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**ARS Agreement #: New Agreement (Expiring Agreement # 59-0206-9-072)**

**Research Category**: **BAR-CP**

**Duration of Award: 1 Year**

**Project Title: Developing Six-rowed Malting Barley Varieties with FHB Resistance and Low DON.**

## PROJECT 1 ABSTRACT

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Fusarium Head Blight (FHB) or scab, caused by the fungus *Fusarium graminearum*, is the major factor limiting barley production in the Midwestern United States. The overall goal of this project is to develop malting barley varieties with enhanced resistance to FHB and lower concentration of the mycotoxin deoxynivalenol (DON). To accomplish this goal, we propose a comprehensive FHB breeding effort utilizing greenhouse for crossing and single-seed advance, extensive field trials for FHB evaluation, various uses of markers to improve selection, regional yield and quality testing, and collaborative regional nurseries to evaluate elite breeding lines. Thus, our specific objectives for the FY14 funding period are to 1) Develop breeding populations segregating for FHB resistance; 2) Evaluate breeding lines in replicated field disease nurseries. Field disease trials will be conducted at two locations in Minnesota that utilize overhead mist irrigation and inoculum applied as either grain spawn or as a suspension of conidia with backpack sprayers. We have recently shifted our early generation screening for FHB resistance from replicated field trials to genomic selection (see project Genomic Selection for FHB Resistance in Midwest Barley). In addition, we phenotype selected sets of lines to continue to improve our genomic selection prediction model. The most promising lines, based on field evaluation are harvested and the grain sent for DON analysis. Most of our parent selection is done using genomic selection to reduce our breeding cycle to one year. To continue to evaluate new sources of resistance, we make a limited number of crosses and evaluate populations at early generations to assess segregation for resistance, determine the genetic architecture of resistance, and move selected resistant progeny in to our crossing block and simultaneously into our GS model training set. Historically our program has focused on spring six-row barley. In response to interest by growers and the malting and brewing industries, we have recently expanded to include both winter and spring as well as six-row and two-row barley. Published studies have shown that two-row barley has in general lower FHB and DON levels. In addition, production of winter barley results in an earlier harvest and thus may reduce the risk of FHB. Therefor development of winter and two-row varieties will provide greater options to producers that should minimize the risk of disease and result in barley grain production with lower DON. All together, these research activities should contribute directly to the development of FHB resistant barley varieties that can become components of an integrated strategy to minimize economic losses due to FHB.