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**ARS Agreement #:** 59-0206-0-178

**Research Category:** BAR-CP

**Duration of Award:** 1 Year

**Project Title:** Breed Scab Resistant and Low DON Winter Barley Varieties for the Great Plains.

### PROJECT 1 ABSTRACT

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Our goal is to develop the most winter hardy barley cultivars that are resistant to Fusarium head blight and that accumulate reduced levels of DON following infection. Specifically we will address Objectives 3, 4, 9, and 10 of the Barley-CP. Our plan is to make crosses among spring and winter barley lines with minor and major genes for FHB resistance and low DON accumulation, integrate improved FHB phenotyping by adding winter barley to our mist nursery while also collaborating with Eastern Wheat Scab researchers (part of another proposal). We will use our winterhardiness selection nurseries to select for the most tolerant winter barley lines in the USA and freely share our germplasm. We intend to expand our ability to screen/select lines through molecular markers and genome wide association studies which will lead to genomic selection strategies. Historically, in years of severe scab epidemics, even the more tolerant/resistant lines will need fungicide application (especially for malting and feed barley), so we intend to expand our fungicide trials to determine the level of protection that fungicides can provide in our conditions. This is a long-term project, so to begin, we will make 20 to 25 crosses specifically for enhanced FHB resistance using the best available winter or spring barley FHB tolerant lines to our elite winter-hardy lines. The F<sub>1</sub>s will be increased at Yuma, AZ and planted (F<sub>2</sub>s) the following year at Lincoln (milder winter) and Mead (severe winter killing site) at high seeding rates (expect most progeny will winter kill) and the survivors will be selected. Concurrently, we will add winter barley to our mist nurseries to develop the fundamental understanding of FHB resistance in our materials which will be also tested in the eastern USA for replicated testing. We will also subject our elite trial to two fungicide treatments (sprayed and non-sprayed) to determine how fungicides can reduce FHB and DON. Furthermore, we will work with the genotyping labs to begin genomic selection, marker assisted selection, and provide marker data on our shared germplasm to other breeders. These efforts will lay the foundation for an integrated best management strategy for the Great Plains. All of this research will be communicated to our growers, maltsters, brewers, and consumers through our extension/outreach efforts using field days, conferences, print, radio, and social media which will allow growers to choose the best cultivars and apply the best fungicides to reduce DON