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PROJECT 1 ABSTRACT
(1 Page Limit)

Fusarium graminearum is an important pathogen of wheat. Infection can result in significant yield losses and grain end-use quality harvested from infected fields may be drastically reduced due to detectable levels of the mycotoxin, Deoxynivalenol. To date insufficient genetic resistance to this pathogen has been identified within wheat germplasm. Combining classical breeding and transgenic development should be considered to enhance resistance. Therefore, the goal of this project is to evaluate transgenes with antifungal and antiapoptotic (anti-programmed cell death, PCD) activities in wheat for durable field resistance towards *F. graminearum*. We have preliminary data that supports the effectiveness of this approach in controlling scab in wheat. This effort will address the following biotechnology priorities: **transform wheat, to demonstrate of the effectiveness of anti-Fusarium transgenes to limit Fusarium infection, growth and spread in vitro, in growth chamber and greenhouse tests and, ultimately, in the field; and identify more genes encoding effective anti-Fusarium proteins.** We will derive homozygous lines and field test our most advanced anti-fungal genes (those based on bovine lactoferrin, other lytic peptides, and ribosomal inactivating proteins) and anti-apoptotic genes (ced9, Bcl-X_L, Bcl-2, and other genes from this family), In addition, we will collaborate with Dr. Yue Jin to screen our homozygous transgenic lines in his greenhouse. We view this collaboration as critical for confirming our results. As for intellectual property rights, we are authorized to use the full-length lactoferrin and the synthetic lactoferricin, and A-16 promoter belongs to us. Dickman has an exclusive agreement with a mammalian pharmaceutical company and has access to many of the new (and not publicly available genes, which also modulate PCD and are excellent candidates for generating new transgenics, with enhanced agronomic traits. We feel that promising lines with FHB tolerance must be rapidly moved into advanced breeding lines which will be part of our breeding effort grant where we will cross the most FHB tolerant transgenic lines to Alsen, (with the intention of enhancing the tolerance of an elite FHB tolerant line), to Wheaton (with the intention of enhancing the tolerance of an elite FHB susceptible line), and to Wahoo or Millennium, since they appear to have some tolerance in our greenhouse trials, and Wesley, a very widely grown, but FHB susceptible line. As part of this grant, we propose making crosses between our elite anti-fungal and our elite antiapoptotic transgenic lines. We are interested in determining if the two mechanisms that we are studying in combination may provide added protection against FHB. We will also intercross elite lines expressing LF or lactoferricin and intercross antiapoptotic transgenic plants as we may be able to enhance the FHB tolerance by increasing gene number (the inserts are believed to be random) or by coupling genes involved in the same disease resistance mechanisms.