

Project # 4127-1604

Final Report Year: 3 of 3

Title: EVALUATION OF WHEAT VARIETIES

Researcher: Clark Neely, Variety Testing Program Lead

EXECUTIVE SUMMARY:

The primary goal of the WSU Extension Cereal Variety Testing Program is to provide growers, the agribusiness industry, university researchers, and other interested clientele with comprehensive, objective, and independent information on the adaptation and performance of winter and spring wheat cultivars across the climatic regions of eastern Washington where wheat is grown.

The Variety Testing Program (VTP) has experienced much change during the course of this three year funding cycle. Aaron Esser handed over the program to me in August of 2019 and a new lead technician was hired on in spring of 2020. We have acquired two new plot tractors equipped with GPS and also upgraded to a new 30' boom sprayer that tripled the tank capacity for more efficient spraying and planting. With additional funds from the WGC the program also acquired a new NIR protein analyzer in 2021 that improves speed of processing samples.

The turnaround time for data getting posted following harvest has improved markedly, particularly with winter wheat, so that yield data is generally available within 48 hours of harvest. This data is posted on our website and an email notification is sent out via the 'prelimdata' list serve. In the past year, the number of members on this list has increased 67% to 355. We continue to publish our final technical report each year which can be found on our website (<http://smallgrains.wsu.edu/variety>) and is posted in December. The variety selection tool has continually been updated each year and in spring of 2021 a new mobile app was developed to provide a user-friendly experience on their phone and even off-line access once the app is installed. We began compiling all ratings for each wheat class into a single table in 2020, which is easily accessible on the yield data webpage as individual tables (labelled as 'Variety Characteristics' tables) and is also included in the final report. These are updated annually. Environmental conditions in 2021 led to ideal conditions for both excellent snow mold and emergence ratings and those have since been updated and are available in the technical report and through the variety selection tool.

Due to COVID-19, in-person field days were cancelled in 2020. In response, the VTP led the effort to organize, record and post virtual field days as our primary Extension outreach that year. A total of four field day playlists were created for each precipitation zone with a total of 47 separate video clips/topics uploaded on to the WSU CAHNRS YouTube Channel. To date, these recordings have garnered 1,811 views. In 2021, we held 16 in-person field days with 334 in total

attendance. We continued the virtual field days as well producing four field day playlists which have received 169 views.

In response to the growing practice of planting hard red spring wheat in the fall in the basin, the VTP began implementing a fall-planted HRS trial in fall 2020 for our two irrigated sites. In fall 2021, we also added a dryland site as well at Dayton due to grower interest in the area. To compliment the yield data, seed of these entries were given to Dr. Kim Campbell's program to screen for cold hardiness. Previously, spring varieties were not screened for this trait. We also plan to work with Dr. Mike Pumphrey's group to screen winter wheat entries for aluminum tolerance alongside his spring wheat aluminum screening nursery. In 2020, we worked with Dr. Pumphrey and University of Idaho to begin screening winter wheat varieties for Hessian fly resistance, which was not previously done.

IMPACT:

The economic value (impact) of the WSU VTP is measured by providing information to growers and seed industry personnel leading to variety selections that maximize profitability and minimize risk. Choosing an appropriate wheat variety to plant is one of the easiest ways that a grower can increase production and decrease costs (through decreased inputs). Between 2.2 and 2.3 million acres of wheat were harvested each year between 2019 and 2021. When comparing the yield from the top five varieties in each trial and comparing their average yield to the trial average, there is approximately a 6.6 bu/a yield advantage. When multiplied across acres harvested and using an average sales price of \$7.24/bu, the VTP had the potential to generate an additional \$308 million dollars over the past three years as shown in the table below. The VTP strives to disseminate information to growers as widely as possible. Both the variety testing website and the variety selection tool average over 8,000 page views each on an annual basis. Another 1,000+ contacts are made through field days and grower meetings each year. While yield is important there are multiple traits that growers look for in a variety, which vary in importance from region to region. While more difficult to assess economic impact, traits such as falling numbers, winter survival, rust resistance, hessian fly resistance, aluminum tolerance, emergence, and snow mold resistance unquestionable have the potential to greatly improve yield or decrease inputs for some growers and in certain environments. The data generated by the Western Wheat Quality Lab using samples from the VTP helps also ensure released varieties maintain superior grain quality, thereby maintaining overseas markets for PNW wheat which supports prices. An additional impact of the VTP comes through the evaluation of breeding lines, providing valuable information to aid breeders in variety release decisions, leading to new and improved wheat varieties available to growers in Washington.

Year	Harvested Wheat Acres	Average Yield Gain for Top Five Varieties in Trials	Averaged Price of Wheat	Additional Income Generated
	# acres	bu/acre	\$/bu	\$
2019	2,215,000	7.2	\$5.53	\$88,192,440
2020	2,295,000	7.0	\$5.70	\$91,570,500
2021	2,230,000	5.5	\$10.49	\$128,659,850
Total	2,246,667	6.6	\$7.24	\$308,422,790

WGC project number: 4127-1604				
WGC project title: Evaluation of Wheat Varieties				
Project PI(s): Clark Neely				
Project initiation date: 07-01-2019				
Project year (X of 3-yr cycle): 3 of 3				
Objective	Deliverable	Progress	Timeline	Communication
1. Conduct representative and objective wheat variety field trial evaluations at locations that represent major production areas of Washington.	a) 24 soft winter wheat trials; 48-60 entries/trial	i.) 2019, 2020 and 2021 trials completed & data finalized ii.) 2022 winter trials planted iii.) Collaborative trials are continuing with OSU at Eureka and Walla Walla.	Each year trials are planted in the spring or fall. Plots are maintained throughout the year and heading dates/plant heights are collected before harvest. Data results are available to growers at the end of the harvest season, which runs from mid-late July through September.	Results from the variety trials are communicated via Extension programming and are detailed under Objective #4.
	b) 16 hard winter wheat trials: 30-36 entries/trial	i.) 2019, 2020 and 2021 trials completed & data finalized ii.) 2022 winter trials planted iii.) Collaborative trials are continuing with OSU at Eureka and Walla Walla.		
	c) 18 soft spring wheat trials; 24 entries/trial	i.) 2019, 2020 and 2021 trials completed & data finalized		
	d) 18 hard spring wheat trials; 18 entries/trial	.) 2019, 2020 and 2021 trials completed & data finalized		
	e) 3 hard red spring fall-planted trials; 18 entries/trial	i.) First trials implemented in 2021; completed ii.) 2022 fall-planted HRS trials planted		
2. Trial entries include: currently grown varieties and advanced breeding lines from major public and private breeding programs in the region.	All widely grown, commercially available varieties and promising experimental lines are included in trials.	i.) 2022 winter trials 46% public, 54% private. Every major breeding program in the PNW is actively participating in the VTP. ii.) 2019, 2020, 2021, and 2022 winter entries, locations, and maps have all been posted on the variety testing website.	i.) Deadline for winter entry requests is August 9 and seed is due by August 13. ii.) Deadline for spring entry requests are February 1 and seed is due February 12.	i.) Send out 'call for entry' letter by mid-July requesting winter entries. ii.) Send out 'call for entry' letter by mid-January requesting spring entries. iii.) Maintain positive relationship with breeding programs to ensure future participation.
3. Provide access to variety trials and harvested grain enabling other researchers and supporting projects to gather information from the trials.	Participation and ratings of characteristics from other projects/ programs.	Cooperation with breeders, pathologists, entomologists, quality lab, FGIS, seed dealers, WSCIA, other universities, and Extension. Data gathered and summarized to produce ratings for falling numbers susceptibility, end use quality, stripe rust resistance, hessian fly resistance, snow mold resistance, strawbreaker foot rot resistance, cephalosporium stripe resistance, aluminum tolerance, emergence, and winter survival. Ratings all finalized and compiled into the final technical report and the variety selection tool.	Ongoing cooperation and collaboration that fit with timelines and other listed objectives.	Quality results in preferred variety pamphlet, falling number results presented by corresponding project, disease ratings presented in seed buyers guide, VTP data used for variety release and PVP applications. All data/ratings included in variety selection tool.
4. Deliver an Extension education program to make the results and interpretation of the variety trials available to growers, the seed industry, and other clientele.	a.) Grower meetings	2019: Participated in Spokane Co. Grower Meeting and PNW Farm Forum 2020: Participated in Adams Co. Grower Meeting; Lincoln Co. Grower Meeting 2021: Participated in VT panel at Tri-state Grower Convention	Will attend meetings when invited.	Attend in person and present results through powerpoint presentation and handouts when appropriate.
	b.) Field Tours	i.) 2020: 4 virtual field days recorded and posted online (1,811 views) ii.) 2021: 16 in-person field days (334 attendance); 4 virtual field days (169 views).	June-July	*List of Field Days provided below; provide paper handouts of data

	ii.) 19 planned for 2022; 2 virtual field days will be filmed and posted online.		
c.) Email List Serv	2019, 2020, and 2021 results delivered; list serve membership increased 67% in 2021	August through November	Email list serve: Data sent to 355 members as it becomes available.
d.) Website	Up to date with 2019, 2020, and 2021 data	August through December	9,950 pageview for 2019 VT data; 8,267 pageviews for 2020 VT data; 6,348 pageview for 2021 VT data
e.) Annual Report	2019, 2020, and 2021 final reports have all been posted online.	December	The annual report is published as a WSU technical report online and in hard copy upon request.
f.) WSCIA Seed Buyers Guides	2019 Guide completed; 2020 Guide not published (decision made by WSCIA) 2021 Guide not published (decision made by WSCIA)	January-February	Seed Buyers Guide published in January-February
g.) Wheat Life	2019: winter VT article completed 2020: spring and winter articles completed 2021: winter and spring VT articles completed 2022: winter VT article to be written in May	Spring VT article: January Winter VT article: May	Articles published in Wheat Life in January and May each year.
h.) Variety Selection Tool (smallgrains.wsu.edu)	Selection tool was updated with new data in 2020 and 2021. Tool to be updated with 2021 data by January 2022. New mobile app developed and released in May 2021 for easier access on mobile devices and off-line.	January 2022	2019: ~6,000 page views 2020: 10,426 page views 2021: 9,406 page views
*Anticipated 2022 in-person Wheat Field Days include: Horse Heaven, Ritzville, Dusty, Connell, Lind, Harrington, Eureka, Walla Walla, Dayton, Moses Lake, Almira, Reardan, Mayview, Anatone, Fairfield, St. John, Lamont, Bickleton, Farmington.			