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Project Title: Evaluation and Genetic Characterization of *Hordeum* Germplasm for Resistance to FHB

PROJECT 1 ABSTRACT

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Fusarium head blight (FHB) has devastated the once-thriving malting barley industry in the Upper Midwest and is now threatening other production areas in the west and northeast. Our overall goal is to reduce the losses caused by FHB, especially quality discounts due to the accumulation of mycotoxins such as deoxynivalenol (DON). In conjunction with chemical and cultural management strategies, this can be best achieved by identifying and incorporating into barley cultivars genes that confer resistance to FHB and the accumulation of mycotoxins.

Our specific objectives for this proposal are to: 1) complete analyses to determine the number, effect, and chromosomal position of FHB resistance loci in the PI 350725/Quest populations using the advanced backcross QTL method, 2) evaluate new *Hordeum* accessions not previously tested for FHB reaction with emphasis on two-rowed types, 3) conduct rigorous multi-location, multi-replicate evaluation trials of the 150 most resistant *Hordeum* accessions for resistance to FHB and DON accumulation; and 4) provide adapted FHB-resistant parental materials to barley improvement programs.

PI 350725 is a two-rowed accession from the Tirol in Austria that has exhibited consistently low levels of FHB and DON accumulation. An advanced backcross population was developed between PI 350725 and the moderately resistant Minnesota cultivar Quest to map QTL underlying resistance to FHB and DON accumulation. Many barley accessions have been reported to carry moderate resistance to FHB; however, no study has been advanced to test all of these select accessions in head to head comparisons. For this objective, we will obtain rigorous multi-location, multi-replicate data on ~150 select *Hordeum* accessions for FHB severity and DON accumulation in order to select the very best ones for genetic studies and breeding. Although extensive FHB evaluations of *Hordeum* germplasm have been completed over the past 18 years, there still remains untested landrace accessions. For this objective, we will evaluate up to approximately 650 new barley landraces for resistance to FHB.

The proposed research will be accomplished within the next two seasons of 2020 and 2021. Key outcomes from this research will be the identification of novel FHB resistance QTL; advanced breeding lines with enhanced resistance; and also new sources of resistance in barley. Use of this knowledge and germplasm in breeding will help fulfill the USWBSI's primary goal to enhance food safety and supply by reducing the impact of FHB on barley.