Progress Report

Project #: 3682

Progress Report Year: 1 of 3

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

Cooperators: T. D. Murray, Plant Pathologist
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Executive summary: Resistance of 44 winter wheat varieties and advanced breeding lines to eyespot and Cephalosporium stripe was determined under field conditions. Summaries of this data were provided to breeders who contributed entries and made available through the WSU Wheat and Small Grains Extension website (smallgrains.wsu.edu). The data from these plots are used to provide disease ratings in the Washington State Crop Improvement Association Seed Buyers Guide. A field plot was established near Ritzville, WA in spring 2016, but later abandoned due to inadequate eyespot disease and too much dryland foot rot to provide meaningful results. A seed treatment trial was planted in fall 2015, disease evaluated and yield determined in summer 2016. Spore-traps were established at the Palouse Conservation Field Station and Spillman Farm to understand the seasonal dynamics of ascospore release, which may contribute to pathogen genetic variation. Field studies were begun to determine the impact of variety mixtures on impact of eyespot and Cephalosporium stripe in winter wheat production.

Impact: Forty four advanced winter wheat selections and new varieties were evaluated for their resistance to eyespot and Cephalosporium stripe. These data were shared with breeders and used to assign ratings in the WSCIA seed buyer's guide for use by growers in making variety selection decisions. Currently, the gene present in Madsen is the primary source of resistance in all other eyespot-resistant varieties. New genes are needed for eyespot resistance to improve effectiveness, further reduce losses to this disease and broaden the genetic base of resistance available to breeders. Developing a better understanding of genetic variation in the eyespot and Cephalosporium stripe pathogens is a long-term goal that will help insure resistance genes remain stable and effective.

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WGC project title: Control of Eyespot and Cephalosporium Stripe in Winter Wheat
Project PI(s): T. Murray, A. Carter, K. Garland-Campbell
Project initiation date: July 1, 2016
Project year (X of 3-yr cycle): 1 of 3

Objective	Deliverable	Progress	Timeline	Communication
1. Evaluate advanced breeding lines and new varieties for resistance to eyespot and Cephalosporium in field plots	Provide unbiased data on the resistance reactions of advanced selections and new varieties to eyespot and Cephalosporium stripe.	Forty-four breeding lines and advanced selections were established in field plots and inoculated in fall 2015. Disease evaluation was conducted on both plots in June 2016. Yield data were not taken due to extensive lodging in both plots that was not related to disease resistance and would have led to misleading results.	This is the last year of variety testing in this funding cycle.	Results from these plots will be presented at field days, variety plot tours and other talks to grower and industry groups, and availble online at the Extension Small Grains Team website.
	Prepare an article for Wheat Life during the three-year project summarizing results.	No progress in 2016.	Submit an article in 2017 or 2018.	
2. Evaluate currently registered and potential new fungicides for eyespot control and yield loss in field plots	Provide data that will help growers and field consultants make decisions about whether and which fungicide to use in controlling eyespot by testing fungicides registered for eyespot control in multiple locations in eastern WA.	A field plot was established near Ritzville, WA in spring 2016, but later abandoned due to inadequate eyespot disease and too much dryland foot rot to provide meaningful results. A seed treatment trial was planted in fall 2015, disease evaluated and yield determined in summer 2016.	This is the last year of fungicide testing in this funding cycle unless the agchem industry provides support.	Results from these plots will be presented at field days, variety plot tours and other talks to grower and industry groups, and availble online at the Extension Small Grains Team website.
3. Evaluate eyespot pathogen populations for resistance to new fungicides	Develop data on sensitivity of the eyespot fungi to new fungicides, especially the active ingredients in Priaxor.	Preliminary in vitro tests were conducted, but methods need to be refined further before general screening of isolates can begin.	This work will begin in fall 2016 or spring 2017, but not complete until the end of the project.	Results of this research will be presented at field days, variety plot tours and other talks to grower and industry groups, and availble online at the Extension Small Grains Team website. Results also will be published in appropriate scientific journals.
4. Screen wild wheat relatives for potential new sources of resistance genes	Identify potential new eyespot resistance genes for use by breeders to improve effectiveness of resistant varieties.	No activity in 2016. Inoculum is being produced now to screen a Madsen population being mapped for cereal cyst nematode resistance to determine the relationship between these genes. Repeat tests of some wild species is anticipated during 2017 to confirm previous results and identify potential donors for genetic studies.	This work will begin in fall 2016 or spring 2017, but not completed until the end of the project.	Results of this research will be shared with breeders, presented at field days, variety plot tours and other talks to grower and industry groups. Results also will be published in appropriate scientific journals.
5. Determine impact of pathogen genetic variation on disease epidemiology, especially the eyespot pathogens, to insure resistance genes remain effective	Develop molecular and microbiological data describing genetic variation in the eyespot and Cephalosporium stripe pathogens and its potential effect on disease control using resistant varieties .	Molecular markers were developed for one of the eyespot fungal species during 2015. Marker development for the other eyespot fungus and *Cephalosporium gramineum* are in progress, but limited progress was made in the second half of 2016 due to personnel turnover. Spore-traps were established at the Palouse Conservation Field Station and Spillman Farm to understand the seasonal dynamics of ascospore	This is a long-term objective and work will be completed each year of the project.	Results of this research will be shared with breeders, presented at field days, variety plot tours and other talks to grower and industry groups. Results also will be published in appropriate scientific journals.

Evaluate mixtures of resistant/tolerant and susceptible varieties in field plots for their impact on eyespot and Cephalosporium stripe.	The potential effectiveness of variety mixtures in controlling eyespot and Cephalosporium stripe will be determined. This is particularly important for Cephalosporium stripe where varieties with highly effective resistance are not available.	Field plots were established in Fall 2015 on the Plant Pathology Farm (eyespot) and Palouse Conservation Field Station (Cephalosporium stripe) to determine the effect of mixtures on each disease. Each plot contains two reistant/tolerant and two susceptible varieties planted separately and in all possible combinations. Plots were inoculated in November and disease severity and yield determined in summer 2016. Data are being analyzed now.	Multiple years of data are needed to reach conclusions, so this work continue each year of the project.	Results from these plots will be presented at field days, variety plot tours and other talks to grower and industry groups, and availble online at the Extension Small Grains Team website.