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Project Title: Control of Scab with Wheat Puroindoline Proteins.

PROJECT 1 ABSTRACT

(1 Page Limit)

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 more than 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 been extended to include wheat scab caused by *F. culmorum* and *F. graminearum*. The results have been surprisingly encouraging. Infection of transgenic wheat that constitutively express the puroindoline genes (*pinA* and/or *pinB*) throughout the plant was greatly reduced in severity. 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 initiate a project to determine the moieties within the puroindoline proteins that contribute to anti-fungal activity and to continue 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 first propose to develop a heterologous gene expression system in yeast with which we will induce specific mutations in the *pin* genes to determine the mutations effects on anti-fungal activity. Secondly, we will continue the process of transforming Harrington barley with the wheat *pin* genes begun under previous funding from USWBSI.

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.