

FY16 USWBSI PROJECT ABSTRACT

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Project ID: FY16-BA-001

ARS Agreement #: 59-0206-4-032

Research Category: BAR-CP

Duration of Award: 1 Year

Project Title: Variety Development and Mapping Resistance to FHB and DON in Winter Barley.

PROJECT 1 ABSTRACT

(1 Page Limit)

Fusarium head blight (FHB) epidemics were widespread in Virginia in 1998 and 2013, and much of the crop was devastated in 2003 and 2009 in Virginia and the southeastern U.S. Because of the limited level of FHB resistance in currently grown barley cultivars, there is a need for new cultivars with improved FHB resistance and lower deoxynivalenol (DON) toxin accumulation. There has been renewed interest in high quality feed barley in both domestic and export markets and new demands for locally grown malt barley from the craft brewing industry, which is expected to increase by 50% over the next five years. In order to supply these industries with quality raw materials, there is a pressing need for germplasm with genes that confer resistance to FHB in barley, where there are relatively few natural sources of FHB resistance.

Each year, winter barley entries in Virginia's state variety trial are evaluated for resistance to FHB and DON in an inoculated and mist irrigated scab nursery. Data from these tests are reported to producers in extension publications and online. Each year, single and top crosses including superior hulled, hullless, and malting barley parents will be made to parents having FHB resistance. Molecular markers previously identified in known resistance sources will be used to screen parents and progeny and to enrich breeding populations. FHB breeding populations in the F₂ and higher generations are evaluated each year in a scab nursery. Heads selected from F₄ and higher generation populations will be evaluated in headrow nurseries to identify desirable FHB resistant pure lines. Superior lines will be evaluated and advanced subsequently in replicated preliminary, advance, state, and regional yield trials as well as in scab nursery tests prior to release.

Barley mapping populations (Eve/Doyce and Eve/VA07H-35WS) each consisting of about 300 recombinant inbred lines (RILs) were evaluated in scab nurseries in KY, NC, VA, and China in 2014-15 season. A second year of regional (KY, NC, and VA) evaluation of the Eve mapping populations will be conducted in 2015-16 season. A mapping population (Nomini/Thoroughbred) consisting of about 200 RILs will be evaluated in scab nurseries in KY, NC, and VA in 2016 and 2017. The mapping populations will be screen with DNA markers in collaboration with USDA-ARS genotyping lab at Fargo, ND. We will identify, validate and develop diagnostic DNA markers for the major scab resistance genes for each resistance source (hullless barley cultivar Eve and hulled barley cultivar Nomini).

To accelerate development of FHB resistant winter barley varieties, 190 or more doubled haploid (DH) lines will be developed from a cross between winter feed barley cultivar Nomini and winter malt barley cultivar Violetta. While the primary goal of this research is to develop superior varieties, the DH population also will be characterized using DNA markers and evaluated for reaction to FHB to validate results obtained from the Nomini/Thoroughbred mapping population.