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

PROJECT #: 30109-3156

Progress report year: 1 of 3

Title: Club wheat Breeding

Researcher(s): **Kimberly Garland Campbell, Arron Carter**
Cooperator: **Mike Pumphrey**

Executive summary:

Pritchett was widely available to farmers as a replacement for Bruehl except in severe snow mold regions. Pritchett club wheat was jointly released in 2016 by USDA-ARS and WSU with improved grain yield, test weight, end use quality, and emergence over Bruehl, and stripe rust resistance, cephalosporium stripe resistance, equal to Bruehl, which it is intended to replace. Castella was increased as foundation seed. It was released jointly by USDA-ARS and WSU in 2017, with improved grain yield, test weight, end use quality and stripe rust resistance over current club cultivars is targeted for the intermediate rainfall area. New entries with better resistance to snow-mold, including one IMI-club, were entered in the WA variety trials in the dry zone. New entries with earlier maturity, excellent standability, excellent club wheat quality and resistance to stripe rust were entered into the WA variety trials in the high rainfall zone. With our collaborators, we evaluated nurseries at 12 locations in Washington, Idaho and Oregon. Evaluation of our elite breeding lines for resistance to low falling number is underway. We discovered that Castella is the only current winter wheat cultivar with resistance to Hessian fly. Pritchett was rated as resistant to soil borne mosaic virus. We evaluated over 2700 breeding lines from around the U.S. for resistance to stripe rust. Because of our work with stripe rust introgression, we have made crosses to several good sources of Hessian fly and wheat virus resistance. We are now increasing in these populations in the greenhouse. We generated 235 doubled haploids. We also evaluated mini-bulk breeding and speed breeding techniques in the greenhouse and discovered that we can save about 20 days off of normal winter wheat generations using these techniques which allows us to advance material through the greenhouse faster and serves as a cost effective alternative to doubled haploids. We advanced 14 populations using this method and plan to increase these efforts in 2020.

Impact

We develop club wheat cultivars with agronomic characteristics that are competitive with soft white wheat cultivars. The integration of genomic selection, speed breeding, doubled haploid breeding, and new methods of analyzing data enables us to continue to be efficient with grower dollars and produce club wheat cultivars that are competitive as well as additional soft wheat germplasm with specific useful traits for other breeders. Better resistance to low falling number will stabilize markets and reduce grower risk. Growers will maximize choice in marketing strategy. New marketing strategies for increased use of club wheat would also be useful although those are outside the scope of this project.

WGC project number: **3019-3156**
WGC project title: **Club wheat breeding**
Project PI(s): **Kimberly Garland-Campbell and Arron Carter**
Project initiation date: **7/1/19**
Project year: **1 of 3**

Objective	Deliverable	Progress	Timeline	Communication
1. Develop agronomically competitive club wheat cultivars targeted to the diversity of rainfall and production zones of the PNW. These cultivars will possess the excellent end use quality characteristic of club wheat. They will also possess excellent resistance to stripe rust. Specific other characteristics will be targeted to individual rainfall regions (see below).	Club cultivar releases	ARSDH08X117-83C was entered into 2019 variety trials but was dropped upon recommendation from the Japanese Flour Millers Assn. Quality Evaluation team. This collaboration was initiated in 2019 and is strengthening our evaluations to meet current market demand. ARS09X492-6C was also entered into the 2019 Variety testing trials and was competitive enough to be re-entered into the 2020 trials.	June 2019-June 2022. Cutlivar releases are targeted as one every three years per rainfall zone.	Presentation at grower meetings, Wheat commission meetings, field days, plot tours, Wheat Life and Research Review. K. Garland-Campbell attended Field plot tours and Field days in Pendleton OR and Fairfield, Harrington, Lind, Mayview, Reardan, St. Andrews and St John WA in 2019.
A. Develop club breeding lines and cultivars for the <15 inch rainfall zone with improved resistance to snow mold and fusarium crown rot, improved emergence and winter survival.	Club cultivar releases and breedling lines entered into Western Regional and state extension trials.	Pritchett was planted on 10,000 acres in 2019. ARS Castella was increased as Foundation seed. New entries into the dry trials are ARSX12015-68CBW (X010746-5C/BRUNEAU) and WA 8317 (Sww13657-b-4-1-1T-3). WA 8317 is an Imi-club.	Sept 2016-June 2019.	Presentation at grower meetings, Wheat commission meetings, field days, plot tours, Wheat Life and Research Review.
B. Develop club breeding lines and cultivars for the >15 inch rainfall zone with improved resistance to eyespot, cephalosporium stripe, aluminum toxicity, and cereal cyst nematodes.	Club cultivar releases and breedling lines entered into Western Regional and state extension trials.	New entries into the high rainfall WA Variety trials in 2020 include ARS09X492-6CBW (ARSC96059-2/IL01-11934//ARSC96059-2-0-6) and ARSX12016-45CBW (X010746-5C/Bitterroot).	Sept 2016-June 2019.	Presentation at grower meetings, Wheat commission meetings, field days, plot tours, Wheat Life and Research Review.
C. Release a club breeding lines and cultivars with early spring green up, targeted to SE Washington.	Club cultivar releases and breedling lines entered into Western Regional and state extension trials.	Both ARS09X492-6CBW and ARS12016-45CBW are earlier than current clubs.	Sept 2016-June 2019. Our next club wheat release after Pritchett will be targeted to this growing environment	Presentation at grower meetings, Wheat commission meetings, field days, plot tours, Wheat Life and Research Review.
Objective 2. Release germplasm and cultivars with the excellent end use quality characteristic of club wheat and with resistance to preharvest sprouting and late maturity alpha amylase (LMA)	Club wheat Breeding lines with stable falling numbers above 300 in all but extreme environments.	We have been collaborating with C. Steber to evaluate breeding lines and develop molecular markers to aid selection for resistance to low falling numbers.	Sept 2016-June 2019.	Presentation at grower meetings, Wheat commission meetings, field days, plot tours, Wheat Life and Research Review. Presentation at the 2020 Falling Numbers Wokshop Jan 28-29, 2020.