

**Washington Grain Commission
Wheat and Barley Research Annual Progress Reports and Final Reports**

Project #: 3672

Progress Report Year: 2 of 3

Title: Graduate student training

Investigator/Cooperators: **AH Carter**, KG Campbell, M Pumphrey, I Burke

Executive summary: The training of new graduate students in plant breeding and related fields ensures the viability and longevity of this discipline. Additionally, projects established to assist in the graduate training can be tailored to have a direct impact on the wheat growers of Washington. The objective of this project is to establish graduate student projects that have direct impact on developing new cultivars for the state of Washington, while simultaneously recruiting and training the best students to be the future plant breeders of the world. Four students have already been recruited with these funds. Austin Case (now a PhD student in Minnesota) identified DNA markers associated with the stripe rust resistance from Coda. These markers are currently being used to introgress resistance into new breeding lines. Shiferaw Gizaw is completing research in both spring and winter wheat on drought tolerance. He has identified spectral readings that can help indirectly select for higher yield potential under drought conditions. Megan Lewien is in her third year of research working on spectral indices for heat tolerance and other selected traits. Research involves both phenotypic and spectral data under greenhouse and field conditions. Caleb Squires is in his third year and is working on screening wheat germplasm and core collections for both resistance and susceptibility to different herbicides. Paul Mihalyov is completing research identifying new genes for stripe and stem rust resistance in wheat. Tara Burke is in her first year and working to develop genetic populations to dissect the genetics underlying specific herbicide resistance traits.

Impact: The number of graduate students interested in plant breeding and cultivar development efforts have been declining in the US over the past decade. Additionally, the number of research projects which are being funded at the federal level are turning away from applied research efforts and more focused on basic research. As a result, the amount of research being conducted directly toward cultivar development is limited. Initiation of research efforts with direct application toward the release of new cultivars ensures productivity, stability, and competitiveness of cultivar development efforts. Students have targeted projects which have direct application toward wheat production in the state. The conclusion of their research allows direct application toward cultivar development efforts through more efficient selection and development of novel traits. As a result of these projects, breeding efforts have been enhanced to select for both biotic and abiotic stress resistance, either through the use of molecular markers or phenotypic screening. Lines in breeding programs are being advanced through the use of these data. Additionally, we have been able to leverage over \$4,000,000 in external grant support through use of these preliminary data. This support is for projects which will directly benefit breeding programs at WSU and the USDA, as well as expedite cultivar development for traits of economic importance in the PNW.

WGC project number: 3672
WGC project title: QTL identification through graduate student training
Project PI(s): AH Carter
Project initiation date: July 1, 2013
Project year: 3 of 3

Objective	Deliverable	Progress	Timeline	Communication
Identify and recruit graduate students and accompanying projects with interest in applied plant breeding	Excellent students trained in applied plant breeding	We have identified and funded six excellent students in the previous years funding. Austin Case (graduated), Shiferaw Gizaw (graduated), Megan Lewien, Caleb Squires, Paul Mihalyov, and Tara Burke. We are in the process of reviewing applications for the 2016 year and upon notice of the successful award, will make an offer.	Student applications are reviewed in January, with offers extended early March.	Students will be introduced to the wheat commission through field days and research reviews
To develop projects which have direct application to the wheat breeding programs to expedite release of superior wheat germplasm	New tools/processes available to plant breeders to more effectively and efficiently breed and release superior wheat varieties	Previous year's funding has resulted in markers for cold tolerance genes, stripe rust resistance, drought resistance, and foot rot resistance. Additionally, students are working on developing herbicide tolerance and susceptibility, as well as identifying phenotypic correlations for heat tolerance using spectral reflectance measurements. Project funding has allowed use to leverage \$4,000,000 in USDA funded support to enhance breeding projects at WSU that are directly impactful to the PNW. The most recent grant will allow us to improve the breeding process by fully incorporating high-throughput phenotyping and genomic selection into multiple breeding programs at the USDA and WSU.	Projects are developed within the first semester the student is at WSU, with focus on projects directly relevant to the breeding programs.	Student projects will be reviewed through field days, research reviews, printed press, and other venues as requested

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