

Wheat Research Progress Report

Project #: 3061-8670

Title: Control of Strawbreaker Foot Rot and Cephalosporium Stripe in Winter Wheat

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Progress Report Year: 2008

Accomplishments:

The objective of this project is to insure Washington wheat growers have access to winter wheat varieties with effective resistance to Strawbreaker foot rot and Cephalosporium stripe and that effective fungicides are available for control of strawbreaker. To accomplish these goals, winter wheat varieties and breeding lines were evaluated for disease resistance and fungicides were tested for their ability to control strawbreaker in field plots at the Palouse Conservation Field Station and Plant Pathology Farms, both near Pullman.

Studies to find new sources of disease resistance genes for eyespot in wild relatives of wheat continued with the development of two mapping populations of *Aegilops longissima*. These populations will be used to identify new genes and develop molecular markers that would make them easier and faster for breeding programs to transfer them into adapted varieties.

Results:

Resistance to Cephalosporium stripe. Twenty-eight winter wheat varieties and advanced breeding lines were evaluated for reaction to Cephalosporium stripe in a field plot at the Palouse Conservation Field Station. Wheat was sown September 12, 2007 and inoculated with the pathogen in October 2007. Disease reaction was determined in summer 2008 by removing about 1.5' of row and then rating disease severity visually. Plots were harvested in the first week of September. Overall disease severity was moderate as indicated by a disease index of 39 for the highly susceptible variety Stephens. The moderate disease severity probably resulted from the long period of snow cover that occurred on this plot, which reduced disease development.

Advanced breeding line WA7971 had the lowest disease index of all entries in the plot at 2.7, but it was not statistically different than Coda, Xerpha, Finch, or UCF Lambert, the best performing commercial varieties (Table 1). Yield ranged from 142.3 bu/Ac for Bruehl to 82 bu/Ac for AP700CL. In contrast to previous trials, Eltan was not the most tolerant commercial variety in the trial, although performance over multiple years should be considered when choosing a variety.

Resistance to strawbreaker foot rot (eyespot). Twenty-eight varieties and advanced breeding lines that are reported to be resistant to strawbreaker were evaluated in a field plot at the Plant Pathology Farm in Pullman. Wheat was sown during on September 25, 2007 and inoculated by

spraying spores of the pathogen on plants in November 2007. Disease reaction was determined by rating about 100 stems visually for disease incidence and severity in June. Plots were harvested during the first week of September. Overall disease was moderately severe based on a disease index of 50 for the susceptible variety Eltan (Table 2). Chukar and Cara had the lowest disease index of all lines, but they were not statistically better than Madsen, the resistant control or breeding line VPM-1 (the source of *Pch1* in all PNW resistant varieties). Yield ranged from 159 bu/ac for Finch to 85 bu/ac for Eddy.

New strawbreaker resistance genes. Resistant and susceptible lines of *Aegilops longissima* previously identified in WWC-funded research were crossed and two populations of recombinant inbred lines are being developed in the greenhouse. One population is now at the F4 and the other at the F3; one population should be ready next fall to begin mapping work. At the same time, we have continued to screen the parents to identify polymorphic microsatellite markers that will be used to develop the genetic map for identification of closely linked markers.

Fungicide testing. The susceptible variety Eltan was planted at the Plant Pathology Farm on 21 September 2007 and inoculated by spraying spores of the pathogen on plants in November 2007. Fourteen fungicide treatments were applied in spring 2008 to test their effectiveness in controlling strawbreaker. Disease index was determined in June 2008 by visually rating plants for disease incidence and severity, and plots were harvested during the first week of September. Strawbreaker was moderate with the disease index ranging from 31 to 65 (data not shown) and nearly 100% lodging in all plots; however, there were no significant differences among treatments for disease control, yield or test weight.

The effect of fungicide application timing was studied for Vanguard (0.9 lbs/ac) and Punch (4 oz/ac) in a separate trial. Fungicides were applied on 20 March and 10 and 28 April with a backpack sprayer. Disease index and yield were evaluated as described above. Disease index for both fungicides was less than the untreated control for all three application dates (Figure 1), but none of the differences were statistically significant. Likewise, differences between fungicides for disease index were not significant, nor were differences in yield or test weight (data not shown). Although strawbreaker severity was moderate, delayed maturity in spring following the long winter limited disease development, which resulted in the lack of differences among treatments in this study. This work is being repeated.

Publications:

Li, H. J., R. L. Conner, and T. D. Murray. 2008. Resistance to soil-borne diseases of wheat: Contributions from the wheatgrasses *Thinopyrum intermedium* and *Th. ponticum*. *Can. J. Plant Sci.* 88:195-205.

Murray, T.D. 2008. Eyespot (Strawbreaker foot rot). in: *Compendium of Wheat Diseases and Insects*, W.W. Bockus, R.L. Bowden, R.M. Hunger, T.D. Murray, R.W. Smiley, and W. Morrill, eds., Third Edition. APS Press, Minneapolis. (IN PRESS).

Li, H., S.S. Jones, and T.D. Murray. 2008. Reaction of wheat-*Thinopyrum* lines with blue aleurone to *Oculimacula yallundae* and *O. acufiformis*, the causal agent of eyespot disease of wheat. *Plant Disease* (IN REVIEW)

Presentations and Reports:

Murray, T. 2008. Wheatgrass as a Source of Genes for Perennial Habit and Disease Resistance in Wheat. Tokachi Nogaku Danwakai, pages 1-12.

Table 1. Cephalosporium stripe disease index, yield and bushel weight of 28 winter wheat varieties and advanced breeding lines grown at the Palouse Conservation Field Station, Pullman, 2008.

Variety	Disease Index ¹	Yield, bu/ac	Test wt, lbs/bu
WA 7971	2.7	133.3	56.5
ORH 010085	11.1	121.0	57.3
WA 7970	11.9	122.3	58.0
Coda	12.4	113.0	59.0
Bruehl	13.4	142.3	56.8
Xerpha (WA 7973)	14.1	138.8	57.8
BU6W00-523	14.5	109.8	56.5
Finch	15.1	132.5	57.8
UCF-Lambert	16.9	93.8	55.0
94-22407 (Bitterroot)	17.4	113.0	56.3
Brundage '96	20.2	120.0	54.5
Cara	21.0	109.8	55.8
ORCF-102	21.6	113.8	55.8
Masami	22.7	125.3	56.3
Mohler	24.3	99.3	54.5
Chukar	25.7	116.8	56.5
BU6W99-456	25.9	98.3	56.5
Eltan	26.3	123.5	57.0
Madsen	27.1	105.3	55.0
Paladin	28.0	112.8	59.8
Tubbs '06	28.8	98.3	54.0
ORCF-101	31.9	87.3	55.0
AP700CL	32.2	82.0	52.8
WB 528	35.0	99.8	56.5
Salute	37.5	110.8	54.8
Eddy	37.7	98.3	58.5
Simon	38.0	94.0	54.3
Stephens	39.2	87.0	52.5
LSD 5%	15.3	19.3	1.1

¹ - Disease index ranges from 0 to 100, where 0=no disease and 100=all plants with severe disease.

Table 2. Strawbreaker foot rot disease index and yield for 28 winter wheat varieties and advanced breeding lines grown at the Plant Pathology Farm in 2008.

Variety	Disease Index	Yield, bu/ac	Test wt., lb/bu
Chukar	7.1	135.2	58.5
Cara	7.4	148.7	58.2
Simon	11.0	130.9	59.5
VPM-1	12.5	97.3	59.1
Mohler	13.3	142.3	59.0
Coda	13.7	140.0	60.3
Masami	14.7	156.7	58.6
Finch	15.8	159.4	60.5
ORCF-102	16.4	154.9	58.8
Madsen	16.6	145.9	58.9
Tubbs '06	17.5	146.8	58.5
WA 7970	20.6	138.5	59.4
Cappelle Desprez	21.4	101.6	57.3
AP700CL	22.6	133.0	58.6
BU6W99-456	23.0	119.5	59.6
Brundage '96	34.5	144.2	58.3
Xerpha (WA 7973)	34.6	147.6	59.3
Eddy	35.7	84.6	58.2
ORH 010085	36.0	136.0	58.4
Salute	37.5	143.9	58.2
BU6W00-523	39.0	144.4	59.2
UCF-Lambert	41.0	117.3	58.1
Bruehl	41.9	147.3	57.8
94-22407 (Bitterroot)	43.1	139.7	58.5
ORCF-101	44.1	128.5	58.5
WB 528	47.5	128.5	59.8
Paladin	49.5	111.0	61.6
Eltan	50.5	122.9	58.8
LSD 5%	13.6	25.3	0.7

¹ - Disease index ranges from 0 to 100, where 0=no disease and 100=all plants with severe disease.

Figure 1. Disease index for two fungicides applied at three times for control of Strawbreaker foot rotin Eltan winter wheat, Plant Pathology Farm, 2008.

