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PROJECT 1 ABSTRACT

(1 Page Limit)

Fusarium Head Blight (FHB), caused primarily by *Fusarium graminearum*, has caused serious yield and quality losses to barley in the Upper Midwest region of the USA since 1993. The disease also has raised public concerns regarding food safety due to contamination of grain by deoxynivalenol (DON), a mycotoxin produced by *F. graminearum*. Development of resistant cultivars is one of the best approaches for combating this disease. Our overall goal is to identify novel FHB resistance alleles in *Hordeum* germplasm and facilitate its transfer into adapted breeding germplasm. Evaluation of the entire of six-rowed spring barley collection and over half of the six-rowed winter and wild barley collection from the USDA National Small Grains Collection (NSGC) (>12,000 accessions in total) revealed very few sources of FHB resistance. To broaden the genetic base of FHB resistance in barley, additional sources of resistance need to be identified and exploited. Thus, we propose to continue the systematic evaluation of cultivated (*Hordeum vulgare*) and wild (*Hordeum vulgare* subsp. *spontaneum*) barley accessions from the NSGC for FHB reaction and DON concentration. Moreover, we have made contact and established cooperative research agreements with other major gene banks of the world in an effort to source unique germplasm for testing. These institutes include the N. I. Vavilov All-Russian Scientific Research Institute of Plant Industry (VIR) in St. Petersburg, Russia, the Station federale de recherches en production vegetale de Changins (SFRSPP) in Nyon, Switzerland, the Nordic Gene Bank (NGB) in Alnarp, Sweden, and the Institute for Cereal Crops Improvement (ICCI) in Tel Aviv, Israel. Thus, for FY06, we will evaluate the FHB reaction of: 1) 43 putative resistance sources identified from germplasm screening efforts in 2001-2005; 2) 400 additional accessions of six-rowed winter barley from the NSGC; 3) 500 diverse *Hordeum* accessions from VIR, 390 Scandinavian landraces and cultivars from NGB, and 150 wild barley accessions from the ICCI. This germplasm will be evaluated in an initial FHB screening test in Hangzhou, China. Spring and winter type accessions exhibiting high levels of resistance in the preliminary screening test will be re-evaluated in replicated FHB nurseries in Minnesota (St. Paul and Crookston) and Virginia (Blacksburg), respectively. Accessions exhibiting high levels of FHB resistance and low concentrations of DON will be distributed to barley breeders for crossing. To assist in the selection of the most diverse sources, we will selectively genotype the putative resistance sources with informative microsatellite markers previously developed for barley. We will also develop a comprehensive database for all FHB and DON data collected by U.S. researchers over the past decade and post it on the USWBSI website. The information obtained from this study will have immediate practical applications for developing FHB resistant barley cultivars, thereby minimizing the devastating effects of this disease.