

PI: Mohsen Mohammadi

PI's E-mail: mohamm20@purdue.edu

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Project Title: FHB Mining: From Genebank to Growers Fields

PROJECT 3 ABSTRACT

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Fusarium head blight (FHB) is the most devastating disease of wheat and barley in the United states mainly caused by a fungal pathogen *Fusarium graminearum* Schwabe [telemorph: *Gibberella zeae* Schw. (Petch)]. The epidemic outbreak of the disease after 1993 cause severe economic loss, approximately ~\$7 billion lost. The value of the production is lost due to yield reduction, quality loss, mycotoxin contamination. The soft red winter wheat region in the US is also prone to the disease and experiences production loss and deterioration of quality. There are several ways to control the disease including crop rotation, application of fungicides, and use of the resistant cultivars.

The use of resistant varieties is environmentally friendly and the most economical way to manage the disease. However, breeding resistant varieties to any diseases requires the availability of resistance and effective genes in the breeding nurseries. To date, the sources of resistance can be attributed to only few plant introduction e.g., Sumai 3 and native germplasm e.g., Truman, Ernie and Freedom. These handful of sources of variations are being used by the soft red winter wheat breeding programs to develop varieties which contains most of these sources using classical breeding or genomic selection. The genetic gain and its sustainability depends on maintenance of genetic diversity. However, breeding for pyramiding of favorable alleles leads to the loss of genetic diversity, which then results in diminishing genetic gains.

From Genebank to Growers Fields is a research pipeline that makes use of the existing wealth of genetic resources at the US National Small Grains Collection. The objectives of this project to source, evaluate, and utilize sources of resistance to *Fusarium* head blight disease, and possibly grain yield and end-use quality in breeding crosses and produce high-yielding and *Fusarium* head blight resistance varieties. This project is long term. The first two years of this project can be envisioned by sourcing, field testing, and FHB testing of selected worldwide (mainly Europe) winter wheat germplasm in the Agronomy Center for Research and Education (ACRE) in West Lafayette, IN. In a later stage, a smaller set of genetic resources will be tested in multiple locations. Other breeding programs have expressed their interest in evaluating the germplasm in later stages. Other breeders in our region with specific knowledge of European germplasm has provided useful suggestions. This project will use advice and mentorship from Dr. Harold Bockelman in USDA genebank, Aberdeen, ID. The budget requested in this proposal is intended to offset the costs of stipend and tuition remission fee for a new MSc student and for duration of half a year. The PI aims to cover the other half via teaching assistantship opportunities in the department.