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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 DON 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.

Winter barley entries in Virginia's state variety, preliminary, and winter malt barley trials as well as winter barley breeding lines from cooperating programs e.g. USDA-ARS Aberdeen, ID and Oregon State will be evaluated for resistance to FHB and DON in an inoculated and mist irrigated scab nursery at Mt. Holly, VA. Data from these tests will be shared with cooperators and reported to producers in extension publications and online. Each year, single and top crosses including superior hulled, hulless, and malting barley parents will be made to parents having FHB resistance. Molecular markers previously identified in known resistance sources will be used to haplotype 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 trials as well as in FHB nursery tests prior to release.

Mapping populations (Eve/Doyce and Eve/VA07H-35WS) each consisting of 180 RILs were evaluated in scab nurseries in KY, NC, VA, and China in the 2014-15 season and in KY, NC, and VA in the 2015-16 season. A mapping population (Thoroughbred/Nomini) consisting of about 200 RILs will be evaluated in scab nurseries in KY, NC, and VA in 2017 and 2018. Genotyping (9K SNP) of the mapping populations will be done in collaboration with USDA-ARS genotyping lab at Fargo, ND. We will identify, validate and develop diagnostic markers for the major scab resistance QTL for each resistance source (hulless cultivar Eve and hulled cultivar Nomini).

To accelerate development of FHB resistant winter barley varieties, 113 doubled haploid lines have been 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 genotyped and evaluated for reaction to Fusarium head blight to validate results obtained from the Thoroughbred/Nomini mapping population.