

TITLE: Winter Wheat

PROJECT: Small Grain Investigations MS 756

YEAR: 1982

PERSONNEL: Leader - Vern R. Stewart
 Technician - Todd K. Keener
 Cooperators - G. A. Taylor, Plant and Soil Science, MSU
 J. A. Hoffman, USDA-ARS, Logan, UT
 Cooperating Agencies - Montana Wheat Research Committee
 Montana Agricultural Experiment Station
 Montana Wheat Research & Marketing Committee
 Montana Cooperative Extension Service

LOCATIONS: Northwestern Agricultural Research Center
 Lance Claridge Farm, Kalispell
 Ross McInyre Farm, Stevensville
 Joe Holland Farm, Plains
 Arthur Mangles Farm, Polson
 Bill Lucier Farm, Missoula

- 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-ARS in the Pacific Northwest wheat germ plasm or varieties that have resistance to dwarf smut (Tilletia controversa Kuhn) and stripe rust (Puccinia striiformis West.)

INTRODUCTION:

The winter of 1982 was near normal for temperature, however precipitation levels were higher than normal in December, January and February. Because this precipitation came mainly as snow we did have relatively good snow cover during the winter season, and during the period when dwarf smut infections would be developing. With this snow cover we did not have the level of dwarf smut that I would have anticipated in the Stillwater area.

Precipitation levels were below normal in May and June and quite low in August. Somewhat higher in July, however the pattern was such that we did not have a high level of stripe rust or other foliar diseases developing in winter wheat.

In September and October of 1982 we established a new study to evaluate the effects of tillage on the levels of dwarf smut over a long period of time. In this study we will be evaluating three tillage types in our dwarf smut field laboratory located on the Lance Claridge farm northwest of Kalispell. This study is planned to run a minimum of five years, but we would prefer a 10 year period to determine the effect of tillage methods on dwarf smut inoculum levels.

1982 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. USDA-ARS Cooperative Studies - Stillwater
 - (a) Fungicide Evaluations
 - (b) Breeding Lines Tested for Smut Resistance
 - (c) Cooperative Dwarf Bunt Study with the Peoples Republic of China
4. Off Station Variety Nurseries
 - (a) Ross McIntyre Farm, Stevensville, Ravalli County
 - (b) Bill Lucier Farm, Missoula, Missoula County
 - (c) Art Mangles Farm, Polson, Lake County
5. Preliminary Evaluations of Hard Red Winter Wheat
 - (a) Kalispell

1982 RESULTS:

Western Regional Hard Red Winter Wheat Nursery - Kalispell

In 1982 the yields were considerably higher than in 1981. This is in part due to timeliness of rain, and a less foliar disease problem than we had in 1981. The highest yielding variety in the test was OR7921 (115.3 bu/a) which was significantly higher than the variety Crest used as a check. It was not statistically higher than Winridge, a newly released variety. The Oregon variety did have 1.12% smut factor which could be a little high for a light smut year, when compared to Karkof 5.5%. The variety has good straw strength and has an earlier heading date than Winridge, but somewhat later than Crest. There were 10 entries that exceeded 100 bu/a in this test, but only one of those showed fair smut resistance (OR 7930 - .62%). MT77066 yielded 100 bu/a, shows good smut resistance, but has a very weak straw. Weston, an Idaho variety, shows good smut resistance as does UT125327. These varieties yielded 98 plus bu/a.

The evaluation for smut resistance is just fair in this test. The smut level of Karkof, a very susceptible variety, was only 5.5% and a variety having 1% would be suspect as far as being smut susceptible under a heavy infestation. UT125327, ID0243, ID002616 and UT125512 had zero dwarf smut readings. Table 1

Test weights were somewhat below the standard 61 lbs/bu. Only ORCR8107 exceeded the standard weight.

Lodging was quite severe. There are a few varieties that have sufficient straw strength for this location. WA6816 and OR7921 had fair straw strength. Most of the Idaho and Montana lines are very susceptible to lodging.

Western Regional Hard Red Winter Wheat Nursery - Stillwater

Yields continue to increase each year in this location. The mean for this year was 83 bu/a with a range of 94.1 to 64.79 bu/a. UT125327 is the highest yielding entry in the nursery and has good smut resistance in this test. In the Kalispell location it showed no smut, whereas in the Stillwater location it showed .12% smut. Winridge, a new release yielded 92.5 bu/a which is not significantly higher than Crest, and shows a fair degree of smut resistance. ID0215 and ID0216 are the only two varieties that show no smut in this location.

Winridge had a test weight of 62.5 lbs/bu which is about the mean level of the entire experiment.

Dwarf smut at this location was light to moderate and Karkof, a very susceptible variety only had 2.25% whereas Wanser, probably equal in susceptibility, is 3.5%. MT 77002 was 5% which indicates to the author that this variety is even more susceptible than Karkof. With the snow cover at this location, we would have anticipated higher levels of dwarf smut than we found, however this is due in part because snow cover did not come early in the fall of 1981.

Six varieties showed a degree of lodging, from moderate to severe, in this study. This is in contrast to the Kalispell location where lodging was severe in most entries in the test. Table 2

Western Regional White Wheat Nursery - Kalispell

Luke was the high yielding entry in this nursery with 140.9 bu/a which is 23 bu/a greater than the mean. Lewjain, a newly released variety, was approximately 10 bu/a less in yield, however this difference was not statistically significant. There were 10 varieties or lines that exceeded 130 bu/a in this study. Yields ranged from 59.7 bu/a to 140.5 bu/a.

Test weight mean was 58.56 lbs/bu. The variety Daws had the highest test weight at 62.37 lbs/bu. Luke reached the standard of 60 lbs/bu and Lewjain was 59.4 lbs/bu.

Smut levels were moderate at this location. The susceptible variety Karkof had a reading of 5.25%. WA6696 was close behind (4.75%), Luke and Lewjain both had 1% plus dwarf smut levels. It should be noted that not a variety in this test was 100% smut free.

Lodging evaluation are significant. We have differential lodging in this experiment between varieties. Moro, Elgin and Karkof were severely lodged, Luke was lightly lodged, about 12%, whereas Lewjain showed no indication of lodging in this location. Table 3

Western Regional White Wheat Nursery - Stillwater

Yields at this location are quite high for the white wheats. Using Luke as the check (101.11 bu/a) we only find four varieties that are significantly higher in yield than Luke. The mean for the nursery was 91.73 bu/a. This illustrates a rather high productive level of these varieties in this test.

Test weights are lighter than we would have anticipated for this location.

Karkof had a smut level of 4.75% which is relatively light. It is interesting to note that Nugaines had approximately the same level of dwarf smut (4%) as we found in Karkof. Table 4

Off Station Nurseries

Four off station nurseries were planted in the fall of 1981. These were located in Missoula, Ravalli, Lake and Sanders Counties. Of the four planted only two were harvested in the fall of 1982.

Missoula County - In this location the nursery was seeded in a field that had been prepared for winter wheat. The operator then seeded the remaining part of the field and seeded through the nursery. In my 30 years of experience, I do not think this has ever occurred in my cooperative work.

Ravalli County - This was located on the Ross McIntyre Farm in Ravalli County. A grower we have worked with for many years. The nursery was located in a fallowed area with no crops seeded around it. Wild game found the seeding and selectively grazed varieties, thus destroying any possibility of obtaining data.

Sanders County - This nursery was located on the Joe Holland farm near Plains, MT. Luke was the high yielding variety in the nursery with 114.3 bu/a. Crest was the lowest with 58.62 bu/a. Winridge, a newly released hard red variety yielded 75.2 bu/a and was significantly lower in yield than the variety Luke.

No variety was entirely free of dwarf smut, however the level was not high, 4% reading. Lewjain and Winridge had the lowest smut readings in the test. Luke was somewhat higher than Lewjain with 1.8%.

Test weights varied from about 61 lbs/bu to 56 lbs/bu with a mean of 58.7 lbs/bu. Luke and Lewjain came close to meeting the 60 lbs/bu standard.

Lodging was quite high in the hard red winter varieties with no real severe problem in the soft whites except Luke had 24% lodging compared to Lewjain with 12%. Table 5

Lake County - This nursery was grown on the Art Mangles farm near Polson, MT. Yields were quite low, but understandably so in this rather light sandy soil. The mean was 43.46 bu/a. Luke was the high yielding variety in the test. Test weights were quite good in this location with a mean of 60.2 lbs/bu, with a range of 61.75 lbs/bu down to 57.8 lbs/bu. All the varieties were quite short. Table 6

Preliminary Yield Evaluation Nursery - Kalispell

This nursery contains preliminary lines developed by Dr. Allan Taylor, Montana State University winter wheat breeder. We evaluated these lines for yield and smut resistance primarily. The mean yield of this nursery was 67.6 bu/a. The test weights were quite good, with a mean of 61 lbs/bu. Lodging was light to moderate with some varieties lodging severely, particularly those with Yogo background.

Smut was light to moderate throughout the nursery and it should be noted there was not a variety that was free of dwarf smut in this study. Considering the parentage of the material in the test we would not have anticipated any degree of smut resistance. Table 7

TABLE 7

SMUT INCIDENCE AND SEVERITY IN SEVEN VARIETIES OF WHEAT

Parentage of varieties
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WINTER WHEAT VARIETIES

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 milling and baking 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 (cont'd)

3. Cheyenne

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

4. Winridge

- a. High yieldings 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, millings and bakings qualities

Soft White Variety

1. Luke

- a. Bearded variety
- b. Good yieldings
- 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 bakings and millings quality for cake flours

Table 1

Astronomic data from the Western Regional Hard Red Winter Wheat Nurseries grown on the Northwestern Agricultural Research Center at Kalispell, MT. in 1982. Random block design, four replications. Field No. E-2, 1-3

Date seeded: September 22, 1981
Size of Plot: 32 sq.ft.

Date harvested: September 1, 1982

VARIETY			YIELD	TEST WT	HEADING	HEIGHT	SMUT	LODGING	LODGING
			BU/A	LB/BU	DATE	INCHES	% 2/	ANGLE	%
OR	7921	0112BEZ/SPRAGUE SEL18-24	115.32a	59.18	168.25a	36.22	1.12	.50b	1.25b
OR	7925	0112CLAR/FEN/WA5836 SEL27	111.21	56.40b	168.25a	30.71b	1.12	1.75b	12.50b
WA	6913	0112CERCO/CI17271,N780240	110.12	60.25a	168.75a	43.41a	2.50	3.00b	15.00b
CI	17902	0112 WINRIDGE	109.57	59.52	171.25a	38.58	1.00	7.25b	95.50
WA	6816	0112ID5012/WA5866	105.86	56.68b	170.50a	35.33	1.25	.00b	.00b
OR	7930	0112BEZOSTAJA/REW	103.44	58.90	170.25a	35.63	.62	5.75b	61.00b
ORCR	8107	0112ALBA/GNS//FN/SONORA64	101.70	61.75a	166.25a	33.76b	2.50	3.50b	13.75b
ID	3518	0112WA4765/3/BZ//BURT/178	101.25	56.73b	174.25a	33.17b	1.12	.75b	6.25b
WA	6817	0112WA5840/CERCO	100.78	57.58	170.00a	33.76b	3.12	2.50b	7.50b
MT	77066	0112C61-9/WLT//CRT	100.60	59.65	171.75a	41.34a	.25	7.25	77.25
CI	17727	0112 WESTON	98.96	60.62a	166.25	43.11a	.12	6.00	80.75
UT125327		0112DLM/PI173438//CLM/3/D	98.74	57.60	168.75a	34.45	.00	9.00	99.00
OR	792	0112TRIUMPH/LCR SEL126	98.07	56.58b	168.25a	38.88	1.75	5.75b	85.75
WA	6815	0112LIND SEL.	96.44	59.25	169.75a	40.55	2.75	6.00	89.50
MT	77002	0112FRD/BEZO	95.96	58.55	167.00	41.83a	.75	7.25	98.00
CI	13880	0112 CREST 1/	94.74	58.37	166.75	37.40	.12	9.00	93.00
UT125911		0112NAJAH/HNL//BGR/CI1383	90.17	58.45	165.75	42.72a	.25	9.00	99.00
ID	0244	0112JEFF//COULEE/ID0033	86.89	58.85	168.50a	35.53	.62	8.50	80.75
ID	0217	0112A667W-46/RANGER	85.30	59.25	170.00a	43.50a	.25	8.75	86.75
ID	0243	0112CI14106/CLM//MC/3/RGR	84.32	55.70b	170.50a	44.49a	.00	9.00	99.00
ID	51021	0112BEZO//BURT/178383/3/A	83.07	59.10	165.50	41.24a	.25	6.00	99.00
ID	0242	0112SM4/TD//3*IT/178383	81.55	57.67	170.75a	46.16a	.12	9.00	99.00
ID	0215	0112CNN*2/178383/3/WRR//K	80.14	57.77	171.25a	42.13a	.00	9.00	99.00
ID	51022	0112BEZO//BURT/178383/3/A	79.37	58.12	165.75	46.46a	.50	5.75b	90.50
CI	13844	0112 WANSER	76.57	57.45	167.75	42.13a	2.63	7.50	95.50
ID	0245	0112II60-155/CI14106//MC/	73.99b	55.62b	169.75a	41.54a	.25	9.00	99.00
ID	0216	0112SM4/TD//3*IT/178383	72.44b	56.85b	170.50a	44.78a	.00	6.75	74.25
CI	1442	0112 KHARKOF	67.42b	56.70b	171.00a	46.06a	5.50a	8.25	95.50
UT125512		0112DLM/PI173438//CLM/3/D	65.72b	58.83	168.00	43.60a	.00	7.50	99.00

Table 1. (con't)

	Yield	T.W.	Headings	Ht.	%Smut	Lod<	Lod %
X	92.06	58.21	196.01	39.95	1.05	6.18	70.77
F 3/	3.86**	9.68**	18.08**	15.41**	1.37	6.82**	19.01**
S.E.X.	6.96	.47	.50	1.14	1.10	1.10	8.54
L.S.D. (.05)	19.58	1.34	1.40	3.20	3.09	3.09	24.01
C.V. %	7.56	.82	.30	2.85	104.43	17.76	12.06

1/ Check variety

2/ % Smut = % TCK (*Tilletia controversa* Kohn) smut per plot by ocular ratings

3/ F value for variety comparison

* indicates statistical significance at the .05 level

** indicates statistical significance at the .01 level

a/ values significantly greater than the check at the .05 level

b/ values significantly less than the check at the .05 level

Table 2.

Agronomic data from the Western Regional Hard Red Winter Wheat Nursery grown on the Lance Claridge farm at Kalispell, MT. in 1982. Random block design, four replications. Size of plot harvested: 32 sq. ft.

Date seeded: September 22, 1981

Date harvested: September 1, 1982

VARIETY		HEIGHT INCHES	YIELD BU/A	TEST WT LB/BU	SMUT % 2/	LODGING ANGLE	LODGING %
UT125327	0112DLM/PI173438//CLM/3/D	35.04	94.11	60.97	.12	.00b	.00b
WA 6816	0112ID5012/WA5866	32.87	93.47	55.97b	1.50	.00b	.00b
ID 0244	0112JEFF//COULEE/ID0033	35.43	92.91	61.35	1.12	.00b	.00b
CI 17902	0112 WINRIDGE	38.78a	92.51	60.25	.87	.00b	.00b
MT 77066	0112C61-9/WLT//CRT	40.45a	90.75	60.10	.50	.00b	.00b
OR 7921	0112BEZ/SPRAGUE SEL18-24	29.92b	90.12	59.70b	2.75	.00b	.00b
WA 6913	0112CERCO/CI17271,N780240	41.14a	89.89	60.45	4.50a	.00b	.00b
OR 7930	0112BEZOSTAJA/REW	35.53	89.76	59.40b	2.37	.00b	.00b
ID 0243	0112CI14106/CLM//MC/3/RGR	43.11a	89.07	60.45	1.38	.00b	.00b
ID 0245	0112II60-155/CI14106//MC/	37.80	87.05	62.00a	.50	.00b	.00b
CI 17727	0112 WESTON	42.03a	86.81	63.00a	1.62	.00b	.00b
OR 792	0112TRIUMPH/LCR SEL126	36.81	86.81	60.68	1.00	.00b	.00b
CI 13880	0112 CREST 1/	35.14	86.65	60.80	1.00	3.50	83.25
ID 0217	0112A667W-46/RANGER	39.37a	86.15	62.75a	.50	.75b	25.00b
CI 13844	0112 WANSER	40.45a	82.80	61.97a	3.50	.00b	.00b
WA 6817	0112WA5840/CERCO	30.41	82.72	58.33b	3.50	.00b	.00b
ID 0215	0112CNN*2/178383/3/WRR//K	46.56a	82.15	60.35	.00	3.00	73.25
ID 3518	0112WA4765/3/BZ//BURT/178	30.61	81.77	56.80b	.25	.00b	.00b
OR 7925	0112CLAR/FEN/WA5836 SEL27	27.76b	81.45	57.60b	3.37	.00b	.00b
MT 77002	0112FRD/BEZO	39.17a	81.35	61.25	5.00a	.00b	.00b
ID 0216	0112SM4/TD//3*IT/178383	40.45a	80.56	60.65	.00	1.75b	42.50b
UT125911	0112NAJAH/HNL//BGR/CI1383	39.27a	80.06	61.95a	.37	.00b	.00b
ID 51021	0112BEZO//BURT/178383/3/A	35.93	79.77	61.43	.37	.00b	.00b
UT125512	0112DLM/PI173438//CLM/3/D	41.63a	78.74	61.33	.25	.00b	.00b
WA 6815	0112LIND SEL.	39.17a	78.67	60.70	1.12	.00b	.00b
ID 0242	0112SM4/TD//3*IT/178383	41.83a	76.19	61.12	.12a	2.25b	52.50b
ORCR8107	0112ALBA/GNS//FN/SONORA64	27.26b	71.76b	60.60	5.75	.00b	.00b
CI 1442	0112 KHARKOF	46.56a	69.67b	59.00b	2.25	.50b	24.75b
ID 51022	0112BEZO//BURT/178383/3/A	39.27a	64.79b	60.25	.75	.00b	.00b

Table 2. (con't)

	Ht.	Yield	T.W.	%Smut	Lod κ	Lod $\%$
\bar{X}	37.58	83.74	60.39	1.60	.41	10.39
F 3/	26.41**	2.03**	30.98**	1.86*	12.45**	8.16**
S.E.X.	.98	5.08	.29	1.18	.27	8.10
L.S.D. (.05)	2.75	14.30	.81	3.31	.76	22.77

1/ Check variety

2/ % Smut = % TCK (*Tilletia controversa* Kuhn) smut per plot by ocular ratings

3/ F value for variety comparison

* Indicates statistical significance at the .05 level

** Indicates statistical significance at the .01 level

a/ Values significantly greater than the check at the .05 level

b/ Values significantly less than the check at the .05 level