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We have developed a rapid and versatile assay system for genes that confer resistance to DON and FHB. This system is based on the recombinogenic plant *Physcomitrella patens* and allows for early functional assessment of genes that confer resistance to DON and FHB infection. We will use the *Physcomitrella* rapid assay system to characterize genes that confer resistance to FHB. Genes effective against FHB will be put into the pipeline for deployment in wheat and barley.

Specific goals, approaches and expected outcomes of this project:

1. Assay wheat homologs of nucleases and oxidative stress genes for efficacy against FHB. Transgenic lines expressing these genes will be constructed and scored for resistance to FHB. This component will provide a set of functionally validated FHB resistance genes suitable for introduction into wheat.
2. Characterize the mechanism of FHB resistance in transgenic plants. Transgenic plants expressing FHB resistance will be scored for altered sensitivity to DON and for the presence of inherent anti-*Fusarium* activity. This component will provide an understanding of the molecular basis for transgene-mediated FHB resistance.
3. Characterize the molecular genetic basis of induced immunity to FHB. We will create gene knockout plants to define regulatory pathways and target genes associated with induced immunity to FHB. This component will functionally define the molecular components responsible for induced immunity against FHB. These genes represent a potentially rich source of novel genes that are effective against FHB.

Relevance of the project to the goals of the US wheat and Barley Scab initiative. This project fulfils the goals of the Gene Discovery and Engineering Resistance (GDER) research area (RA) to identify “candidate genes for resistance from wheat, barley and other plants.” The use of the *Physcomitrella* assay system fulfills the criterion of the GDER to support the use of non-cereal systems “for the purpose of rapidly screening potential anti-*Fusarium* genes.” The use the *Physcomitrella* medium throughput functional assay fulfils the FY08 Research Priority #2, for “increased efficiency of identification of candidate genes for resistance against FHB and reduced DON accumulation” and provides the foundation for fulfilling FY08 Research Priority #3, to “develop effective FHB resistance through transgenic strategies.”