

## Progress Report

**Project #:** 3682

**Progress Report Year:** 1 of 3

**Title:** Control of Eyespot and Cephalosporium Stripe in Winter Wheat

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**Executive summary:** Variety trials for eyespot and Cephalosporium stripe were conducted in 2018-19 and are in progress for 2019-20. Forty-two new varieties and advanced lines were evaluated for resistance to eyespot and tolerance to Cephalosporium stripe in inoculated field trials. Sixty lines were planted for each trial in September 2019 for evaluation in June 2020. Data from these plots will be used to update disease ratings in the Washington State Crop Improvement Association Seed Buyers Guide and the WSU Extension Small Grains variety selection tool.

Experiments to map disease resistance genes for eyespot in a Madsen population were conducted to determine whether the same genes control resistance to both pathogens. Phenotyping and genotyping were completed; data analysis is in progress now. In collaboration with colleagues in China, we mapped resistance to both species of cereal cyst nematode (CCN) in the same Madsen population and demonstrated that it carries two different genes, one each to *H. avenae* and *H. filipjevi*, both derived from VPM-1, the source of eyespot resistance. That work was published and available to breeders.

Field experiments on the use of variety mixtures for eyespot and Cephalosporium stripe control and spore-trapping of the eyespot fungi to better understand its epidemiology were completed. Data has been summarized, analysis is in progress, and papers being prepared for publication.

**Impact:** Cephalosporium stripe and eyespot continue to be significant yield-limiting diseases for winter wheat production. Nearly all public and private breeding programs in the PNW are addressing these diseases because resistant/tolerant varieties are the most effective way to limit their impact. This project is the only place where all new varieties and advanced breeding lines are evaluated side-by-side for their reaction to eyespot and Cephalosporium stripe. The data we generate are shared with wheat breeders to support variety release and growers at variety testing field tours, online at the WSU Extension Small Grains website, and is used to provide ratings in the WSCIA seed buyer's guide and the WSU Small Grains Variety Selection tool for use by growers in making variety selection decisions.

The gene present in Madsen is the primary source of resistance in all PNW eyespot-resistant varieties and understanding its genetic control will insure it remains effective. We suspect differences in effectiveness among resistant varieties may be the result of minor genes that have not been identified and/or differences in resistance to the two eyespot fungi. Identifying minor genes affecting eyespot resistance and molecular markers for them will allow breeders to develop new varieties with more effective eyespot resistance. Screening wild relatives of wheat for new sources of eyespot resistance is an important long-term goal.

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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:** 7/1/2019  
**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 stripe in field plots	Provide unbiased data on the resistance reactions of advanced selections and new varieties to eyespot and Cephalosporium stripe.	<b>2020:</b> Forty-two winter wheat cultivars and breeding lines were evaluated for their resistance/tolerance to eyespot and Cephalosporium in inoculated field trials in June 2019. Another 60 lines were planted in September for evaluation in 2020.	<b>2020:</b> This was the third year of testing in collaboration with the WSU Variety Testing program and WSU Winter Wheat Breeding. This activity will continue annually.	Results from these plots are presented at field days, variety plot tours, and other talks to grower and industry groups, and available online at the Extension Small Grains Team website. Data are used to update variety ratings in the Washington State Crop Improvement Seed Buyer's Guide, the WSU Extension Small Grains Variety Selection tool, and published online in Plant Disease Management Reports so they are available to the larger wheat research community.
2. Screen wild wheat relatives and other genetic populations to identify and map potential new eyespot resistance genes	Identify potential new eyespot resistance genes for use by breeders to improve effectiveness of resistant varieties.	<b>2020:</b> Conducted two experiments to screen 135 lines from a Cappelle Desprez x Whetstone population for eyespot resistance; one study each with Oy and Oa was completed and data have been summarized. A third experiment was setup in December for the second round of screening. DNA was collected from all lines and submitted for genotyping. We anticipate completing the screening experiments in late spring and then follow with analysis of the data.	<b>2020:</b> We anticipate beginning work on populations of the wheat relative <i>Dasyphyrum villosum</i> in collaboration with Chinese wheat breeders in early summer or fall 2020.	Results of this research will be shared with breeders, presented at field days, variety testing plot tours, and other talks to grower and industry groups. Data also will be published in appropriate scientific journals.
3. Evaluate fungicides currently registered for eyespot control for effectiveness and determine the potential for development of fungicide resistance	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.	<b>2020:</b> Two field trials were planted in September 2019; one for the evaluation of eight seed treatments and another for spring-applied foliar fungicides for eyespot control.	<b>2020:</b> Fungicides will be tested annually depending on interest and support from industry. Work on resistance has not begun.	Results from this research will be presented at field days, variety plot tours, and other talks to grower and industry groups, and available online at the Extension Small Grains Team website. Results also will be published in Plant Disease Management Reports so they are available to the larger small grains pathology community.
Prepare an article for Wheat Life during the three-year project.	Prepare an article for Wheat Life during the three-year project.	<b>2020:</b> Management options for wheat diseases in the Inland PNW published in January Wheat Life	<b>2020:</b> One article published in January	