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TITLE: Winter Wheat

PROJECT: Small Grains Investigations MS 756

YEAR: 1972

PERSONNEL: Leader - Vern R. Stewart
Cooperator - G. A. Taylor

LOCATION: Northwestern Agricultural Research Center and several off station locations throughout western Montana which will be identified in the manuscript.

DURATION: Indefinite

OBJECTIVES:

1. To obtain the information necessary for making varietal recommendations and evaluating new varieties and selections.
2. To cooperate in a breeding program in Northwest Montana designed to produce high yielding varieties with particular emphasis on the acceptable quality and resistance for dwarf bunt and stripe rust. Other agronomic characteristics such as straw strength, winter hardiness etc., will be evaluated in this program.

SIGNIFICANT FINDINGS:

1. There were no new entries in the intrastate nursery that provided any additional disease resistance or additional straw strength above that of Crest.
2. The variety Sundance did not perform in this test at an acceptable level.
3. CI 14565 and 14564 both Washington lines of white wheats, show promise for use in western Montana. They are superior in yield and straw strength to Luke and Nugaines. Further testing should be continued on these.

FUTURE PLANS: Plans for 1972-73 include the regular yield nurseries and assistance in the over all state breeding program. It is also possible that consideration will be given to reducing the winter wheat program in western Montana because of the declining acreage of winter wheat in the area.

MATERIALS AND METHODS:

Standard nursery procedures were used in all of the variety testing programs. A randomized block design was used having four to six replications. Data obtained were: Yield; plant height; test weight; disease and lodging. Nurseries grown were: Intrastate Winter Wheat Nursery at the Northwestern Agricultural Research Center in Field E-1; Western Regional Hard Red Winter Wheat Nursery grown on the L. B. Claridge farm, Northwest of Kalispell in a dwarf bunt area; Uniform White Wheat Nursery grown at the Northwestern Agricultural Research Center in Field E-1. The off station nurseries were planted in Missoula, Lake and Sanders Counties. Plots were harvested with a power harvester.

RESULTS AND DISCUSSIONS:Intrastate Hard Red Winter Wheat Nursery

The mean yield for the nursery was 71.73 bu/a. The mean test weight of 62.6% for all varieties was above average. Dwarf smut was present in the nursery but not a high level of infection as we have seen in previous years. Stripe rust infection rate was very high in the nursery. The mean for prevalence was 30.34% and the mean for type was 4.45 on a 0-9 coded scale. The highest yielding entry was Nugaines at 83.31 bu/a which was significantly higher than Crest, the variety used as a check. The yield of Crest was 70.87 bu/a. Crest does lodge severely. We did note some stripe rust on this entry in 1972. Again this variety is a little bit too tall for western Montana's conditions and we would prefer a variety in the area of 30 to 35 inches. Sundance was significantly lower in yield than Crest. It has limited resistance to dwarf smut and lodges severely. There is considerable evidence that this variety is not resistant to stripe rust. The bulk of the material included in the intrastate nursery does not show a great deal of promise for use in western Montana. In table 1, there are found the data from this nursery.

In table 2 is found a summary of selective winter wheat varieties grown at the Northwestern Agricultural Research Center, 1963 to 1972. Cheyenne is used as a check variety. In this summary there are 6 entries that are superior in yield to Cheyenne and this is only a range of from 1 to 15%. Wanser is 15% greater in yield than Cheyenne, however Wanser is very susceptible to dwarf smut. Crest, our resistant hard red is 4% better in yield than Cheyenne over the years. Centurk, a Nebraska line, is 8% better than Cheyenne. This variety is quite susceptible to stripe rust and also to dwarf smut. Comparing Sundance with Cheyenne we see that it is only 79% of Cheyenne.

Western Regional Hard Red Winter Nursery

Stands in this nursery were somewhat erratic. There was considerable variation between replications at this location. This seems to be a common problem in this area where this Western Regional Nursery is grown. However, because of the high incidence of dwarf smut found in this location we will continue to place our studies in this location.

The analysis of variance indicated that the yield data were non-significant, however the yield range was from 22.2 bu/a to 45 bu/a. The highest yielding entry in this nursery was ID 71040. Crest is used as the check variety. We did note some dwarf smut at a rate of 3%, however these could have been contaminants. ID 33 and ID 30 had the highest rate of dwarf smut with 15%. It is interesting to note that all of the Idaho entries had high levels of dwarf smut. One line WA 58336, from Washington also had 15% dwarf smut. Mean yield for the nursery was 31.85. Dwarf smut infection rate was lower than normal, with a mean of 6.77%, however this could be due in part to several resistant varieties being used. The mean for stand was 70% which is relatively high for this particular area.

Western Regional White Winter Wheat Nursery

Stands were excellent throughout this nursery, however no stand estimates were made. Dwarf smut and stripe rust data were obtained. The dwarf smut levels were not particularly high. The mean was 3%. The highest yielding entry was CI 14565 with 95.78 bu/a and this is contrasted with the nursery mean of 75.23 bu/a. Using Nugaines as the

Results and Discussions (con't)

check variety we found that CI 14565 was significantly higher in yield. Luke, a newly released variety, was not significantly higher in yield than the check, but did have good dwarf smut resistance and almost completely free of stripe rust. CI 14565 and CI 14564 show some promise for use in western Montana. Heading date is the same as Nugaines. Plant height is acceptable at 30 inches and they have relatively good stripe rust and dwarf smut resistance. Table 4.

In table 5 comparisons are made with Nugaines. Hyslop is 110% of Nugaines in this study or in the summary, but it does have some susceptibility to dwarf smut. This is one we should continue to evaluate. Luke is 106% of Nugaines and still continues to out yield it especially under some conditions. CI 14565 is 117% of Nugaines, it also shows some promise as a variety. Some of the newer entries show considerable yield advantage over Nugaines in 1972, however final decision will have to wait until further evaluation.

Off Station Nurseries

Three off station nurseries were seeded in Missoula, Lake and Sanders Counties. Of that number only the one at Sanders County was harvested. In Lake County at seeding time conditions were very dry resulting in poor emergence and stands were very erratic, therefore the nursery was abandoned. The nursery at Missoula County was abandoned because of poor emergence and high infestation of weeds.

Sanders County - Results from the nursery were outstanding. The average stand was 80%, better than what we would anticipate from this region. Highest yielding entry in this nursery was McCall (28.8 bu/a) whereas the average for the nursery was 22.34 bu/a. The high yielding white wheats do not yield well in this location. Crest is used as the check in the nursery and CI 14564 was the only entry significantly lower in yield. This line has preformed very well at the Northwestern Agricultural Research Center. Table 6.

The Elite Yellow Rust Nursery

This nursery is grown in cooperation with the main station in Bozeman. The primary purpose of the nursery is to evaluate new lines for stripe rust resistance and dwarf bunt resistance. Crest is used as the check variety because of its stripe rust and dwarf bunt resistance. MT 71103 is the highest yielding entry in the nursery, but does not have adequate stripe rust resistance. It appears to have relatively good straw strength. Lines that were superior to Crest in yield did not have adequate stripe rust resistance. The reader is referred to table 7 for details of this nursery.

Seed Treatment Study

To measure the effectiveness of various fungicides on the control of dwarf smut in winter wheat a study was established using the variety Cheyenne. The study consisted of 7 treatments. The fungicides used are found in table 8. The analysis of these data indicate no significant difference in yield due to the fungicide treatment and no significant difference in dwarf smut incidence to treatment. The smut rate was higher in the treated plots than in the non-treated plots, however as indicated these differences were not significant.

Table 4. Agronomic data from the Western Regional White Winter Wheat nursery grown on the Northwestern Agricultural Research Center, Kalispell, Montana in 1972. Experimental design - random block, four replications.

Planting date: September 16, 1971 Harvest date: August 8, 1972 Size of plot: 16 sq. ft.

C.I or State No.	Variety	Yield Bu/A	Test Wt. Lbs/Bu.	Heading Date	Plant Ht.In.	Dwarf Smut %	Stripe Rust	
							Sev.	Type
CI 14565	Nord Desprez/2*Sel.101	95.78*	60.50	158.25b	31.25a	.75	7.50	2.25
CI 14564	Nord Desprez/2*Sel.101	90.08*	60.50	159.50	30.75	.50	.50	1.50b
CI 14485	Suwon 92/4*Omar	88.93*	60.50	160.75a	33.50a	1.00	.00	.00b
WA 5829	S.Helvia//Suwon92/13645	88.73*	62.00	159.00	28.50	2.00	5.25	3.00
WA 5909	167822/C.I.13438	88.10*	62.00	160.00	33.00a	.25	35.00a	6.00a
WA 5910	181268/Gaines	85.90*	61.00	159.25	31.75a	.50	7.50	3.00
ID 71042	IDD50/2*Gaines//WA4765	83.58	62.00	159.50	33.00a	4.00	14.00	3.50
ID 71041	Gaines*2/Swedish Type	82.28	63.00	160.50	36.75a	1.00	6.25	3.00
CI 14563	Yamhill	82.13	58.50	161.50a	36.25a	1.75	2.00	3.00
OR 6734	PI 178383/3 Omar	78.28	62.50	159.75	42.25a	.25	4.25	3.25
OR 6857	27-15//Rio/Rex/3/EG/4/MO	76.03	61.50	159.00	37.25a	.50	1.75	2.25
WA 5907	C.I. 13253/5*Marfed	75.12	60.50	161.00a	38.00a	2.00	20.00a	6.00a
CI 14483	Suwon 92/4*Burt	73.80	61.50	158.00b	30.00	1.00	2.00	3.00
CI 14586	Luke	73.55	62.50	161.00a	31.00a	.25	.00	.00b
CI 13968	Nugaines ^{1/}	73.00	62.50	159.75	29.25	3.00	3.00	3.00
OR 6882	Oam/3/178383/2*Omar//101	72.92	62.50	160.50	42.50a	.75	16.25	3.25
CI 11755	Elgin	70.75	62.00	160.50	41.25a	.75	67.25a	6.00a
WA 5826	OM/1834-3//178383/13431	69.42	60.00	161.75a	29.50	.25	.00	.00a
CI 13740	Moro	68.47	60.50	160.50	40.00a	1.50	6.50	3.00
WA 5353	Omar Mutant	62.42	62.00	161.75a	40.25a	1.00	46.25a	3.25
WA 5572	Omar Mutant 642026-197	61.35	63.00	160.75a	39.25a	.75	27.50a	3.00
CI 1442	Kharkof	59.72	62.00	157.75b	46.00a	3.00	21.25a	3.75
WA 5906	14482/3/OM/1834//178383	30.03	54.00	159.75	27.25b	42.50a	8.00	3.00

^{1/} Check variety

* Varieties yielding significantly more than the check

a Values significantly more than the check

b Values significantly less than the check

\bar{x}	75.23	61.17	160.00	35.15	3.01	13.13	2.96
F-value for variety comparison	13.21**	.00	11.99**	75.38**	52.80**	12.16**	21.09**
S.E. \bar{x}	3.81	.00	.33	.61	1.19	4.86	.35
L.S.D. (.05)	10.68	.00	.91	1.71	3.34	13.60	.99
C.V.%	5.07	.00	.20	1.74	39.61	37.00	11.99

Table 5. Summary of western regional white winter wheat nursery grown at the Northwestern Agricultural Research Center, Kalispell, Montana from 1963-1972

C.I. or State No.	Variety	1963	1964	1966	1967	1968	1969	1970	1971	1972	Sta. Yrs.	\bar{x}	% Nugaines
1442	Kharkof	50.1	49.2	52.1	47.4	58.5	58.9	56.4	62.1	59.7	9	54.9	73
11755	Elgin	41.6	57.3	52.3	49.6	80.5	51.2	74.1	73.0	70.8	9	61.2	83
13740	Moro		50.1	85.9	57.2	86.3	65.7	75.4	68.3	68.5	8	69.7	94
13968	Nugaines			79.7	58.7	85.8	63.2	77.6	102.8	73.0	7	77.3	100
14485	Suwon 92/4*Omar					98.1	65.4	87.0	101.2	88.9	5	88.1	109
14564	Nord Desprez/2*Sel. 101					90.1	62.7	87.3	113.1	90.1	5	88.7	110
14483	Suwon 92/4*Burt					84.5	55.4	73.1	100.4	73.8	5	77.4	96
14563	Heines VII/Redmond						69.6	78.4	97.9	82.1	4	82.0	104
14586	Luke							93.1	103.1	73.6	3	89.9	106
14565	Nord Desprez/2*Sel. 101							88.8	111.9	95.8	3	98.8	117
OR 6857	27-15//Rio/Rex/3/EA/4/Moro							74.7	93.3	76.0	3	81.3	96
OR 6882	Omar Mutant/3/178383/2*Omar//101							67.4	74.3	72.9	3	71.5	85
WA 5572	Omar Mutant 642026-197							64.9	63.0	61.4	3	63.1	75
WA 5353	Omar Mutant									62.4	1	62.4	85
WA 5826	Omar/1834-3//PI178383/CI 13431									69.4	1	69.4	95
WA 5829	Super Helvia//Suwon 92/CI 13645									88.7	1	88.7	122
OR 6734	PI 178383/3*Omar									78.3	1	78.3	107
WA 5909	PI 167822/CI 13438									88.1	1	88.1	121
WA 5910	PI 181268/Gaines									85.9	1	85.9	118
ID 71041	Gaines*2/Swedish Type									82.3	1	82.3	113
ID 71042	Idaed 50/2*Gaines//WA 4765									83.6	1	83.6	115
WA 5906	CI 14482/3/Omar/1834//PI 178383									30.0	1	30.0	41
WA 5907	CI 13253/5*Marfed									75.1	1	75.1	103