

Washington Grain Commission

Wheat and Barley Research Annual Progress Reports and Final Reports

Project #: 3019 3162

Progress Report Year: 2 of 3 (maximum of 3 year funding cycle)

Title: Improving Spring Wheat Varieties for the Pacific Northwest

Cooperators: Mike Pumphrey, Vadim Jitkov, 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 spring club wheat was released in 2020, Hedge Cl+.* Foundation and registered seed of hard red spring Net Cl+ was produced and sold in 2020. 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 92% of certified soft white spring wheat production acres in Washington in 2020.* 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 Ryan was by far the leading variety in the state with over 160,000 acres planted. Glee, Chet, and Alum are leading dryland hard red spring wheat varieties, and Net CL+ has been rapidly adopted. *WSU spring wheat varieties collectively were planted on 70% of the certified spring wheat production acres in Washington in 2020.* 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, yield protection, and end-use quality. Our latest releases package excellent yields with superior quality and key yield protection traits. Public wheat breeding programs at WSU and across the country consistently pay back on research dollars invested. *With 70% or more of the spring wheat acres in Washington planted to WSU spring wheat varieties in 2019, growers continue to realize a substantial return on research dollars invested in this program.* The yield of our top three released soft white spring wheat varieties (Ryan, Seahawk, Tekoa) averages 107% of the top three varieties from other programs, using 5-year average data from over 60 variety trials in >12" precipitation locations from 2016-2020.

Outputs and Outcomes: File attached

WGC project number: 3019 3162

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

Project PI(s): Mike Pumphrey

Project initiation date: 2019

Project year: 2 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 generated significant positive economic impact for PNW growers in 2020 by our varieties being planted on 70% of spring wheat acres. Five year yield trial data for the top three WSU SWS wheat varieties across all locations >12" precipitation demonstrates that our market-leading varieties produced 107% of the top three varieties from other breeding programs. We had very good test plots across regions in 2020. Good data quality is fundamental to making solid selections. Our 2-gene Clearfield breeding efforts have matured, and we released a new spring club CL+ line in 2020. 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 2020. A primary focus in 2020 was backcrossing new Hessian fly resistance genes into spring wheat germplasm. Extensive crossing blocks for irrigated hard red spring wheat germplasm development were also completed. Two large fall-seeded spring wheat trials were conducted in 2020 with irrigation. Backcrossing of the AXigen trait for CoAXium wheat production system was continued. 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 2020 to help long term breeding efforts. Scientific products of our efforts through multiple projects in 2020 include five 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.	