0203-SH-103 Control of Scab with Puroindoline-Containing Transgenic Wheat and Barley.

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PROJECT ABSTRACT
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Head scab of wheat and barley, caused by *Fusarium graminearum* and *F. culmorum*, has been a major disease problem in parts of the country for almost a decade. Numerous strategies to control this problem have been investigated with more or less success. One approach that has met with very limited success to date has been the use of anti-fungal proteins to limit the spread of the pathogen. We have been studying the anti-fungal properties of the puroindoline proteins, which are found in wheat endosperm and contribute to grain softness. These studies have recently been extended to include wheat scab caused by *F. culmorum*, and the preliminary results have been surprisingly encouraging. Infection of transgenic wheat that over-express the puroindoline genes (*pinA* and/or *pinB*) was greatly reduced in severity and the percentage of tombstone kernels was reduced by 90%. This reduction in infection would often be enough to lower toxin concentrations to more acceptable levels. More importantly, reductions of this scale could be added to reductions resulting from improved germplasm, selective fungicide use and improved farming practices to create vastly improved options for farmers plagued by wheat and barley scab. The proposed experiments will determine if the puroindolines are effective in controlling wheat scab caused by *F. graminearum* and to begin the process of transforming these genes into barley.

The long-term goal of this research is to apply the use of the anti-microbial puroindoline proteins (PIN) to plant disease resistance. The specific aims of the research described in this proposal are to confirm and strengthen the evidence that the puroindolines can provide control of wheat and barley scab caused by *Fusarium graminearum* and *F. culmorum*. To that end, we propose to 1.) confirm the preliminary field and greenhouse results using wheat transformed with the *pin* genes with *F. culmorum* and extend those results to F. *graminearum* , 2.) determine the effect of puroindolines extracted from wheat seed on the *in vitro* growth of *F. graminearum* in order to correlate *in vitro* and *in vivo* sensitivity of the fungus to the puroindolines and 3.) begin the process of transforming barley with the wheat *pin* genes.

While the use of transgenic plants to control disease is a hotly debated topic these days, research in this area needs to continue so that materials will be available and tested when this technology is accepted. An advantage to using the puroindoline proteins for this purpose is that they are already in the food supply as natural constituents of wheat flour.