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Project Title: Developing and Characterizing Transgenic Wheat for Scab Resistance.

PROJECT 2 ABSTRACT

(1 Page Limit)

Fusarium head blight (FHB, scab), a fungal disease of small grain crops caused by *Fusarium graminearum*, threatens to reduce wheat and barley to economically unviable crops in the United States. Substantial losses are occurring due to reduced grain yield and quality. Major breeding efforts are underway to combat this disease problem. To complement the breeding efforts, my lab is developing transgenic wheat carrying genes with potential to confer resistance to FHB.

We plan to continue to develop novel transgenic wheat and to test these and the transgenic lines that are currently in my lab against FHB. We will develop transgenic plants carrying the following genes: rice *Nhl*, Arabidopsis *NPRI*, wheat lipid transfer protein and wheat glutathione-S-transferase. As these plants are developed, we will test them for resistance to FHB. In previously-funded USWBSI grants, we identified four β -1,3-glucanase, one α -puro-thionin and two *tlp-1* transgenic wheat lines that exhibited statistically-significant reductions in scab severity compared to the non transformed controls in multiple greenhouse screens. These lines will be tested in the field in the summers of 2004 and 2005. We have also developed a large set of transgenic wheat lines carrying chitinase, RIP, chitinase/RIP, chitinase/*tlp-1*, and RIP/*tlp-1*. In two greenhouse screens, six chitinase, one RIP, one chitinase/RIP, one chitinase/*tlp-1*, and four RIP/*tlp-1* lines exhibited statistically-significant reductions in FHB severity compared to the non transformed controls. These lines will be screened again in the greenhouse and promising lines will be screened in the field in the summers of 2004 and 2005.

We plan to continue to develop transgenic wheat lines with combinations of transgenes and test these lines against FHB. We obtained a transgenic wheat line carrying the *F. sporotrichioides TRI101* gene that exhibits a reduction in FHB severity from Dr. Ann Blechl (USDA-ARS, Albany, CA). We crossed the *TRI101* line with our promising *tlp-1* and β -1,3-glucanase lines and developed lines carrying the *TRI101/tlp-1* and *TRI101/β-1,3-glucanase* combinations. We also crossed our promising *tlp-1* and β -1,3-glucanase lines to generate lines carrying the *tlp-1/β-1,3-glucanase* combination. We will characterize these plants for expression of the resistance genes and test them for enhanced resistance to FHB in the greenhouse and field. We will also continue to combine different resistance genes into a common genetic background and test their efficacy against FHB.

The proposed research meets the objectives of the U.S. Wheat and Barley Scab Initiative and fits within the biotechnology area of research because we are developing transgenic wheat with enhanced resistance to scab.