

TITLE: Winter Wheat
PROJECT: Small Grains Investigations MS756
YEAR: 1978
PERSONNEL: Leader - Vern R. Stewart
 Research Technician - Todd Keener
 Cooperator - G. A. Taylor
 Cooperating Agencies - Montana Agricultural Experiment Station
 Montana Wheat Research & Marketing Committee

LOCATION: Northwestern Agricultural Research Center, L. B. Claridge farm, Kalispell, MT

- OBJECTIVES:
1. To obtain information necessary to make varietal recommendations and evaluate new varieties and selections.
 2. To cooperate in the breeding program in northwestern Montana designed to produce a high yielding variety with particular emphasis on quality, disease resistance to dwarf smut and stripe rust. Other agronomic characteristics such as straw strength and winter hardiness will be evaluated.

1978 EXPERIMENTS:

1. Western Regional Hard Red Winter Wheat Nursery
2. Western Regional White Winter Wheat Nursery
3. Elite Yellow Rust Nursery
4. Seed Treatment Study
5. Special lines from Sunderman

1978 RESULTS:

Western Regional Hard Red Winter Wheat Nursery - Kalispell

Yields in 1978 were very low with a mean of 25.07 bu/a. This low yield was caused by a high level of snow mold. Crest, the check variety, was about equal in yield to the other varieties and had a better than average survival level. ID745520 was the highest yielding entry but not statistically significant. The high C.V. can be accounted for in part because of the uneven stands. Test weights were all below standard in the test.

High levels of dwarf smut were found in this test. Only one variety ID154 was free of this disease. ID745520 the highest yielding line, had only 1.25% smut which does indicate some resistance. Table 1.

Western Regional Hard Red Winter Wheat Nursery - Stillwater

This was seeded later than the Creston location. This delay in seeding resulted significantly in better stands and little or no loss due to snow mold. There was a relatively high level of dwarf smut infection, therefore giving a significant reading as to resistance. The highest yielding entry is UT89099 with 97.29 bu/a. It had a relatively low level of dwarf smut - .75%. Three Utah lines were the highest yielding lines in this study.

Test weights were low and can be accounted for because of the heavy rainfall and delayed harvest. UT890152 showed no evidence of dwarf smut and was second in yield. ID126 also showed no dwarf smut, but had a very weak straw and a low yield.

Kharkof, one of the more susceptible checks had a dwarf smut level of 21.25%. Therefore, we feel this is a pretty good test of the varieties in the nursery. The mean yield for the nursery was 65.37 bu/a. The C.V. is somewhat higher than we would like to see, but this is due in part to lack of uniformity in the field. Table 2.

1978 Results (con't)Western Regional White Winter Wheat Nursery - Kalispell

In 1978 we had the lowest yields of white wheats ever grown in this location. There was a very high level of dwarf smut. The mean yield for the nursery was 25 bu/a and we would anticipate a mean yield of 60 to 70 bu/a. Hyslop was the highest yielding entry at 36.94 bu/a. It had a smut reading of 5.75%. McDermid the check variety, was found to be significantly lower in yield than other lines and had a smut reading of 9.75%. There were no lines with 0.0% smut readings.

Stand loss is due to high levels of snow mold. The soft white variety survival level is much lower than the hard red winter varieties. In 1978 there are few or no promising lines in the white wheats. Luke had a smut reading of 7.25%, which is much higher than we can tolerate. Table 3.

Western Regional White Winter Wheat Nursery - Stillwater

Yields were above average for the Stillwater location. We had a mean yield of 69 bu/a, which ordinarily we would expect at the Kalispell location. McDermid was used as the check variety.

Smut levels were not as high as at Kalispell. We had excellent stand as seen by the yields. There are no varieties that have what I consider an acceptable dwarf bunt resistance level, however ID755312 was quite low at 1.25% and ID745318 at 1%. Luke, a smut resistant variety had a dwarf smut reading of 1.25%. Kharkof, one of the checks had a reading of 8.25%. Table 4.

In Table 5 is a summary of the yields for the Western Regional White Wheat Nursery at the Northwestern Agricultural Research Center for 1968-78. Nugaines is used as the check. Hyslop compared over the 11 years is 11.4% higher in yield.

Elite Yellow Rust Nursery - Kalispell

The hard red wheat lines in this nursery are being evaluated for resistance to stripe rust and dwarf smut. There were differences in survival due to snow mold. MT7789 is the highest yielding entry in the test, but it is not significantly higher in yield than Crest which we used as a check. There were no lines in this test that were completely immuned to dwarf smut, however there were six lines that were less than 1% dwarf smut. Some varieties had very good straw strength. MT77077 and MT 77079 have some resistance to dwarf smut. MT77079 does not have as strong a straw, but probably would be acceptable. MT77066 has good straw but has a high dwarf smut reading. Westmont, which is a dwarf smut susceptible variety, has a smut reading of 30.75% which indicates that many of the lines in this test do show some promise for resistance. Table 6.

Elite Yellow Rust Nursery - Stillwater

This nursery has the same objectives as the previous one. Mean yield of 51.72 bu/a, is very high for this location for hard reds. The dwarf smut level was not as high as the Kalispell location, however high enough to give us information on the resistance of most lines. MT77056 showed no smut, had good straw strength and yielded 66.97 bu/a. MT77069 also had a 0.0% reading on dwarf smut. C.V.'s are very high, this can be accounted for in part because of the unevenness in stand at this location which was due to water standing in the field in early spring. Table 7.

Special Lines from Sunderman

Six hard red wheat lines from the breeding program at Aberdeen, Idaho were evaluated for yield and dwarf smut resistance. Two lines were found to be free of dwarf smut. A7014W-16-1 was the highest yielding line, had good straw strength, fair test weight and .0% smut. Two of these hard red lines need to be evaluated further. Table 8.

1978 Results (con't)Seed Treatment Study

Dwarf smut levels were quite high in this study. Westmont, a very susceptible variety, had a reading of 38%. Stands were uneven throughout the study. An error made in harvesting made it impossible to obtain a statistical analysis of the yield data. Thus the yield data shown is the average of the number of plots harvested from each treatment, which may vary from one to three.

The major information from this study is the smut data for each of the fungicide treatments. Thiabendazole (TBZ) at two and four ounces per bush provide fairly effective control of dwarf smut in all varieties. Resistant varieties treated with TBZ decreased smut levels some. The variety Crest when treated with TBZ at two ounces had a reading of 0%, 4 oz., .7 % and the check 3.3%. The two and four ounce rates of TBZ on Luke provided 100% control of the dwarf smut.

Benomyl did not give effective control of dwarf smut in Westmont and McDermid, but did reduce smut readings as much as 50%. However, this is not an acceptable smut level for commercial production. Benomyl and Uniroyal H719 did not increase the dwarf smut control in the resistant varieties Luke, Hansel and Crest.

In summary we conclude that TBZ did give us effective control of dwarf smut in 1978, which we have seen in our work since 1972. The combination of resistant varieties and seed treatment should give us an effective tool for controlling this disease. Table 9.

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Table 1. Agronomic data from the western regional hard red winter wheat nursery grown at the Northwestern Agricultural Research Center, Kalispell, MT in 1978. Field No. E-1. Random block design, four replications.

Date seeded: September 15, 1977 Date harvested: August 29, 1978
Size of plot: 16 sq. ft.

C.I. or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Heading Date	Height Inches	% Survival	Dwarf Smut
ID 745520	Bezo//Burt/PI178383	34.74	59.00	163.25a	39.00a	83.75	1.25
ID 75537	WA4765//Burt/PI 178383	31.51	55.10	167.00a	31.00b	76.25	2.00
UT 890152	Utah Sel. 890152	31.41	57.60	169.00a	34.00	78.75	1.25
ID 156	A7037W-3-3-1	29.71	56.60	165.00a	36.50a	70.00	6.00
UT 890123	Utah Sel. 890123	28.71	57.40	164.00a	35.00	80.00	2.25
CI 13880	Crest-	28.68	56.50	160.75	33.25	82.50	1.00
ID 745130	Ark Sib//MREI 10-ST/2*CI#	27.91	57.50	169.00a	32.75	75.00	.75
WA 6364	Koelz 7941/2*McCall	27.73	58.40	166.50a	34.25	75.00	38.00a
UT 890143	Utah Sel. 890143	27.01	57.60	167.00a	35.00	70.00	.75
ID 74747	Ark Sib	26.08	59.40	176.00a	39.75a	68.75	1.25
ID 154	Bsn//KO/CI#3/II60/CI#	25.88	57.50	169.00a	36.00a	56.25b	.00
ID 114	CI14106/McCall, Sel.2	25.38	57.20	167.50a	34.75	68.75	1.25
UT 89033	Utah Sel 89033	25.23	57.70	168.50a	35.50a	57.50b	.50
WA 6365	Koelz 7941/2*McCall	25.16	58.10	170.00a	36.25a	67.50	36.50a
ID 745102	Bex//Burt/178383/3/Ark	25.13	57.00	165.00a	39.00a	71.25	4.25
WA 6473	14484/3B1/BK1205//13438	23.88	57.40	168.00a	29.50b	61.25b	41.50a
ID 158	Heglar/ID 5006	23.51	58.00	169.00a	33.25	76.25	50.00a
ID 157	14106/MC/3/WR//KO/178383	23.13	57.50	167.00a	34.75	62.50b	1.75
ID 155	Heglar/Ranger	23.06	57.20	162.50	34.25	67.50	.25
CI 13844	Wanser	22.78	56.50	165.00a	36.25a	51.25b	34.75a
UT 89099	Utah Sel. 89099	22.71	57.10	161.50	31.50	48.75b	.50
ID 126	A68227W-B-7-14-3-1	22.03b	57.50	160.75	35.00	80.00	.25
MT 7216	YG/CI#1155//YG4662-20411	21.16b	58.20	166.00a	33.00	75.00	25.75a
CI 12933	Itana	20.01b	57.20	168.00a	38.25a	56.25b	35.25a
CI 1442	Kharkof	15.36b	53.60	172.50a	41.50a	58.75b	44.50a
WA 6367	Suwon 92/Burt//Wanser	13.80b	55.50	165.00a	27.50b	27.50b	38.75a
	\bar{x}_2	25.07	57.24	166.64	34.88	67.16	14.24
	F ²	3.93**	.00	29.82**	18.38**	3.53**	33.33**
	S.E. \bar{x}	2.34	.00	.64	.73	6.72	3.17
	L.S.D. (.05)	6.58	.00	1.80	2.06	18.89	8.93
	C.V. %	9.33	.00	.38	2.10	10.00	22.29

1/ Check variety

2/ F-value for variety comparison

a/ Values significantly greater than the check .05 level

b/ Values significantly less than the check .05 level

* Indicates statistical significance at the .05 level.

** Indicates statistical significance at the .01 level.

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Table 2. Agronomic data from the western regional hard red winter wheat nursery grown on the Lance Claridge farm, Kalispell, MT in 1978. Random block design, four replications.

Date seeded: September 27, 1977
Size of plot: 32 sq. ft.

Date harvested: September 21, 1978

C.I. or State No.	Variety	Yield Bu/A	Test Wt Lbs/Bu	Height Inches	Lodging			Dwarf Smut
					Type	%	Sev	
UT 89099	Utah Sel. 89099	87.29a	58.60	36.00	.00b	.00b	.00b	.75
UT 890152	Utah Sel. 890152	84.48a	57.80	38.50	.00b	.00b	.00b	.00
UT 890123	Utah Sel. 890123	80.99a	58.60	41.00a	.00b	.00b	.00b	.50
WA 6364	Koelz7941/2*McCall	80.38a	59.30	37.50	.00b	.00b	.00b	15.00a
UT 890143	Utah Sel. 890143	78.04a	57.70	37.00	.00b	.00b	.00b	1.25
ID 155	Heglar/Ranger	77.00a	59.60	41.50a	4.33	33.33	6.00	.75
ID 75537	WA4765//Burt/PI 178383	75.76a	53.50	33.00	.00b	.00b	.00b	1.00
ID 114	CI14106/McCall, Sel.2	73.39a	57.60	40.00a	.00b	19.67	1.67b	1.50
WA 6365	Koelz7941/2*McCall	70.39	57.80	42.25a	.00b	.00b	.00b	14.75a
ID 745130	Ark Sib//MIRM 10- ST/2*CNN	69.34	56.60	35.50	.00b	.00b	.00b	4.00
WA 6473	14484/3/BI/BK1205// 13438	68.42	57.70	28.75b	.00b	.00b	.00b	17.75a
UT 89033	Utah Sel 89033	67.42	57.50	40.00a	.00b	.00b	.00b	2.25
WA 6367	Suwon 92/Burt//Wanser	61.76	55.70	30.50	.00b	.00b	.00b	8.50a
ID 745102	Bez//Burt/178383/3/ Ark	60.62	57.00	43.50a	2.33	16.67	3.00	2.75
ID 154	BSM//KO/CI#3/II 60/ CI#	60.37	59.40	39.25	.00b	.00b	.00b	.75
ID 157	14106/MC/3/WR//KO/ 178383	60.32	57.20	38.25	2.00	43.33	6.00	1.50
ID 745520	Bezo//Burt/PI178383	59.99	60.00	38.75	.00b	.00b	.00b	1.00
ID 156	A7037W-3-3-1	58.91	56.80	41.25a	9.00	60.00	9.00	5.00
ID 74747	ARK SIB	58.71	57.70	47.25a	.00b	.00b	.00b	2.75
CI 12933	Itana	57.72	57.50	42.25a	2.33	3.33	3.00	12.25a
MT 7216	YG/CNN1155//YG4662- 20411	55.67	58.40	38.50	.00b	.00b	.00b	11.50a
CI 13844	Wanser	55.24	56.60	37.50	.00b	.00b	.00b	16.00a
ID 158	Heglar/ID 5006	52.82	58.50	34.75	.00b	.00b	.00b	18.00a
ID 126	A68227W-B-7-14-3-1	51.74	57.20	40.25a	5.33	46.67	6.00	.00
CI 13880	Crest ^{1/}	48.98	57.20	35.50	5.33	33.33	6.00	2.75
CI 1442	Kharkof	43.80	53.00	46.00a	6.00	31.67	6.00	21.25a
	\bar{x}_2	65.37	57.48	38.63	1.41	11.08	1.79	6.29
	F ^{2/}	2.10**	.00	0.68**	3.99**	2.56**	3.46**	14.54**
	S.E. \bar{x}	8.02	.00	1.44	1.25	11.43	1.51	1.81
	L.S.D. (.05)	22.55	.00	4.04	3.52	32.14	4.26	5.10
	C.V.%	12.26	.00	3.72	88.65	103.15	84.31	28.82

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