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Project Title: A Rapid Assay System for Trangenes that Confer Resistance to DON and FHB.

PROJECT 1 ABSTRACT

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There is considerable interest in using transgenic approaches to enhance resistance to Fusarium Head Blight (FHB). However, the introduction of transgenes into wheat and barley lines is time consuming and results are not always predictable. The goal of this proposal is to develop a rapid and efficient whole-plant system that allows potentially useful transgenes to be assessed for efficacy against FHB, before they are introduced into wheat or barley.

The whole plant assay system is based on the recombinogenic plant Physcomitrella patens, an emerging model system for functional genomics. We have shown that Physcomitrella can be infected with *Fusarium culmorum* and that the plant is sensitive to the economically important tricothecene deoxnivalenol (DON). Sensitivity to DON is markedly reduced in transgenic plants that (i), overexpress the cell death regulator BI-1; (ii), express the modified ribosomal L3Δ gene, confirming L3 as a target for DON in this system; or (iii) contain gene knockouts for several endogenous pathogen-induced genes.

These results confirm that the response to DON is under genetic control and provide a foundation for developing an assay system for transgenes that confer resistance to DON and, potentially, to FHB as well. The specific goals of this proposal are to (i) establish Physcomitrella as a pathosystem for studying infection by *F. graminearum*, (ii) compare the efficacy of different plant transgenes against FHB in Physcomitrella, (iii) determine the efficacy of wheat and barley genes encoding BI-1 and L3Δ to confer resistance to DON and FHB in Physcomitrella.

Relevance of the project to the goals of the US Wheat and Barley Initiative. Development of a rapid assay system for genes active against FHB will provide other researchers with a tool for assessing transgenes, prior to their introduction into wheat or barley. Since the construction and assessment of transgenic wheat and barley is labor- and resource intensive, an early assay system will help researchers focus on genes with a high chance of success. Although it is outside of the scope of the immediate proposal, this system could be used in the future for medium-to-high throughput screens for novel sources of FHB-resistance genes.