

## Washington Grain Commission

### Wheat and Barley Research Annual Progress Reports and Final Reports

**Project #:** 3019 3676

**Progress Report Year:** 3 of 3 (maximum of 3 year funding cycle)

**Title:** Improving Spring Wheat Varieties for the Pacific Northwest

**Cooperators:** Mike Pumphrey, John Kuehner, Vic DeMacon, Sheri Rynearson, Wycliffe Nyongesa

#### **Executive summary:**

The WSU spring wheat breeding program's elite material and recently released varieties continue to be the top performers in statewide variety trials and for growers. *A new 2-gene Clearfield hard red spring wheat is planned for release in 2019.* Foundation and registered seed of Ryan, Seahawk, Tekoa, Alum, Chet, and Glee spring wheats and JD and Melba spring club wheats was produced and sold in 2018. Each variety has very good to excellent end-use quality, which is a primary goal of our program to help maintain and increase the value of Washington wheat. *WSU soft white spring wheat varieties accounted for 80% of certified soft white spring wheat production acres in Washington in 2018.* Our newest soft white spring wheat varieties, Ryan, Seahawk, Tekoa, and Melba, have broad adaptation, superior all-around disease, grain, and agronomic traits, most desirable end-use quality, and top yield performance. They have been rapidly adopted by seed dealers and growers as seed stocks are multiplied. Glee has been the leading dryland hard red spring wheat variety in the state the past five years, while Chet has been widely adopted in lower rainfall areas and Alum is rapidly increasing in acreage. WSU hard red spring wheat varieties were planted on 28% of the certified hard red spring wheat production acres in Washington in 2018. The consistency, broad adaptation, disease and pest resistances, sound grain traits, most desirable end-use quality, good falling numbers, and overall performance of these varieties reflects the outputs of comprehensive wheat breeding and genetics research effort supported primarily through funding from this project.

#### **Impact:**

The WSU spring wheat breeding program is in a unique position to focus on grower opportunities and challenges, large and small. We identify and develop traits, technology, germplasm, and release varieties to meet the needs of the majority of Washington producers, whether the needs are localized or widespread. We emphasize traits like stable falling numbers, Hessian fly resistance, stripe rust resistance, and aluminum tolerance, and hold the entire industry to a greater standard for yield and yield protection. Our latest releases package excellent yields with superior quality and key yield protection traits. Our newer releases are poised to lead acreages planted in the future due to improved potential profitability for growers, and rapid industry adoption. Public wheat breeding programs at WSU and across the country payback consistently on research dollars invested. With 50% or more of the spring wheat acres in Washington planted to WSU spring wheat varieties, growers continue to realize a substantial return on research dollars invested in this program.

**Outputs and Outcomes:** File attached

WGC project number: 3019 3676

WGC project title: Improving Spring Wheat Varieties for the Pacific Northwest

Project PI(s): Mike Pumphrey

Project initiation date: 2016

Project year: 3 of 3

Objective	Deliverable	Progress	Timeline	Communication
Develop biotic and abiotic stress tolerant, high-yielding, and high-quality hard red, soft white, club, and hard white spring wheat varieties for diverse Washington production environments.	New spring wheat varieties that are superior to existing varieties. This effort includes all four market classes of spring wheat and all precipitation regions in Washington state.	WSU released varieties Seahawk, Glee, Alum, Chet, Tekoa, Melba, and Ryan continued to lead yield trials in their classes in 2018, and have widespread seed availability. Significant positive economic impact for PNW growers is generated by higher-yielding varieties. We had very good test plots across regions in 2018. Good data quality is fundamental to making solid selections. Our 2-gene Clearfield breeding efforts have fully matured, and we plan to release our first hard red spring wheat in 2019. Our attention to stable falling numbers over the past five years has resulted in selection of superior lines for this trait.	Recurring annually	WSU Field days, Private company field days, Workshops/meetings/presentations attended/given by Pumphrey: Western Wheat Workers, WSCIA Annual Meeting, WSCIA Board, WA Grain Commission, Trade tours/international buyer groups.  Annual Wheat Life contributions as requested
Improve PNW spring wheat germplasm to strengthen long-term variety development efforts/genetic gain.	Enhanced germplasm. Consistent genetic gain for many desirable traits.	Multiple stripe rust, aluminum tolerance, Hessian fly, and quality traits were selected in backcross populations for long-term parent building in 2018. A primary focus in 2018 was backcrossing Fusarium head blight resistance into hard red spring wheat germplasm. Extensive crossing blocks for irrigated hard red spring wheat germplasm development were also completed. A large fall-seeded spring wheat trial was established in October 2018 with irrigation. Backcrossing of the AXigen trait for CoAXium wheat production system was initiated in 2018. We are backcrossing into both soft white and hard red spring wheat germplasm.	The payback for this work will fully be realized for many years to come as these lines continue to be crossed into existing breeding lines. We expect this effort to result in introgression of desirable variation for yield, disease resistance, and other agronomic characters.	
Discover/improve/implement scientific techniques and information to enhance current selection methods.	Current projects are development of DNA markers for useful sources of Hessian fly and stripe rust resistance, drought and heat tolerance loci, identification of superior germplasm through association mapping, screening for tolerance to aluminum, development of facultative wheat, and the development of high-throughput field phenomics selection methods.	Several specific trials and locations were again evaluated in 2018 to help long term breeding efforts. Scientific products of our efforts through multiple projects in 2018 include nine publications in high-quality international scientific journals. Information from these research efforts help guide specific germplasm development efforts focused on Hessian fly, stripe rust, genomic selection, high-throughput phenotyping, association mapping, marker-assisted selection, drought tolerance, heat tolerance, yield, test weight, gluten strength, etc.	This work has short, medium, and long term goals. We are already using new DNA markers discovered through this work to improve selection for quality and pest resistance.	