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Research Area: BIO

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

PROJECT 1 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. There are three major objectives in the proposed work including: (1) develop transgenic wheat carrying genes for potential resistance to FHB; (2) characterize transgenic wheat for transgene expression and resistance to FHB; and (3) combine proven transgenes into a common background and with an elite wheat line.

We plan to continue to develop novel transgenic wheat and to test these lines against FHB. We will use standard protocols in my laboratory to transform wheat with the wheat lipid transfer protein, the wheat glutathione-S-transferase, the rice *Nhl1*, and the wheat 3BS FHB resistance genes. We will characterize these transgenic plants at the molecular level and test them for resistance to FHB in the greenhouse.

My laboratory has developed one, two, four, eight, one, one, three, three and three lines (26 in total) carrying α -puro-thionin, thaumatin like protein 1 (tlp-1), β -1,3-glucanase, chitinase, ribosome inactivating protein (RIP), chitinase/RIP, chitinase/tlp-1, tlp-1/ β -1,3-glucanase and RIP/tlp-1 genes, respectively that exhibit statistically significant reductions in FHB severity compared to non transgenic controls in multiple greenhouse screens ($P < 0.05$). Four β -1,3-glucanase, one α -puro-thionin and two tlp-1 lines were screened in the field and one α -puro-thionin, one tlp-1, and three β -1,3-glucanase lines exhibited field resistance compared to non transgenic controls ($P < 0.05$). All 26 lines will be screened in the field in the summer of 2005 and/or 2006.

We will combine proven transgenes into a common genetic background and with the wheat cultivar Alsen. We plan to cross or transform transgenes encoding differing modes of action into a common genetic background and test the lines for FHB resistance in the greenhouse and field. We will focus our future efforts on those transgenes that exhibit resistance in multiple greenhouse and field screens. We also plan to introgress proven transgenes into Alsen, a line carrying the chromosome 3BS FHB resistant QTL. To determine if the transgenes will enhance FHB resistance in Alsen, we will select progeny from these crosses that contain Alsen-derived resistance and the transgene and test them for enhanced resistance to FHB in the greenhouse.

The proposed research meets the objectives of the USWBSI and fits within the biotechnology area of research because we are developing transgenic wheat with enhanced resistance to scab.