TITLE: Small Grain Investigations

PROJECT NUMBER: 5023 (Winter Wheat)

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

FUNDS: State - $3509.00

LOCATION: Northwestern Montana Branch Station, Field No. E-3, R-rotation and several off-station locations.

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 smut and stripe rust. Other agronomic characteristics such as straw strength, winter hardiness, etc., will be evaluated in this program.
3. To determine the effect of seeding date, seeding depth and variety on the incidence of dwarf smut.
4. To determine the effectiveness of fungicides in the control of stripe rust.
5. To maintain a pure genetic varietal seed source of recommended winter wheat.

EXPERIMENTAL DATA:

INTRODUCTION

Research in 1962-1963 has been directed to finding a solution or solutions to two major problems in winter wheat production in western Montana. The problems are dwarf bunt and stripe rust. Of the two,stripe rust is causing more yield losses throughout the area.

The winter wheat research program in 1962-1963 consisted of; variety testing a breeding program, cultural studies, and a cooperative program with the Regional Disease Control Laboratory in Pullman, Washington.

MATERIALS AND METHODS

A complete description of procedures and designs are found on page seventy of the 1961 Annual Research Report of the Northwestern Montana Branch Station.

Three nurseries were seeded in the fall of 1962, two located on the station and one off-station in the dwarf bunt area, northwest of Kalispell. Six off-station nurseries were seeded in September of 1961 with one each being located in Missoula, Ravalli, Lake, Sanders, Mineral and Lincoln Counties.

Thirty entries were included in the intrastate hard red winter wheat nursery and it was grown in field E-3. The western regional white wheat nursery contained 25 entries and was also grown in field E-3. In the dwarf bunt area, Northwest of Kalispell, the regional hard red winter wheat nursery was grown on the Lance Claridge farm. The foregoing nurseries were grown in four row plots and replicated four times.

The six off-station nurseries contained 14 entries and were grown in single row plots, replicated four times. The location and grower are found in the tabulated data from each of the studies.

The breeding plots were located on the Lance Claridge farm and a duplicate planting on the station in field number E-3. A discription of materials in the breeding program is found under Results and Discussion.

Pathology studies were carried on by the Regional Disease Control Laboratory. Report of this work will be made in the annual report of the Disease Control Laboratory.

Fungicide studies for control of stripe rust were conducted on a field basis and plot basis. Fungicides in the field plots were applied with an air craft. Two applications were made during the growing season. An eighteen acre field was used in the study. Two varieties were used, namely Westmont and Gaines. The field was divided into three equal parts. Yields from this study were obtained by harvesting the entire treated area. The small plots were located on the Leonard Marshell farm, in the variety, Westmont. The fungicide was applied using a small research type "spray rig". Plots were 60 feet long and ten feet wide. Four random samples were obtained from each treatment. Two treatments were made 16 days apart.

RESULTS AND DISCUSSION

Each nursery will be discussed separately in this report.

Intrastate Hard Red

The majority of the entries in this nursery were from selections made from Burt x P.I. 178383 material. The yields on most of these selections were superior to Westmont but many of them were late in maturity and lodged severly. Gaines was the highest yielding entry in the nursery.

Stripe rust infections were very high in the susceptable lines. Four of the Burt x P.I. 178383 entries had immuned reactions to stripe rust. No dwarf bunt was found in this nursery. Table XXXIV, shows complete results of this study.

Western Regional White

Gaines is used as a check in this nursery and only one entry is higher in yield but not significantly. Stripe rust infestation was quite high in this nursery. The mean of the nursery was 57.0 bushels per acre, 7.4 per acre less than the hard red nursery which was adjacent to this nursery. Table XXXV, shows complete data for this nursery.

Western Regional Hard Red

Severe winter weather in January 1963 caused considerable damage in this nursery. Temperatures had been holding in the mid-thirties for several days, there was very light snow cover, then on January 9, 1963, a rapid drop in temperature and high winds caused a loss in some fields of 100 percent of the winter wheat stands. Some entries in this nursery were completely killed, others were injured to a lessor extent. Stripe rust was quite severe on the more susceptible entries.

Rego is the highest yielding entry, but not significantly higher than Westmont.

Dwarf bunt was not a significant factor in this area in 1963. See Table XXXVI, for complete data.

Off-station

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

Missoula County - Stands in the fall were very poor and severe winter conditions reduced the stand still more. Because of the erratic stands within a variety, this study was not harvested.

Ravalli County - Good emergence of all varieties was obtained in the fall of 1962. In February of 1963 a rapid warming trend caused severe erosion by melting snow water in this nursery. Some rows were completely destroyed.

Clay spots in the nursery also caused erratic growth rates and stands. Because of these conditions this nursery was not harvested in 1963.

Lake County - Results from the study on Glen Vergerants, Table XXXVII, were non-significant when analyzed statistically. The high C.V. points out the large amount of variation found in this nursery, which is due in part to stand.

Proteins are variable among the different varieties. Delmar (14.0%) is the highest and Tendoy with (10.7%) is the lowest.

Sanders County - Melting snow in February caused flooding of this nursery and all but one replication was partically or completely destroyed. Cheyenne and Tendoy are the highest yielding lines on a single plot basis. This has been the pattern of these two varieties over the past three years. Proteins are variable and it should be noted that both Cheyenne and Tendoy have low protein percentages, Table XXXVIII.

Mineral County - Yields were very good for this area of Montana in 1963. Dwarf smut and stripe rust were not to great of a problem. This, no doubt, accounts for the superior yield of Westmont. The reliability of this study maybe open to question, because of the high C.V. The white wheats were poorer in yield than the hard red wheats. The data for this study is found in Table XXXIX.

Table XXXVI. Agronomic data from the western regional hard red winter wheat nursery grown on the Lance Claridge farm, Route 3, Kalispell, Montana in 1962 - 1963.

Date Planted: 9/13/62 Date Harvested: 8/9/63 Size of Plot: 16 square feet.

Variety or Cross	C. I. or N. No.	Heading Date	Height in Inches	Stand %	Stripe Rust 0-4	Stripe Rust %	Stripe Rust Coefficient	Grams per Plot I	Grams per Plot II	Grams per Plot III	Grams per Plot IV	Total Grams	Yield Bushel per A.
Rego	13181	6-11	27	100	0	5	.5	115	225	180	285	805	20.1
Burt x P.I. 178383	C61- 9	6-16	24	100	0	T	.1	165	190	136[1]	170	711	17.8
Burt x P.I. 178383	C61-24	6-16	23	82	0	5	.5	176	255	110	145	686	17.2
Westmont	12930	6- 8	27	98	4	90	90	165	210	100	200	675	16.8
Rex - Rio x Cheyenne[5]	13675	6-13	23	90	2	T	.4	105	205	200	150	660	16.5
Gaines	13448	6-17	21	90	1	10	2	112	190	205	111	618	15.5
Tendoy	13426	6-13	26	98	0	T	.1	85	176	165	175	601	15.0
Kharkof	1442	6-15	24	78	2	10	4	40	209	175	175	599	15.0
Columbia	12928	6- 8	24	96	4	90	90	65	180	150	200	595	14.9
(Wasatch x Kharkof)-17-1-8-5	13691	6-16	26	80	0	5	5	130	95	120	220	565	14.1
(Rex x Rio x Cheyenne[2]) x Turkey[2]	13674	6-11	26	100	1	10	2	90	145	134	195	564	14.1
Burt x Itana Sel 160	13694	6-13	22	98	0	T	.1	100	105	165	190	560	14.0
Rio	10061	6-13	23	78	1	5	1	50	181	135	193	559	14.0
(Itana x Kharkof-17)-1-26-1	13692	6-13	26	95	1	T	.2	90	145	145	130	510	12.8
Burt x Itana Sel 7	13693	6-14	23	78	3	30	40	85	120	176	126	507	12.7
Delmar	13442	6-13	24	85	1,3	40	24	55	140	162	140	497	12.4
Cheyenne	8885	6-14	25	85	1	10	2	70	235	60	125	490	12.3
Burt x P.I. N78383	C61-22	6-15	35	37	3	25	20	130	130	110	111	481	12.0
Itana	12933	6-11	26	96	4	90	90	55	125	185	111	476	11.9
(Alicel-Rex-P-80) x Commanche	13695	6- 9	22	55	2	5	2	90	105	75	105	375	9.4*
(Alicel-Rex,P80) x Cheyenne[2], Sel. 4	13676	6-17	18	95	0	T	.1	90	95	75	90	350	8.8*
Burt x P.I. 178383	C61- 2	6-16	24	33	0	T	.1	115	50	85	70	320	8.0*

NOTE: Westmont used as a check in this nursery

1 Calculated missing plot

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

$\bar{x}$..... 13.9
S.E.$\bar{x}$..... 2.09731
L.S.D.(.05).. 5.9
C.V.%..... 15.12

Analysis of Variance

Source	D.F.	Mean Square	F.
Replications	3	16816.57866	9.56
Varieties	21	3482.71904	1.97*
Error	62	1759.48812	
Total	86		