

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

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 Seeded: September 21, 1961 Date Harvested: August 14, 1962 Size of Plot: 32 square feet

Variety	C.I.No.	Head- ing Date	Smut %	Ht. in In.	Lodg- ing %	Grams per plot				Total Grams	Yield in Bu./A.	Bu. Wt.
						I	II	III	IV			
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 <sup>5</sup>	13649	6-16	3.3	39	5.0	1105	1015	1250	982	4352	54.4	59.3
Awmed Elgin <sup>6</sup>	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

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	117895.2	13.98 **
Varieties	18	69055.7388	8.19 **
Error	54	8433.10925	
Total	75		

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