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**Project ID: FY16-BA-011**

**ARS Agreement #: 59-0206-4-020**

**Research Category: BAR-CP**

**Duration of Award: 1 Year**

**Project Title: Developing Malting Barley Varieties with Enhanced FHB Resistance and Lower DON.**

### **PROJECT 1 ABSTRACT**

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There is a need for new varieties that are agronomically competitive, have acceptable malting quality, improved resistance to FHB, and lower DON. The levels of resistance have improved steadily in advanced breeding lines in our program and the variety Quest with lower DON is available to growers. However, higher levels of resistance in high yielding lines are needed to reduce the overall risk of FHB to barley in the U.S. Increased need by industry for two-rowed barley will require additional breeding effort. Breeding to enhance resistance to FHB has resulted in steady progress. Many current breeding lines in our program exhibit modest levels of resistance ~50 % (or less) levels of DON compared to Robust. These lines trace back to multiple exotic sources of resistance and crossing among them should provide continued improvement in disease resistance. We have recently adopted genomic selection to select lines in early generations (F2, F3) based on predictions for DON, yield and some quality parameters. Initial indications of success have encouraged us to expand this approach to our two-row breeding programs. We currently have four breeding programs: spring six-row, spring two-row, winter six-row and winter two-row. We will make ~ 100 crosses for spring barley in our fall greenhouse and ~ 50 crosses for winter barley in our winter greenhouse. We will advance lines by single seed decent to the F3 when we will genotype lines, use genomic selection to make predictions on multiple traits, and select lines that will be crossed as parents and advanced to yield trials. For each breeding program we will genotype ~ 1500 F3 plants. The specifics of our GS approaches will be informed by our past and ongoing work described in our companion GS proposal. Selected lines for advancement (~200 for each of the four breeding programs) will be increased either locally or in a counter-season nursery. In the first year of field evaluation all lines will be entered into yield trials at 3 locations and FHB nurseries at 2 locations. Approximately 30 lines from each program will be advanced to 2nd year trials at five locations. Third year entries will be repeated again at five locations and also possibly entered into region trials (Mississippi Valley Nursery, Winter Malting Barley Trial) and American Malting Barley (AMBA) Pilot Malting Evaluations. Lines performing well in pilot testing will be considered for plant scale brewing evaluations and eventual release.