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Project ID: FY20-SP-007 **ARS Agreement #:** *New*

Research Category: VDHR-SPR **Duration of Award:** 1 Year

Project Title: Developing FHB Resistant Wheat Cultivars for Idaho and the Western US

PROJECT 1 ABSTRACT

(1 Page Limit)

FHB has generated both national and international concern and has created substantial issues in the irrigated and high-rainfall spring wheat production areas in Idaho, Montana, and Washington due to increased corn production, reduced tillage and the changing climate. Currently, most grown spring wheat cultivars are susceptible to FHB and often produce high levels of the toxin, Deoxynivalenol (DON). Developing FHB resistant wheat cultivars will reduce or eliminate costs of using fungicides for disease control and will help growers and industry reduce yield and quality losses when an epidemic occurs. Using the known FHB resistance source, 'Sumai 3', and its related sources, several cultivars such as 'Alsen' (2000), 'ND2710' (2004), 'Glenn' (2005), and 'Rollag' (2015) were released. These released cultivars, the sequenced wheat genome, and the cloned *Fhb1* gene provided great resources that enabled us to develop adapted FHB-resistant spring wheat cultivars in the Pacific Northwest (PNW) spring wheat regions.

Through extensive screening of FHB resistance in elite lines, we released two FHB tolerant cultivars 'UI Stone' (2012) and 'UI Cookie' (2020) with native resistance. Using the resistance cultivar 'Alsen', we developed a hard red spring wheat elite line, 'IDO1805S', with a high level of FHB resistance. We also successfully integrated *Fhb1* and *Fhb3* genes from the Chinese resistance sources 'W14', 'Ning 9016', and 'Futai 8944' into adapted backgrounds with native resistance (UI Stone and UI Cookie) and developed eight soft white spring (F8) and four hard red (F8) experimental lines that have *Fhb1*. The objectives of the proposed study are: 1) To release 'IDO1805S' and make production of 'UI Cookie'; 2) To stack *Fhb1*, *Fhb2*, and *Fhb3* genes with native resistance into adapted elite line backgrounds using a combination of traditional breeding, molecular marker assisted selection, and wheat by maize doubled haploid methods; 3) To assess FHB resistance in FHB nurseries in Aberdeen, ID, and in Pullman, WA in collaboration with Dr. Deven See, 4) To use the unknown resistance gene from synthetic wheat in collaboration with Dr. Steven Xu at the USDA-ARS facility at Fargo, ND, 5) To train an under-graduate student on FHB research.

This project aligns well with the CP's research priorities: 1) Increase efficiency of coordinated project breeding programs to develop and release FHB resistant varieties; 2) Evaluate and implement new breeding technologies and germplasm to further enhance short term and long-term improvement of FHB resistance and to efficiently introgress effective resistance genes into breeding germplasm.