	18	15.4

Table LI. Yield and disease rating data from fungicide study conducted on Park oats grown at Creston, Montana in 1962. Four row plots, three replications.

Date Seeded: 4/27/62 Date Harvested: 8/21/62 Size of Plot: 16 sq. ft.

Treatment	Rate	Dis- ease Rate	Plot Yield Bu/A			Ave. Yield Bu/A
			I	II	III	
Panogen 15	1/2 fl. oz./bu.	9	22.8	30.4	37.0	30.0
Panogen 15	3/4 fl. oz./bu.	7	48.1	37.8	28.9	38.2
Ceresan 100	1/2 fl. oz./bu.	4	33.4	42.7	29.8	35.4
Ceresan 100	3/4 fl. oz./bu.	6	41.8	31.7	44.5	39.3
OM 1563	2 oz./100 lbs.	9	36.1	42.8	29.7	36.3
Pandrinox	2 1/8 fl. oz./bu.	12	28.3	33.0	30.0	30.5
Panogen 15 + EP 165	3/4 + 2 fl. oz./bu.	10	35.0	47.0	36.2	39.3
Panogen 15 + Drinox H-34	3/4 + 2 1/2 fl. oz./bu.	11	33.2	32.0	33.0	32.8
Bayer 22555-Aldrin	1 oz./bu.	9	38.0	32.7	29.4	33.4
Check	Not treated	12	30.3	26.6	47.0	34.6

Analysis of Variance			
Source	D.F.	Mean Square	F
Replications	2	3.69635	---
Treatments	9	34.488	---
Error	18	50.95188	---
Total	29		

\bar{x} 35.0
 S.E.E. 4.1212
 L.S.D. NS
 C.V. 11.78 %

Table LII. Yield and disease rating data from fungicide study conducted on Compara barley grown at Creston, Montana in 1962. Four row plots, three replications.

Date Seeded: 4/27/62 Date Harvested: 8/21/62 Size of Plot: 16 sq. ft.

Treatment	Rate	Dis- ease Rate	Plot Yield Bu/A			Ave. Yield Bu/Acre
			I	II	III	
Panogen 15	1/2 fl. oz./bu.	33	21.2	23.8	28.4	24.5
Panogen 15	3/4 fl. oz./bu.	46	30.8	24.7	16.6	24.0
Ceresan 100	1/2 fl. oz./bu.	41	19.9	25.8	20.5	22.0
Ceresan 100	3/4 fl. oz./bu.	41	25.4	25.4	21.2	24.0
OM 1563	2 oz./100 lbs.	41	29.6	25.5	20.6	25.2
EP 204	1/4 oz./bu.	33	22.2	24.5	19.7	22.1
EP 204	1/3 oz./bu.	40	22.0	15.4	19.3	18.9
EP 204	1 oz./bu.	33	19.0	22.6	30.6	24.1
Pandrinox	2 1/8 fl. oz./bu.	42	25.0	22.6	21.2	23.0
Panogen 15 + EP-165	3/4 + 2 fl. oz./bu.	30	25.8	25.0	16.0	22.1
Panogen 15 + Drinox H-34	3/4 + 2 1/2 fl. oz./bu.	35	21.8	20.8	19.5	20.7
Bayer 22555-Aldrin	1 oz./bu.	31	22.4	20.4	20.7	21.0
Check	Not Treated	35	25.6	24.5	20.4	23.5

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	2	26.68949	---
Treatments	12	9.314915	---
Error	24	14.11754	
Total	38		

\bar{x}	22.7
S.E. \bar{x}	2.16929
L.S.D.	NS
G.V.	9.54 %

TITLE: Preliminary Investigations

PROJECT NUMBER: 5028

PERSONNEL: Leader - Vern R. Stewart
Cooperator - State Miscellaneous Crops Committee

FUNDS: State - \$ 1292.00

LOCATIONS: Northwestern Montana Branch Station in field numbers A-1c, Y-1, and Z-1

DURATION: Indefinite

OBJECTIVES:

1. To determine the agronomic adaptability and oil potential of several plant species
2. To determine the best date of seeding for yellow mustard in Northwestern Montana
3. By natural selection find a strain of safflower that will mature and produce seed in the Flathead Valley.

EXPERIMENTAL DATA:

INTRODUCTION

Work with "new crops" for western Montana was continued again this season. This area of work was expanded to study more plant species and increase some of the more promising species in field blocks.

MATERIALS AND METHODS

Two mustard nurseries were grown, both of which were identical in entries. One was grown under irrigated conditions and the other under dryland conditions. These were grown in four row plots and replicated four times. These were sprayed with DDT for control of insects once during the growing season. Ten entries were included in these nurseries.

The new crops nurseries consisting of thirteen entries were grown under both dryland and irrigated conditions. These were grown in four row plots and four replications.

Two field plots of new crops were grown, namely, Camelina sativa and Crambe abyssinica. The Camelina sativa was grown in a dryland grain hay rotation with the crop being grown in place of spring wheat. Crambe abyssinica was grown under both dryland and irrigated conditions. Included in this study were seeding rates and spacing of rows, namely, seven and fourteen inches.

A block of safflower was seeded from last year's planting which originated from a bulk of Plant Introductions. This block was harvested in bulk again this year.

RESULTS AND DISCUSSIONS

Irrigated mustard yields were higher than the dryland yields this season. In past seasons the dryland yields have been higher than irrigated. There were no significant differences in the irrigated varieties when these data were analyzed statistically. Table LIII. Using the analysis of variance significant differences were found in the dryland mustard nursery. The Oriental Yellow selections were all higher in yield than the Yellow selection, Yellow, Gisilba, and Commercial. Table LIV shows yield data from this nursery.

The high C.V. in the dryland new crop Intrastate nursery would raise a question on the reliability of these data. Using Duncan's multiple range test there were no significant differences in yields of all species except the barley entry. Stands of Lepidium campestre, L. densiflorum, and Alyssum alyssoides were obtained, but no seed was produced by these three entries. See Table LV for complete details.

Four species seeded in the irrigated nursery did not emerge. They were Lepidium campestre, L. densiflorum, Alyssum alyssoides, and pig weed. There is little difference in yields between the irrigated nursery and the dryland nursery. Barley was significantly better in yield than the other entries. There were no significant differences in yields between Camelina sativa, Cow Cackle, flax, and Crabwe abyssinica. These differences are measured using the Duncan's multiple range test. See Table LVI for other comparisons and complete agronomic data.

The field plot of Crabwe abyssinica was grown in cooperation with USDA, ARS. Yields were quite low which, no doubt, can be accounted for by the high weed population in the entire field. The report submitted to the USDA, ARS is made a part of this report. This report presents all data obtained from this study.

GRAMBE PLANTINGS

Data desired for comparing results from all locations

1. Location - Northwestern Montana Branch Station, Route Four, Kalispell, Mont
2. Size of Planting - one acre
3. Soil Type - Creston silt loam
4. Drainage - good
5. Frost Date - Last freeze in spring - May 30, 1962
First freeze in fall - September 3, 1962
6. Rainfall and temperature records - May 30 to September 3, 1962

<u>Month</u>	<u>Ave. Temperature</u>	<u>Precipitation</u>
May	51.5° F	2.59 inches
June	58.6° F	1.15 inches
July	62.1° F	.11 inch
August	62.1° F	.72 inch
TOTAL		4.57 inches

High temperature for season - 92° F on August 16, 1962

7. Irrigation - 2 inches on June 20, 1962
8. Planting Date - May 1, 1962
9. Fertilizers - none
10. Seeding Rate - six pounds per acre in seven inch rows and three pounds per acre in fourteen inch rows
11. Distance between rows - seven and fourteen inches
12. Spacing in row - not measured
13. Depth of Planting - one-half inch
14. Type of Seeding Equipment - International No. 10 grain drill
15. Time to Emergence - not recorded - approximately seven days
16. Average Height at Maturity - fifty inches - approximately - not measured
17. Date of Blooming - July 12, 1962
18. Weeds, Insects, or Disease noted and extent of damage -
 1. Weeds were a great problem, namely -
 - (a) Wild oats - Avena fatua
 - (b) Cow Cockle - Saponaria vaccaria
 - (c) Fan Weed - Thlaspi arvense

Weeds gave the crop considerable competition and, no doubt, account for the poor yields.
 2. Insects - none
 3. Disease - none evident
19. Control Measures Used - none
20. Date of Harvest - September 4, 1962
21. Color of Seed at Harvest Time - light brown
22. Type of Harvest Equipment - self propelled combine
23. Yield -

7" spacing dryland	- 571.2 pounds per acre
7" spacing irrigated	- 606.8 pounds per acre
14" spacing dryland	- 408.4 pounds per acre
14" spacing irrigated	- 528.0 pounds per acre

Yields of *Camelina sativa* in the field planting was about two-thirds of the yield obtained in the nursery planting or a yield of 765 pounds per acre. There was a little shattering of the top bolls before the lower ones were ready for harvest.

The bulk breeding plot of safflower was harvested in bulk. The probability of a line suitable for the Flathead Valley coming out of the material was much greater than last season. The reason being that summer temperatures were lower than normal and the growing season several days shorter than last season.

Table LI. Agronomic data from irrigated Intrastate mustard nursery grown at Creston, Montana in 1962. Four replications, four row plots, field number D-6 (old number).

Seeding Date: May 3, 1962 Date Harvested: August 27, 1962 Size of Plot: 16 sq. ft

Type	Selection Number	Flower- ing Date	Replications				Total Grams	Pounds per Acre
			I	II	III	IV		
Oriental Yellow Selection	49-5934-2	6-26	280	340	274	240	1134	1701
Oriental Yellow Selection	60-9233	6-24	215	270	189	350	1024	1536
Oriental Yellow Selection	60-8786	6-26	155	305	160	180	800	1200
Oriental Yellow Selection	60-9265	6-26	200	221	180	245	846	1269
Oriental Yellow Commercial	60-8093	6-26	315	330	220	215	1080	1621
Oriental Yellow Selection	60-8807	6-24	180	276	270	260	986	1480
Yellow Selection	48-6687	6-14	220	290	140	175	825	1238
Yellow	48-6729	6-16	190	365	280	255	1090	1636
Gisilba	Sunburst	6-21	295	346	270	205	1116	1675
Commercial	60-8104	6-13	310	211	169	280	970	1455

Analysis of Variance				\bar{X}	1480
				S.E. \bar{x}	154.636
				L.S.D.	NS
				C.V.	10.44%
Source	D.F.	Mean Square	F		
Replications	3	11722.825	4.41		
Varieties	9	3896.13611	1.47		
Error	27	2656.93611			
Total	39				

Table LIV. Agronomic data from dryland Intrastate mustard nursery grown at Creston, Montana in 1962. Four row plots, four replications, field number A 1-c.

Date Seeded: May 3, 1962 Date Harvested: August 23, 1962 Size of Plot: 16 sq. ft.

Type	Selection Number	Flower- ing Date	In. Ht.	Replications				Total Grams	Lbs./ Acre
				I	II	III	IV		
Oriental Yellow Sel.	49-5934-2	6-23	35	155	200	164	150	669	1003*
Oriental Yellow Sel.	60-9233	6-23	38	215	230	165	185	795	1192*
Oriental Yellow Sel.	60-8786	6-22	35	165	185	155	186	691	1037*
Oriental Yellow Sel.	60-9265	6-23	38	135	195	160	140	630	945*
Oriental Yellow Commercial	60-8093	6-23	36	220	217	160	160	757	1136*
Oriental Yellow Sel.	60-8807	6-23	37	215	200	200	140	755	1133*
Yellow Selection	48-6687	6-11	32	165	120	126	115	526	789
Yellow	48-6729	6-9	31	145	130	150	115	540	810
Gisilba	Sunburst	6-15	35	140	170	150	110	570	855
Commercial	60-8104	6-11	29	131	120	126	115	492	738

Note: Commercial is used as a check in this nursery.

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

\bar{x}	963
S.E. \bar{x}	60.
L.S.D.	174
C.V.%.....	6.

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	2364.025	5.80 **
Varieties	9	2894.95833	7.10 **
Error	27	407.65463	
Total	39		

Table LV. Agronomic data from dryland New Crops Intrastate nursery grown at Creston, Montana in 1962. Four row plots, four replications, field number A 1-c. Seeding Date: May 3, 1962 Size of Plot: 16 square feet

Species	Flower--		Har-vest Date	Height in Inches	Plot yield in grams				Total Grams	Yield Lbs. per acre
	ing Date				I	II	III	IV		
Barley - Unitan	6-26		8-24	29	730	735	572	457	2494	374.2
Cow Cackle	6-29		8-24	16	380	345	250	235	1210	181.6
Oriental Yellow Mustard	6-23		9-5	42	240	400	265	150	1055	158.3
Safflower N-10	8-7		10-18	28	315	243	225	220	1003	150.5
Graber Abyssinica	7-10		9-5	32.4	275	215	155	870	1305	130.5
E. Pervidis	6-24		9-5	38	175	265	254	100	794	119.1
Camelina sativa	6-29		8-24	27	208	264	185	115	772	115.8
E. juncea P.I. 173847	6-24		9-5	38	190	270	135	155	750	112.5
Flax - Redwood	6-30		8-24	22	155	195	160	135	645	96.8
Pigweed	---		9-5	18	120	130	115	20	385	57.8

\bar{x} 1497
 S.E. \bar{x} 181.888
 C.V. 29.23 %

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	34444.9	1.53
Species	9	82144.2111	3.66 **
Error	27	22449.3704	
Total	39		

Table LVI. Agronomic data from irrigated New Crop Intrastate nursery grown at Creston, Montana in 1962. Four row plots, four replications, field number Y-1. Date Seeded: May 3, 1962 Size of Plot: 16 sq. ft.

Species	Flower-		Har-		Height		Replications				Total Grams	Yield in lbs. per acre
	ing Date	vest Date	inches	inches	I	II	III	IV				
Barley - Unitan	6-21	8-24	36	705	638	925	350	2618	3928			
Cow Cackle	7-3	9-5	22	375	340	335	1385	2028				
Camelina sativa	6-29	8-24	39	290	270	299	1139	1709				
Flax - Redwood	7-4	9-5	28	200	300	190	1000	1500				
Crambe abyssinica	7-11	9-5	46	326	224	160	995	1492				
E. juncea P.I. 173847	6-25	9-5	49	225	176	225	806	1209				
E. perividis	6-25	9-5	46	180	110	195	667	1001				
Oriental Mustard	6-24	9-5	46	165	110	145	610	915				
Safflower N-10	8-21	10-18	40	55	75	65	340	510				

x 1487
 S.E.X. 282.588
 C.V. 18.99%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	2934.074	12.28 **
Species	8	108964.8611	
Error	23	8866.9469	
Total	34		