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

PROJECT 1 ABSTRACT

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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. To complement the current 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 genes encoding a wheat lipid transfer protein (LTP), a wheat glutathione-S-transferase (GST), and a wheat oxalate oxidase. Our goal is to develop ten lines carrying each transgene. We have developed nine lines carrying the wheat LTP gene and are regenerating plants that carry the wheat GST gene. We will develop a plant transformation plasmid with the wheat oxalate oxidase gene and develop transgenic plants carrying this transgene. We will characterize these transgenic plants at the molecular level and test them for FHB resistance in the greenhouse.

We plan to continue to field test promising lines. My laboratory has identified 24 lines carrying a variety of transgenes that exhibit statistically significant reductions in FHB severity compared to non transgenic controls in multiple greenhouse screens ($P<0.05$). In collaboration with Dr. R. Dill-Macky, we conducted two field screens, (one screen contained 7 lines and the other screen contained 24 lines) and we identified eight lines exhibiting reduced severity compared to non transgenic controls ($P<0.05$). We will retest the lines in the field that have only been screened once. We will also field test new lines that exhibit reduced severity in our greenhouse screens.

We will combine proven transgenes into a common genetic background and with the type II resistant wheat cultivar Alsen. We have and will continue 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 have crossed five transgenic lines exhibiting reduced severity in the field trials into Alsen. To determine if the transgenes will enhance FHB resistance in Alsen, we will select progeny from these crosses that contain the chromosome 3BS 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 genetic engineering and transformation area because we are developing transgenic wheat with enhanced resistance to scab.