

**PI: Shah, Jyoti****PI's E-mail: Shah@ksu.edu****Project ID: FY06-SH-099****FY05 ARS Agreement #: New****Research Area: GET****Duration of Award: 1 Year****Project Title: Engineering Scab Resistance in Wheat with a Plant Defense Signaling Gene.****PROJECT 1 ABSTRACT**

(1 Page Limit)

Our long-term goal is to develop wheat plants expressing enhanced resistance to *Fusarium* head blight (FHB; scab). In the US, annual losses of wheat to scab have averaged between \$ 200-400 million. In some years these losses have been higher, approaching \$ 1 billion. Biotechnology offers an alternative approach for rapidly developing scab resistant wheat. Genes involved in regulating signaling mechanism offer an advantage that they can simultaneously affect expression of multiple defense genes. Our studies with *Arabidopsis thaliana* and *Fusarium graminearum* have identified the *AtNPR1* gene as a promising candidate for engineering FHB resistance in triticae crops. Overexpression of *AtNPR1* enhances resistance against *F. graminearum* in Arabidopsis, suggesting a role for this gene in plant defense against *F. graminearum*. *AtNPR1* regulates the activation of acquired resistance mechanisms in plants. Wheat and rice have ESTs with homology to *AtNPR1*, suggesting conservation of *AtNPR1*-like sequences amongst dicots and monocots. Furthermore, we have shown that *AtNPR1* expression in the transgenic hexaploid wheat cultivar Bobwhite confers enhanced resistance against FHB.

The specific objectives of this proposal are to: (1) Continue field trials and green house studies to evaluate the stability of *Ubi1:AtNPR1* expression and scab resistance in the transgenic hexaploid wheat cultivar Bobwhite. We propose to carry out additional field trials on two *Ubi1:AtNPR1* expressing lines. We will measure the disease index and DON levels in these trials. We will evaluate stability of transgene expression and scab resistance in backcrossed progeny of these transgenic lines and identify *Ubi1:AtNPR1* bearing lines free of the *Ubi1:bar* gene, which was used as a selectable marker for wheat transformation. We will also monitor the *Ubi1:AtNPR1* plants for any adverse phenotypes on growth and yield in the absence of pathogen (2) Engineer *AtNPR1* expression in durum wheat and other hexaploid wheat cultivars. The *Ubi1:AtNPR1* construct, which was previously utilized to successfully enhance scab resistance in the hexaploid wheat cv Bobwhite, will be transformed into durum wheat and other hexaploid wheat cultivars. We will evaluate transgene expression in the transgenic plants and propagate these lines. In ensuing years, we will test scab resistance in promising *AtNPR1* expressing lines.

***Our ongoing and proposed projects are relevant to the BIOTECHNOLOGY initiatives of USWBSI, by promoting the transgenic testing of genes/signaling pathways for creating scab resistant germplasms.***