TITLE: Winter Wheat

PROJECT: Small Grain Investigations MS 756

YEAR: 1981

PERSONNEL: Leader - Vern R. Stewart
Technician - Todd K. Keener
Cooperator - G. Allen Taylor
Cooperating Agencies - Montana Wheat Research Committee MAES, Montana Wheat Research and Marketing Committee, Pacific Northwest Regional Commission

LOCATION: Northwestern Agricultural Research Center and L. B. Claridge Farm, Kalispell

OBJECTIVES:

1. To obtain information necessary to make varietal recommendations and evaluate new varieties and selections.
2. To obtain from a cooperative program with the USDA-AR in the Pacific Northwest wheat germ plasm or varieties that have resistance to dwarf smut (Tilletia controversa Kuehn) and stripe rust (Puccinia striiformis West).

1981 EXPERIMENTS:

1. Western Regional Hard Red Winter Wheat Nursery
   (a) Kalispell
   (b) Stillwater
2. Western Regional White Winter Wheat Nursery
   (a) Kalispell
   (b) Stillwater
3. Off station Variety Nurseries (3)
   Locations in tabulated data.
4. Preliminary Evaluations Hard Red Winter Wheat

1981 RESULTS:

The winter of 1980-81 was relatively open and quite mild. As a result of the mild winter there was a high level of stripe rust spores that survived the winter. This resulted in a high level of strip rust infestation in the nurseries in 1981. Snow cover during the winter is critical for dwarf smut development. With only minimal snow cover in 1980-81 we did not have a good test for dwarf smut resistance in the materials grown.

The months of May and June had higher than normal precipitation. This produced ideal environment for most foliar diseases including stripe rust.

Western Regional Hard Red Winter Wheat Nursery - Kalispell

Yields were slightly below average for this location, however it did give us a good test of the yielding ability and performance of the entries in the nursery.

The highest yielding entry was ID220 at 87.9 bu/a. Test weight was excellent at 61 lb/bu. MT77077 (Winridge) yielded 70 bu/a which was significantly lower in yield than ID220. ID220 and Winridge both have fair stripe rust resistance, with ID220 having a slightly higher degree of resistance in this test. Weston is fair in yield

1981 RESULTS: (con't)

and has an excellent test weight. Weston and Winridge are both significantly better in yield than Crest which is used as a check.

Lodging was moderate in 1981. Crest has the weakest straw of any variety tested. Weston had a lodging factor of about 50% whereas Winridge did not lodge in this location.

Crest is the earliest variety in the nursery heading 10 days ahead of Winridge and five days before ID220 the highest yielding entry.

Lacking in 1981, is a really good evaluation of smut resistance in this test. Table 1.

Western Regional Hard Red Winter Wheat Nursery - Stillwater

Yields were considerably above the annual average. Yields are higher due in part to increasing fertility levels in this area and timely rainfall during the growing season.

There was not sufficient snow cover for the usually high levels of dwarf smut found in this location. Susceptible varieties such as Kharkof and Wanser each had smut levels of 10% and we would expect levels of 50% and 80% respectively. Thus we do not have really good dwarf smut information on these entries.

OR7921 was the highest yielding variety (90 bu/a). Weston and MT77077 (Winridge) were not significantly better statistically than Crest which is used as a check variety. MT77090 was excellent in yield and significantly better than Crest, but not significantly higher in yield than MT77077 (Winridge).

Eight lines showed a high degree of resistance to stripe rust, however only MT77066 yielding significantly more than Crest showed good resistance to this disease.

Lodging was moderate in this experiment, and Table 2 shows the difference between varieties. Weston, Crest and OR7921 have fairly high lodging indexes.

Light dwarf smut was noted in the susceptible varieties, however we do not feel the levels are high enough to secure a good evaluation of the lines and varieties in this test. Table 2.

Western Regional White Winter Wheat Nursery - Kalispell

Luke is used as the check variety in this nursery. There are no varieties significantly higher in yield, however there were six varieties that were lower in yield. Luke appears to perform very well in this location. Daws looked excellent this year at 98.88 bu/a. WA6363 and WA6313 are promising varieties for this location. Tyee is the highest yielding variety at 91.11 bu/a, however the test weight was light. Daws had one of the better test weights. Test weight on Luke was off one pound from the standard. Luke is somewhat later heading than other varieties. Daws is six days earlier in heading than Luke. Daws has a better straw than Luke, however it is somewhat taller. Tyee, Daws and Luke have good stripe rust resistance, however we did not have any dwarf smut this season to be able to compare resistance of these lines to that disease. Table 3.

1981 RESULTS: (con't)

A ten year summary of white winter wheat yields for Kalispell is located in Table 3a.

Western Regional White Winter Wheat Nursery - Stillwater

Yields were excellent in this location. They were some of the highest we have ever obtained at this location in the past 20 years.The highest yielding line was WA6698 at 105.45 bu/a and is significantly higher than Luke. There were six lines that were significantly lower in yield than Luke.

The mean of test weights for the experiment was 55.57 lbs/bu. The test weight of Luke was 53.45 lbs/bu which is very low, whereas WA6698 had a test weight of 57.5 lbs/bu.

Tyee, Faro and ID3528 indicated good resistance to stripe rust of the varieties tested.

Dwarf smut evaluations are inconclusive because of the low level found in susceptible varieties.

Lodging was light in this test, with Moro and Kharkof having the greatest amount. Table 4.

Off Station Nurseries

Ravalli County - Yields were lower in this location when compared to other locations (See Table 5), however they are above average for this site. OR68007 and Tyee had significantly higher yields when statistically compared to Winridge which was used as the check variety in the off station locations.

Test weights were also lowest in this nursery among the three off station locations. Crest and Weston had test weights significantly greater than the check. The test weights in Ravalli County were very similar to those obtained at Stillwater.

Heights were below the five location mean, but were not abnormal. Almost all varieties were significantly less in height than Winridge. This is more or less similar for all the off station nurseries.

Missoula County - No variety yielded significantly higher than Winridge, however Crest and Weston had yields that were significantly less.

All test weights were significantly less than Winridge except for Weston which was higher.

Lake County - The highest yields for all off station locations were obtained from the Lake County nursery. This is surprising considering all the cheatgrass that was extracted from these plots. Varieties yielding significantly higher than the check (Winridge) were Stephens, Faro, OR68007, OR680073, Weston and Tyee.

Test weights were higher than the Ravalli or Missoula County nurseries, but many varieties were less than the same varieties harvested in Kalispell. All but four varieties had significantly lower test weights when compared to Winridge (Table 6).

1981 RESULTS: (con't)

Kalispell and Stillwater data was included in the following tables as a means of comparison. The discussion on these nurseries was given earlier in this report.

Preliminary Evaluations Hard Red Winter Wheat

The mean yield for this nursery was lower than normal which may be a reflection of the stripe rust infestation. Eight varieties yielded significantly higher than Centurk, the check, with a range of yields from 20.5 bu/a to 76.6 bu/a.

Test weights were also less than previous year means. More than two-thirds of the entries had test weights significantly less than Centurk at 58.2 lbs/bu. Heading dates and height varied according to variety with no abnormal variances observed.

There was very little smut observed throughout the study so meaningful comparisons of resistance could not be made this year. Stripe rust was prevalent throughout the nursery. Nine winter wheat varieties demonstrated resistance toward the disease with two others showing slight resistance (Table 8).

WINTER WHEAT VARIETIES RECOMMENDED FOR WESTERN MONTANA

Hard Red Varieties

1. Crest - dryland
2. Winalta - dryland
3. Cheyenne - dryland
4. Winridge - dryland

Soft White Varieties

1. Luke - dryland or irrigated

CHARACTERISTICS OF RECOMMENDED VARIETIES

1. Crest

   a. Bearded variety, developed in Montana
   b. High yielding potential in dwarf smut and stripe rust areas
   c. Tall type
   d. Maturity - early to mid-season
   e. Good test weight
   f. Weak straw strength
   g. Moderate shattering resistance
   h. Resistant to stripe rust
   i. Moderate resistance to dwarf smut
   j. Susceptible to stem rust and sawfly infestation
   k. Not extremely winter hardy
   l. Adequate baking and milling quality

2. Winalta

   a. Bearded variety
   b. Fair yielding
   c. Tall type
   d. Maturity - early to mid-season
   e. Good test weight
   f. Weak straw strength
   g. Good shattering resistance
   h. Susceptible to dwarf smut and sawfly infestations
   i. Resistant to stripe rust
   j. Moderate resistance to stem rust

Recommended Winter Wheat Varieties (con't)

3. Cheyenne

a. Bearded variety
b. Good yielding ability
c. Tall type
d. Maturity - early to mid-season
e. Good test weight
f. Weak straw strength
g. Susceptible to shattering
h. Moderate resistance to stripe rust
i. Susceptible to dwarf smut, stem rust and sawfly infestation
j. Good milling and baking qualities

4. Winridge

a. High yielding ability
b. Tall type
c. Good test weight
d. Resistant to shattering
e. Resistant to lodging
f. Resistant to dwarf smut, stripe rust and cephalosporium stripe
g. Winter hardy
h. Acceptable protein, milling and baking qualities

Soft White Varieties

1. Luke

a. Bearded variety
b. Good yielding ability
c. Semi-dwarf type
d. Maturity - mid-season
e. Fair test weight
f. Poor to fair straw strength
g. Resistant to shattering
h. Resistant to dwarf smut and stripe rust
i. Foot rot tolerant
j. Good baking and milling quality for cake flours

Table 1. Agronomic data from the western regional hard red winter wheat nursery grown on the Northwestern Agricultural Research Center at Kalispell, MT in 1981. Random block design. Four replications. Field No. E-1.

Date seeded: September 22, 1980 Date harvested: August 13, 1981
Size of plot: 32 sq. ft.

C.I. or State No	Variety	Yield Bu/A	Test Wt Lbs/Bu.	Heading Date	Height Inches	Stripe Rust %[3]	Stripe Rust I.T.[4]	Lodging %	Lodging Sev.
ID 220	14106/CLM// MC/4/PJ/Y54//	87.99a	61.05	156.00a	45.00	5	2.5	.00b	.00b
OR 7925	CLAR/FEN/WA 5836 Sel27-26	79.79a	56.57b	156.00a	32.25b	0	0.0	.00b	.00b
MT 77090	DM/CST	78.79a	60.98	153.00a	46.00	10	2.0	.00b	.00b
WA 6817	WA5840/CERCO	78.59a	59.85	158.50a	37.50b	15	2.0	.00b	.00b
OR 7921	BEZ/Sprague Sel18-24	77.78a	60.07	156.25a	39.50	5	1.0	.00b	.00b
MT 77066	C61-9/WLT// CRT	77.69a	60.05	163.50a	45.25	5	1.0	.00b	.00b
OR 7930	BEZOSTAJA/ REW	77.26a	60.03	160.25a	41.75	10	2.0	.00b	.00b
OR 792	Triumph/LCR Sel126	75.02a	60.88	156.75a	45.50	5	1.0	.00b	.00b
WA 6816	ID5012/ WA5866	74.21a	58.63	162.25a	41.50	0	0.0	.00b	.00b
ID 3518	WA4765/3/BZ// BURT/178383	73.61a	58.15b	170.50a	34.75b	0	0.0	.00b	.00b
CI 17727	Weston	73.07a	63.32	155.50a	43.75	0	0.0	52.25b	.75b
MT 77002	FRD/BEZO	71.77a	60.65	155.25a	46.00	5	1.0	.00b	.00b
ID 219	14106/CLM//MC/ 5/FROCOR//	71.50a	60.95	156.75a	52.75a	25	3.5a	5.00b	.50b
UT122275	DLM/PI143438// CLM/3/DLM/	70.67a	60.60	159.25a	47.75a	0	0.0	.00b	.00b
MT 77077	C61-9/WLT// CRT	70.01a	60.75	161.25a	46.50a	10	2.0	.00b	.00b
ID 217	A667W-46/ Ranger	68.22a	62.17	157.25a	49.50a	0	0.0	78.75	3.75
UT119402	Utah Sel.	68.12a	58.55	161.75a	48.75a	0	0.0	.00b	.00b
UT119416	Utah Sel.	67.91a	59.98	161.25a	49.25a	0	0.0	.00b	.00b
CI 13844	Wanser	67.37a	58.78	156.00a	50.25a	40	5.0a	.00b	.00b
WA 6815	173467/GNS// WSR/4/NRN10/	66.97a	60.90	159.25a	46.00	0	0.0	.00b	.00b
WA 6818	173467/13438// McCall/3/C	66.16a	60.47	160.00a	35.50b	25	3.5a	.00b	.00b
ID 218	14106/MC/3/WRR //KO/PI17	62.12a	59.85	157.50a	48.25a	0	0.0	66.00	3.25
ID 216	SM4/TD//3*IT/ PI178383	61.36	60.85	162.00a	47.75a	45a	6.5a	53.75b	5.50b
ID 178	SNR64/II-60-155//Heglar/	59.34	55.17b	155.25a	45.00	0	0.0	52.50b	2.50
ID 51022	BEZO//Burt/ 178383/3/ARK	58.02	60.15	154.00a	49.25a	0	0.0	.00b	.00b
ID 51021	BEZO//Burt/ 178383/3/ARK	56.07	60.17	153.50a	44.75	0	0.0	.00b	.00b
CI 13880	Crest[1]	50.85	61.00	151.50	42.25	0	0.0	83.25	4.50

Table 1. (con't)

C.I. or State No	Variety	Yield Bu/A	Test Wt Lbs/Bu.	Heading Date	Height Inches	Stripe Rust %3/	Stripe Rust I.T.4/	Lodging %	Lodging Sev.
ID 215	2CNN/PI17/3/ WRR//KO/PI17	47.34	54.65b	162.25a	51.00a	70a	8.0a	.00b	.00b
CI 1442	Kharkof	41.14	60.98	162.75a	52.25a	50a	6.5a	20.00b	.50b
	$\bar{x}$	68.23	59.87	158.46	45.02	11.21	1.38	14.19	.73
	F2/	7.76**	3.41**	76.10**	14.67**	17.95**	.538**	10.20**	11.79**
	S.E.$\bar{x}$	3.76	1.01	.46	1.36	4.30	.986	8.54	.45
	L.S.D.(.05)	10.56	2.83	1.29	3.81	12.45	2.855	24.01	1.27
	C.V.%	5.51	1.68	.29	3.01	38.35	6.018	60.18	61.42

1/ Check variety
2/ F-value for variety comparison
a/ Values significantly greater than the check at .05 level.
b/ Values significantly less than the check at .05 level.
* Indicates statistical significance at the .05 level
** Indicates statistical significance at the .01 level
3/ Percent of plot infected
4/ Postion of rust on plant: 1 = basal leaves; 3-4 = lower leaves; 5-7 = between last and second to last leaf; 8 = flag leaf; 9 = head

Table 2. Agronomic data for the western regional hard red winter wheat nursery grown on the Lance Claridge farm at Kalispell, MT in 1981. Random block desing. Four replications.

Date seeded: September 23, 1980 Date harvested: September 8, 1981
Size of Plot: 32 sq. ft.

C.I. or State No	Variety	Yield Bu/A	Test Wt Lbs/Bu	Height Inches	Stripe Rust Sev[3/]	Rust IT[4/]	% Smut	Lodging %	Lodging Sev.
OR 7921	BEZ/Sprague SEL18-24	90.27a	58.40a	37.00b	2.00	5.00	.50	62.25b	2.25b
OR 792	Triumph/LCR SEL126	84.79a	56.92	41.75	3.00	5.00	1.00	7.50b	.75b
MT 77090	DM/CST	83.03a	56.60	42.25	2.00	5.00	.00	10.00b	.50b
WA 6815	173467/GNS// WSR/4/NRN10/	82.45a	58.55a	45.00a	1.00	5.00	.00	12.50b	.50b
OR 7930	BEZ/STAJA/REW	81.26a	56.67	39.25	2.00	5.00	.50	.00b	.00b
MT 77066	C61-9/WLT//CRT	80.54a	56.45	43.00	1.00	5.00	.00	20.00b	.50b
WA 6816	ID5012/WA5866	77.64a	52.53b	39.00	.00	.00	.50	.00b	.00b
WA 6817	WA5840/CERCO	77.54a	54.63	35.50b	2.00	5.00	1.00	.00b	.00b
OR 7925	CLAR/FEn/WA5836 SEL27-26	77.23a	55.17	33.75b	1.00	5.00	.50	.00b	.00b
CI 17727	Weston	76.98	59.72a	44.50a	.00	.00	.50	69.75b	2.75b
WA 6818	173467/13438// McCall/3/C	76.73	57.97a	33.25b	3.00	5.00	.00	.00b	.00b
UT119402	UTAH SEL.	75.89	53.28b	47.25a	.00	.00	.00	30.00b	2.25b
UT119416	UTAH SEL.	75.75	54.60	48.75a	.00	.00	.00	42.50b	2.75b
CI 13844	Wanser	73.52	56.47	45.50	2.00	5.00	10.00a	40.00b	1.75b
UT122275	DLM/PI173438// CLM/3/DLM/	72.44	54.60	47.50	.00	.00	.00	77.25	2.50b
ID 220	14106/CLM//MC/ 4/PJ/Y54//	71.86	57.13	39.25	4.00	8.00	.50	94.25	5.50
ID 178	SNR64/II-60-155// Heglar/	70.92	56.82	44.75a	1.00	5.00	1.00	99.00	4.25b
MT 77002	FRD/BEZO	70.15	59.53	42.75	1.00	5.00	1.00	87.00	4.25b
MT 77077	C61-9/WLT//CRT	69.25	54.25b	45.00	2.00	5.00	.50	52.50b	2.7[illegible]
ID 218	14106/MC/3/WRR// KO/PI17	68.99	56.47	46.75	2.00	5.00	.00	99.00	6.00
CI 13880	Crest[1/]	66.62	55.88	40.75	.00	.00	.00	99.00	6.75
ID 51022	BEZO//Burt/ 178383/3/ARK	66.03	58.87a	47.75	1.00	2.00	.50	13.75b	1.50b
ID 3518	WA4765/3/BZ//Burt/ 178383	65.65	50.50b	32.50b	.00	.00	.50	.00b	.00b
ID 51021	BEZO//Burt/178383/ 3/ARK	65.32	58.30a	41.00	.00	.00	.00	.00b	.00b
ID 219	14106/CLM//MC/5/ FROCOR//	63.66	57.20	48.00a	4.00	8.00	.00	99.00	5.25
ID 217	A667W-46/Ranger	63.62	58.20a	46.75a	2.00	5.00	.00	99.00	5.75
ID 215	2CNN/PI17/3/WRR// KO/PI17	60.68	53.15b	48.00a	4.00	8.00	.00	99.00	6.00
CI 1442	Kharkof	56.43	55.82	51.75a	2.00	5.00	10.50a	96.75	2.50b
ID 216	SM4/TD//3*IT/ PI178383	55.51b	54.98	45.75a	3.00	8.00	.00	96.75	6.25

Table 2. (con't)

C.I. or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu.	Height Inches	Stripe Sev 3/	Rust IT 4/	Smut	Lodging %	Lodging Sev.
	$\bar{x}$	72.44	56.20	42.90	1.55	3.93	1.00	48.51	2.53
	F 2/	5.16**	9.92**	31.97**	.00	.00	2.12**	20.83**	14.48**
	S.E.$\bar{x}$	3.72	.69	.89	.00	.00	1.78	9.11	.61
	L.S.D.(.05)	10.46	1.95	2.51	.00	.00	5.14	25.61	1.71
	C.V.%	5.14	1.24	2.08	.00	.00	177.61	18.78	24.12

1/ Check variety
2/ F-value for variety comparison
3/ Percent of plot infected
4/ Postion of rust on plant: 1 = basal leaves; 3-4 = lower leaves; 5-7 = between last and second to last leaf; 8 = flag leaf; 9 = head
a/ Values significantly greater than the check at .05 level
b/ Values significantly less than the check at .05 level
* Indicates statistical significance at the .05 level
** Indicates statistical significance at the .01 level