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Research Area: EDM

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Project Title: Monitoring Infection of GFP-marked *Fusarium graminearum* in Transgenic Barley.

PROJECT 2 ABSTRACT

(1 Page Limit)

Fusarium head blight (FHB), predominantly caused by *Fusarium graminearum*, is an important disease of all classes of wheat and barley throughout much of the small grains-producing regions of the world. The more recent scab outbreak in the United States caused huge economic losses, estimated in billions of dollars. There are currently a limited number of wheat and barley genotypes that offer only partial resistance to FHB.

Researchers believe that resistance in cereal crops can be achieved by overexpressing antitoxin and antifungal genes. To date, anti-fungal and anti-toxin genes have been successfully introduced into wheat and barley for protection against FHB and more candidate antifungal proteins or defense response genes are being tested against pathogenic fungi. Various plant responses to pathogen attack include the deposition of mechanical barriers to infection (lignin, papillae, suberin), synthesis of phytoalexins and PR proteins, and the activation of various stress/wound-related pathways, or even a combination of these responses. Temporal expression patterns of PR genes during the early stage infection of *F. graminearum* in wheat have been investigated. However, the response of the pathogen to antitoxin and antifungal genes that are expressed in transgenic host plants during early infection has not been determined. A combination of antitoxin and antifungal genes may offer greater protection and it is important to make *in vivo* observations on the response of the fungus and the mechanism of plant defense. Some transgenic Conlon barley lines expressing antitoxin (Tri101 or PDR5) and/or antifungal (chitinases or tlp) have been developed in our lab and are excellent plant materials for this area of investigation.

This project proposes to use a GFP-expressing *F. graminearum* strain as inoculum in resistant and susceptible barley lines as well as transgenic lines that express antifungal and/or antitoxin genes. A new strain of GFP-expressing *F. graminearum* is currently being developed and can be used to monitor fungal infection and its sub-cellular route into barley tissues. The use of a sensitive and rapid fungal detection method/quantification as a component in the study of host-pathogen interactions will facilitate real-time observations during early- and post-infection events *in vivo*, having no need for additional substrates and time consuming staining. A single spore inoculation technique will be used to pinpoint infection on host tissues for observation of single hyphae development.

This project fits in the epidemiology and disease management research area, specifically, to study the host-pathogen interactions.