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Project Title: Coordinated Fungal Biomass Measurements of FHB in Barley and Microbial Fingerprinting

PROJECT 1 ABSTRACT

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Overall Project Goals: To further determine the usefulness of *Fusarium* biomass measurements for breeding purposes and determine the level of *Fusarium* biomass and DON 3 days post heading compared to harvested grain. We will collect barley samples from the North American Barley Scab Evaluation Nursery (NABSEN) prior to DON analysis, grind samples under a unified protocol for DNA extraction and DON analysis. DNA extracted will be analyzed with qPCR for levels of *Fusarium* biomass and saved in a DNA library for microbial fingerprinting with high-throughput genomic sequencing for later use. Approximately 4,000 samples will be tested for *Fusarium* biomass from NABSEN and material from other barley nurseries including those from NABSEN, PIs: Baldwin, Smith, and Esvelt Klos with the following objectives:

Objective 1: *Fusarium* biomass measurements in harvested seeds in the NABSEN, Aberdeen spring barley training population, and hulless barley population. Seeds will be sent to our program for grinding, DNA extraction, and *Fusarium* biomass measurements before being sent to the DON testing laboratories.

Hypothesis: Breeding for FHB resistance and DON accumulation will be enhanced with the addition of *Fusarium* biomass data. **Determination** – If a stronger signal or novel genotypic selection is not achieved or if barley breeders do not utilize *Fusarium* biomass in their selection decisions then the hypothesis is nullified.

Objective 2: Measure *Fusarium* biomass and DON from the Aberdeen Spring Training Population grown in two FHB mist nurseries 3 weeks post heading. The *Fusarium* biomass and DON measurements will be compared to the harvested grain *Fusarium* biomass measurements in objective 1.

Hypothesis: *Fusarium* biomass and/or DON taken at 3 weeks post heading is a predictor of *Fusarium* biomass and DON at harvest. **Determination** – If the measurement of *Fusarium* biomass and DON at 3 weeks post heading has no predictive capacity for *Fusarium* biomass and DON at harvest then the hypothesis is nullified.

Statement of Mutual Interest: This is a unique study in USWBSI that targets the usefulness of *Fusarium* biomass measurements for enhancing breeding selection and for gaining insight into the relationship between head blight and DON. The relationship of *Fusarium* biomass to infection and DON in the field is not well understood. This study will determine if *Fusarium* biomass measurements positively influence genotypic analysis and selection decisions by providing a more complete picture of the Fusarium head blight resistance in barley.