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Project ID: FY14-GI-009

ARS Agreement #: New

Research Category: GDER

Duration of Award: 1 Year

Project Title: Cloning and Validation of the FHB1 QTL from Sumai3 for Resistance to Wheat Scab.

PROJECT 1 ABSTRACT

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• Overall project goals:

The overall goal of the proposed research is to clone the *Fhb1* QTL from Sumai 3, which is the most consistently reported source of Type 2 resistance to the devastating Fusarium Head Blight (FHB) disease of wheat. Subsequently validation of the cloned QTL will be done using reverse genetics approaches. Long term applications of the work will be exploring the molecular mechanism responsible for resistance of this QTL and use of the findings to both wheat and barley for incorporating resistance through transgenic and other breeding approaches.

• Project Objectives and Expected Outcomes:

1. The contiguous sequencing of *Fhb1* region of Sumai3 using Sumai3 BAC library is the first objective. We have obtained ~300 kb of sequence but there are some gaps (>100 kb) which still need to be filled. BAC screening will be done and selected BACs will be sequenced using NGS techniques. The sequences will be annotated for putative candidate genes followed by their validation.
2. From the sequenced portion, we have identified three putative candidates based on expression profiling and validation of the promising genes will be done using approaches of reverse genetics using TILLING and RNAi. Additional putative genes which may be detected in the gap region, will also be analyzed using the same methodology.
3. Association mapping across a panel of several Chinese Landraces with *Fhb1* will be done to find additional alleles, gene features, and conserved domains that may play a role in resistance to FHB.
4. Additional validation experiments will be done using a GFP strain of *Fusarium graminearum* on R-NIL and S-NILs and TILLING knock out mutants to investigate the mechanism of host-parasite interaction in FHB, about which not much is known till date.

• Plans to accomplish project goal(s) within proposed period:

The proposed experiments and studies are planned to be completed within 2 years (May 2014-Apr 2016).

• Relevance of the Project to the USWBSI goals:

Fhb1 is the most important source of Type 2 resistance against scab and consequently, lowered DON accumulation in wheat. Cloning of *Fhb1* will be pivotal in developing strategies to rapidly identify and incorporate sequences conferring resistance to FHB. Association studies for the candidate(s) may identify additional alleles for resistance, which could be used in diverse backgrounds using breeding strategies. Using transgenic approaches even barley cultivars can use the cloned gene. Investigation of the host-parasite interaction using fluorescent strain of *Fusarium graminearum* will be imperative in understanding the mechanism of action conferred by *Fhb1*.