<h1 style="text-align:center">Progress Report</h1>

Project #:   3675

Progress Report Year: 1 of 3

Title: Enhancing Resistance to Snow Mold Diseases in Winter Wheat

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Executive summary: In fall 2015, field plots were established at three locations in WA and another near Tetonia, ID to test advanced breeding lines for snow mold resistance and agronomic performance. Development of three new doubled-haploid populations was completed using a new source of resistance, PI 173438, and PNW-adapted lines to expand the diversity of resistance genes. These populations were planted in field plots in fall 2016. Advanced winter wheat breeding lines were also planted at these locations for evaluation in spring 2017. Wheat samples for fructan analysis were collected from field and growth chamber experiments, and methods for the analysis were developed. Analysis of the samples is in progress and data analysis will begin in the first half of 2017. Results of these studies will be used to improve growth chamber screening for resistance. Although we don't expect controlled environment testing to replace field testing, it will allow us to make progress on genetic studies throughout the year and eliminate very susceptible lines from field testing.

Impact: During this funding cycle, data analysis and submission of a manuscript on new QTL and molecular markers associated with snow mold resistance and cold hardiness in the Finch x Eltan population was completed.

Development of three genetic populations with a new source of snow mold resistance PNW-adapted lines. These have potential for introduction of a new source of snow mold resistance in the PNW.

Successful completion of these objectives will provide growers with a greater selection of adapted, high-yielding snow mold-resistant varieties and the development cycle for future varieties will be shorter compared to the conventional methods now used. Results generated in this project are communicated to farmers and field consultants at field days, other meetings, and publications such as Wheat Life. Results are communicated to other scientists directly and through publication in appropriate journals.

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Project PI(s): T.D. Murray, A. Carter, D. Skinner, K. Garland-Campbell, J. Marshall
Project initiation date: July 1, 2016
Project year: 1 of 3

Objective	Deliverable	Progress	Timeline	Communication
1. Field test new doubled-haploid populations to identify resistant lines for breeding program, identify new genes and associated molecular markers.	Data on snow mold resistance of genetic populations that will be used to identify new genes and make selections for the breeding program.	Three doubled haploid populations were created in three different backgrounds all using PI173438 as the parent. There are two soft white parents and one hard red parent adapted to the PNW. Populations were planted in Waterville and Mansfield, as well as in Tetonia, ID for snow mold screening. Plots had good stand establishment in the fall, and data will be collected in the spring for snow mold tolerance.	Field testing will be conducted in the spring of 2017 and the spring of 2018. More years of testing may be needed depending on the level of snow mold in each year. The three populations will also need to be genotyped, but because of new developments in genotyping we are waiting to see if new platforms will be developed before genotyping.	Results of this work will be presented at field days, variety plot tours, other grower and industry talks, and on the WSU Wheat and Small Grains website.
2. Field test advanced breeding lines and new varieties to determine their reaction to snow mold diseases.	Provide data on snow mold resistance of advanced selections and new varieties. Expand variety ratings in the seed buyer's guide.	The winter wheat breeding program planted 246 advanced breeding lines for testing in the spring of 2017 under snow mold conditions.	Field plots will be establised in fall 2016 and rated in the spring of 2017 for reaction to snow mold. This will continue each year of the project.	Results of this work was presented at field days, variety plot tours, other grower and industry talks, and on the WSU Wheat and Small Grains website. Data will be used to provide ratings in the seed buyer's guide.
	Prepare an article for Wheat Life during the three-year project summarizing results to date.		An article will be submitted in February 2018.	
3. Measure fructan concentrations in winter wheat crowns of breeding populations and identify genes involved in its production to determine their association with snow mold resistance.	Methods and data that can be used to screen breeding populations efficiently and determine whether fructan accumulation can be used to indirectly select for resistance to snow mold diseases.	Samples were collected in 2016 from both field and growth chamber experiments. Sample preparation has been completed, and are now being run to determine fructan concentrations in the different lines. Data should be ready for analysis in early 2017. These lines have also been screened for cold tolerance and snow mold tolerance in order to correlate results. Two populations are being screened. One looking at different levels of cold and snow mold tolerance between lines, and the other is a set of isolines varying for the VRN alleles.	Multiple years of data will be needed to reach conclusions, so this work will be conducted each year of the project. Growth chamber plants were harvested in 2016 and will continue into 2017. Field collections are ongoing through 2017.	Results of this work will be presented at field days, variety plot tours, and other grower and industry talks. When completed, results will be published in Wheat Life, scientific journals, and the WSU Wheat and Small Grains website.

4. Establish protocols for screening large numbers of breeding lines for snow mold resistance under controlled environment conditions.	A method of screening for snow mold resistance in growth chambers.	Waiting for results from fructan studies to identify critical environmental conditions to idenify resistance.	Growth chamber experiments to measure fructan accumulation will begin in 2016 and continue each year of the project.	Results of this work will be presented at field days, and other grower and industry talks. When completed, results will be published in Wheat Life, scientific journals, and the WSU Wheat and Small Grains website.